

# CX-400

SERIES

## Compact Photoelectric Sensor



**Full line of world standard sensors now available!**

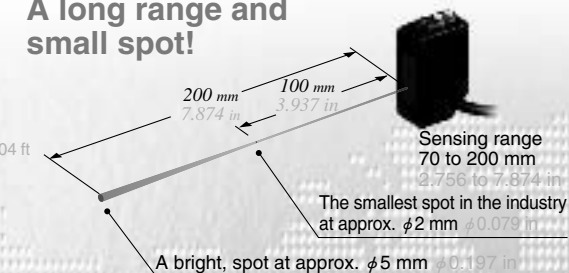
**We have a full lineup of world standard photoelectric sensors! 116 models available!**



- Output...NPN, PNP
- Connecting method...Cable type, M8 Plug-in connector type, M12 Pigtailed type
- Cable length of cable type...0.5 m 1.640 ft, 2 m 6.562 ft, 5 m 16.404 ft

**Special transparent object circuit enhances detectability!**

**A long range and small spot!**



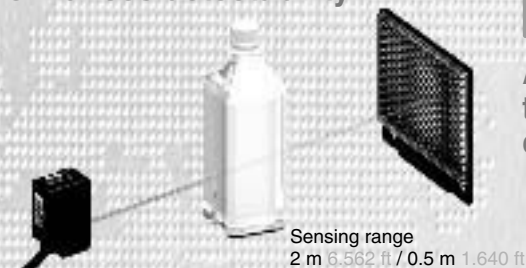
**Diffuse reflective • narrow-view type**  
CX-423

**A height difference equal to the thickness of one business card can be detected!**

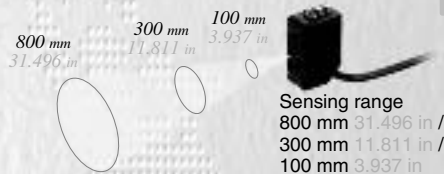
A bright spot at approx. 2 mm (0.079 in) **CX-441**

Sensing range  
300 mm 11.811 in /  
100 mm 3.937 in /  
50 mm 1.969 in

**Retroreflective type for transparent object sensing**  
CX-482/481



**Adjustable range reflective type**  
CX-442/444/443/441



**Diffuse reflective type**  
CX-422/421/424



**Retroreflective type**  
CX-493/491



**Thru-beam type**  
CX-412/411

## CX-400 Series Selection

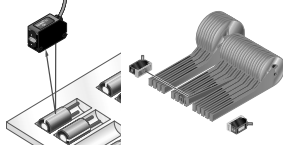
■ CX-400 series sensors solves all your sensing troubles.

### Long range sensing desired



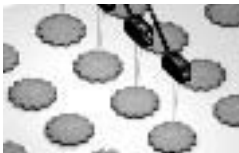
|                         |                                                        |        |
|-------------------------|--------------------------------------------------------|--------|
| Thru-beam type          | Longest in its class with a distance of 15 m 49.213 ft | CX-412 |
| Retroreflective type    | Longest in its class with a distance of 5 m 16.404 ft  | CX-493 |
| Diffuse reflective type | Long sensing range 800 mm 31.496 in                    | CX-422 |

### Small parts sensing desired



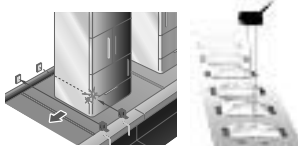
|                                       |                                                                                  |        |
|---------------------------------------|----------------------------------------------------------------------------------|--------|
| Fit slit for thru-beam type           | Minimum size for sensing object $\phi 0.5$ mm $\phi 0.020$ in with slit fitted   | CX-411 |
| Diffuse reflective • narrow-view type | LED light source realizes a spot diameter of approx. $\phi 2$ mm $\phi 0.079$ in | CX-423 |
| Adjustable range reflective type      | Approx. $\phi 2$ mm $\phi 0.079$ in spot unaffected by background objects        | CX-441 |

### Minute height difference discernment desired (Background present)



|                                  |                                                                    |            |
|----------------------------------|--------------------------------------------------------------------|------------|
| Adjustable range reflective type | High precision, 0.4 mm 0.016 in height difference sensing possible | CX-441/443 |
|                                  | Long sensing range 300 mm 11.811 in / 100 mm 3.937 in              | CX-442/444 |

### Glossy object sensing desired



|                                  |                                               |            |
|----------------------------------|-----------------------------------------------|------------|
| Thru-beam type                   | Sensing range 15 m 49.213 ft / 10 m 32.808 ft | CX-411/412 |
| Retroreflective type             | Polarizing filter built-in                    | CX-491     |
| Adjustable range reflective type | FGS function ensures stable sensing           | CX-44□     |

### Area prone to dirt and dust



|                                  |                                                                           |        |
|----------------------------------|---------------------------------------------------------------------------|--------|
| Thru-beam type                   | Uses penetrating infrared light                                           | CX-412 |
| Adjustable range reflective type | Judgment based on incidence angle to avoid light-receiving amount swaying | CX-44□ |

### Oil is scattered about



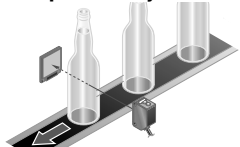
|                         |                                                           |        |
|-------------------------|-----------------------------------------------------------|--------|
| Thru-beam type          | Uses acrylic for lens surface for superior oil resistance | CX-41□ |
| Diffuse reflective type | Uses acrylic for lens surface for superior oil resistance | CX-42□ |
| Retroreflective type    | Uses acrylic for lens surface for superior oil resistance | CX-49□ |

### Simple light beam axis adjustment desired



|                                       |                                                     |        |
|---------------------------------------|-----------------------------------------------------|--------|
| Diffuse reflective • narrow-view type | The bright spot makes the beam axis clearly visible | CX-423 |
| Adjustable range reflective type      | The bright spot makes the beam axis clearly visible | CX-44□ |

### Precise transparent object sensing desired



|                      |                                                                               |        |
|----------------------|-------------------------------------------------------------------------------|--------|
| Retroreflective type | High precision type with built-in special transparent object circuit          | CX-481 |
|                      | Built-in special transparent object circuit. Long sensing range 2 m 6.562 ft. | CX-482 |

# CX-400

**‘Strong’ against even the harshest conditions guarantees reliability.**

**Strongest in its class** ※

## Strong against oil and coolant liquids

※ As of April 2004 and based on research conducted by SUNX.

**CX-41□/42□/49□**

The lens material for the thru-beam type, retroreflective type (excluding the **CX-48□**) and the diffuse reflective type are made of a strong acrylic that resists the harmful effects of coolants. These sensors can be used with confidence even around metal processing machinery that disperses oil mists. The protection mechanism also conforms to IP67 (IEC).



## Strong against ethanol

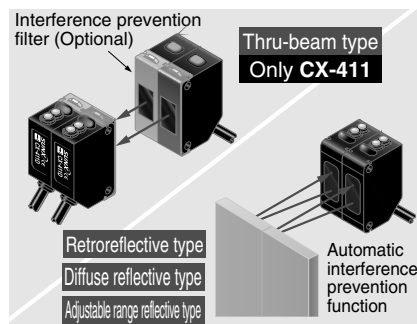
**CX-44□/48□**

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).



## Strong against interference

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

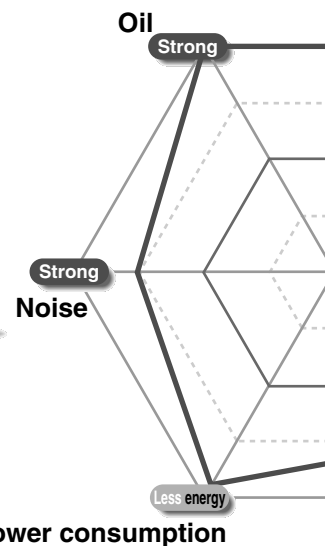
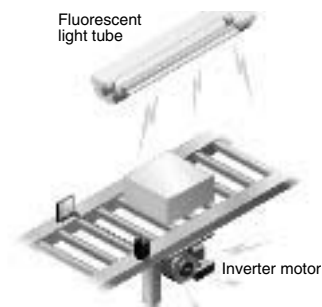


## Strong even in cold environments

Stable performance can be maintained even in environments of  $-25^{\circ}\text{C}$   $-13^{\circ}\text{F}$ .

## Strong against noise

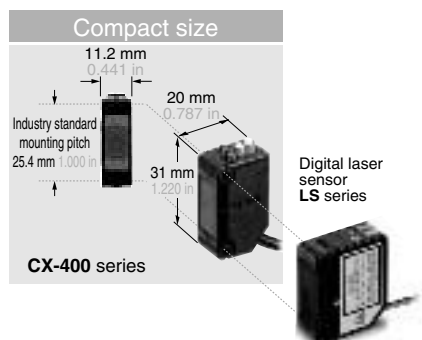
Significantly stronger against inverter light and other extraneous light as well as high frequency and electromagnetic noise generated by high-pressure inverter motors and other devices.



**The ideal sensors that are people and environmentally friendly are born from the concept of ‘less’ waste.**

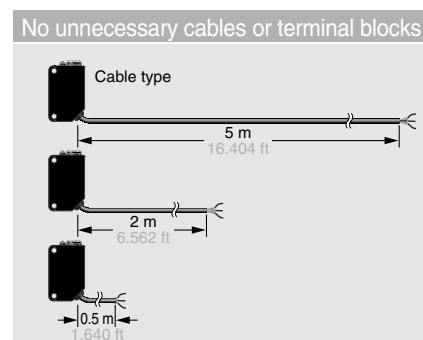
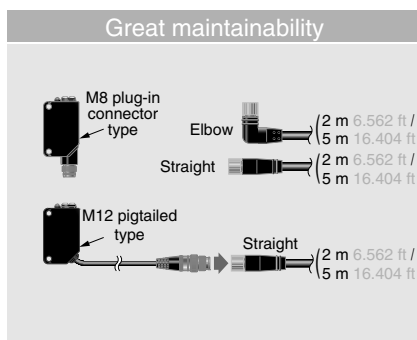
## Less space

The sensors are compact in size at  $W11.2 \times H31 \times D20$  mm  $W0.441 \times H1.220 \times D0.787$  in. The mounting pitch is also at the world standard size of 25.4 mm 1.000 in.



## Less processing

M8 plug-in connector type and M12 pigtailed type are available. This contributes to less time spent in setting up. In addition, cable types are available with cable lengths of 0.5 m 1.640 ft, 2 m 6.562 ft and 5 m 16.404 ft. This results in less wastage.



The new standard sensors for the 21st Century provide 'high' performance detection.

## High precision optics and high performance special circuitry

SUNX's unique optical systems and specially designed electronic circuits provide stable sensing of even the minutest height difference and the thinnest transparent film.

Highest performance in its class

※ As of April 2004 and based on research conducted by SUNX.

### CX-441/443

Detecting a height difference of even as little as 0.4 mm 0.016 in possible (equivalent to one business card).

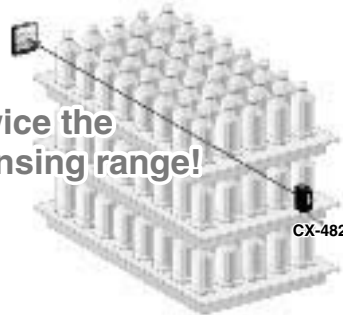
2.5 times the sensing capability!



### CX-481/482

A full range of 2 m 6.562 ft sensing range types are available. They are capable of sensing a 10 μm transparent film even at a long range.

Twice the sensing range!



### CX-44

• Even different colored object can be sensed at roughly the same distance. No adjuster control is needed when the setup is changed.

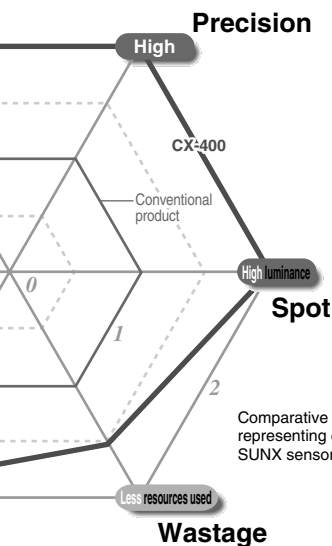
30 % increase in sensing range between black and white※ compared to the conventional products!

※ The difference in sensing range between black non-glossy paper (lightness: 5) and white non-glossy paper

• BGS / FGS functions make even the most challenging settings possible. Controls the adverse effects of background objects.

Refer to p.8 for details.

Easy to use high-level functions!



High

Smallest spot in its class

※

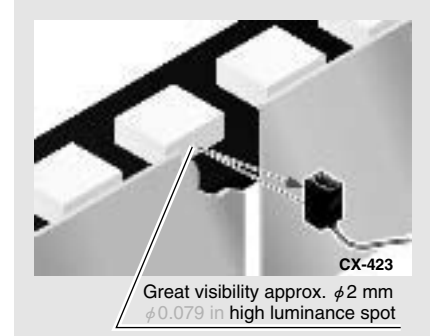
### High luminance spot

※ As of April 2004 and based on research conducted by SUNX.

### CX-423/44

These sensors realize a high luminance red spot that provides bright visibility. The sensing position can be checked at a glance.

Because it has the smallest spot in its class, approx. φ2 mm φ0.079 in (CX-423/441), even the minutest object can be accurately detected.

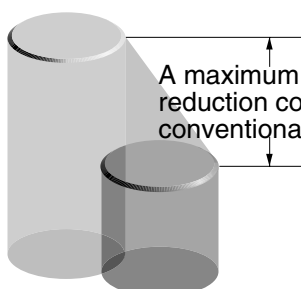


Great visibility approx. φ2 mm φ0.079 in high luminance spot

Less

### Less power consumed

The CX-400 series sensors achieve a maximum of approx. 55 % the power consumption of conventional sensors. Contributes to preserving the environment.



A maximum 45 % reduction compared to conventional sensors!!

### Less resources used

Based on environmental considerations, simplified packaging is used in order to reduce waste.

In addition, the bag is made from polyethylene which produces no toxic gases even when burned.



# CX-400



## Thru-beam type

**CX-411:** 10 m 32.808 ft

**CX-412:** 15 m 49.213 ft

**The longest in its class**※

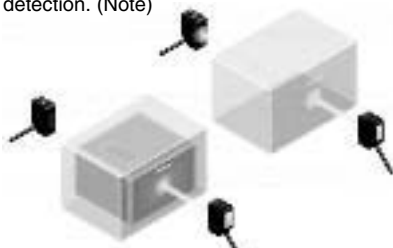
※ As of April 2004 and based on research conducted by SUNX.

**The longest in its class**※

### Strong infrared beam

**CX-412**

The longest in its class, it realizes a 15 m 49.213 ft long-distance sensing range. Remarkable penetrating power enables applications such as package content detection. (Note)



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

### Strong on dust and dirt

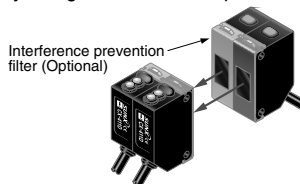
**CX-412**

Because the light source is an infrared light, it is strong on dust and dirt compared to the red beam type.

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

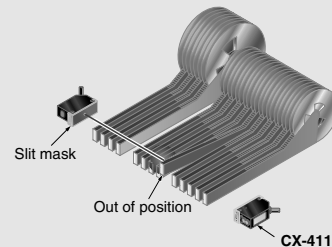
**CX-411**

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

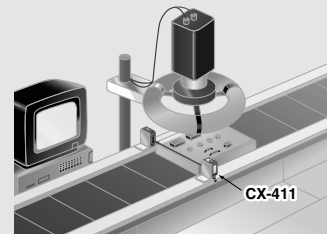


## Applications

- Detecting out of position tape feeder cassette



- Synchronizing sensor for image processing systems



## Retroreflective type

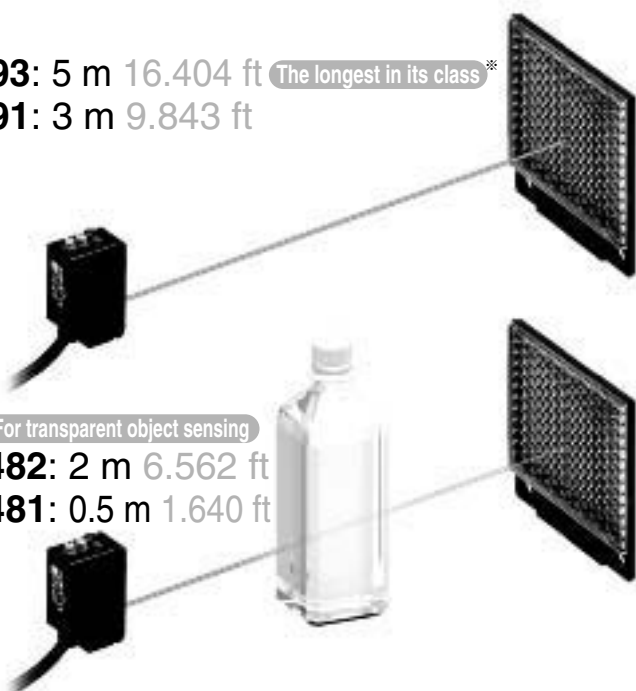
**CX-493:** 5 m 16.404 ft **The longest in its class**※

**CX-491:** 3 m 9.843 ft

**New** For transparent object sensing

**CX-482:** 2 m 6.562 ft

**CX-481:** 0.5 m 1.640 ft



※ As of April 2004 and based on research conducted by SUNX.

**The longest in its class**※

**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. 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.

**No.1 in the industry**※

### Strong against extraneous light and noise

**CX-491**

With a level of performance ranked No.1 in the industry※, these sensors provide stable sensing.

### Two sensors can be mounted close together

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 200 mm  
Narrow-view type 2.756 to 7.874 in

**Smallest spot in its class** ※

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

**CX-423**

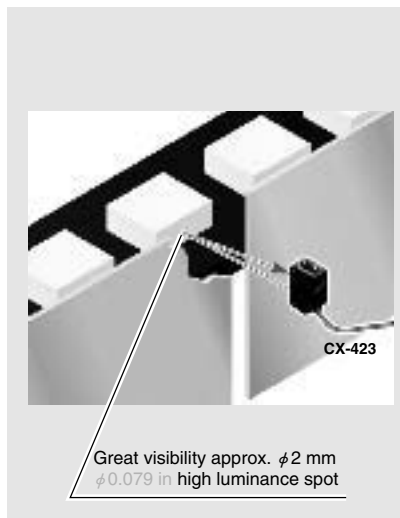
These sensors realize a high luminance red LED spot that provides bright visibility enabling the sensing position to be checked at a glance.

Because it has the smallest spot in its class, approx.  $\phi 2$  mm  $\phi 0.079$  in, even the minutest object can be accurately detected.

### Reduction of volume adjustment labor

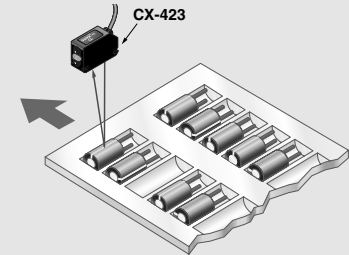
Because these sensors possess many variations depending on the sensing range, enables you to make optimal volume adjustment easily.

※ As of April 2004 and based on research conducted by SUNX.

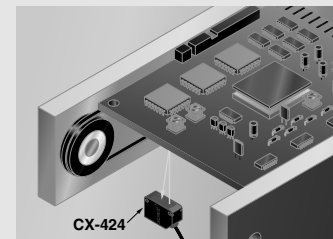


## Applications

- Small parts sensing



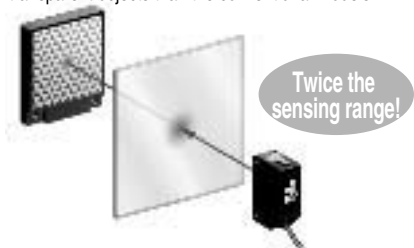
- Passage confirmation on substrate conveyance equipment



## Introducing the transparent **New** object sensing type sensor

**CX-48**

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



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

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

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

[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.

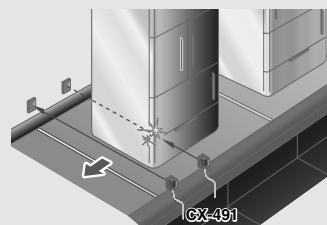
$\phi$ : Length of cylindrical glasses

$t$ : Thickness of sensing object

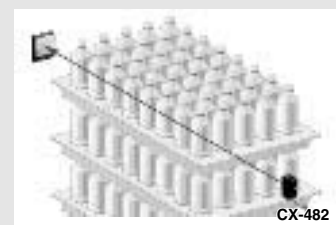
Note: The optimum condition is defined as the condition in which the sensitivity level is set such that the stability indicator just lights up when the object is absent.

## Applications

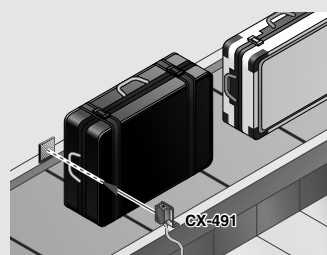
- Sensing glossy white electric appliances



- Sensing plastic bottles stacked on pallets



- Passage confirmation of object on a conveyor belt



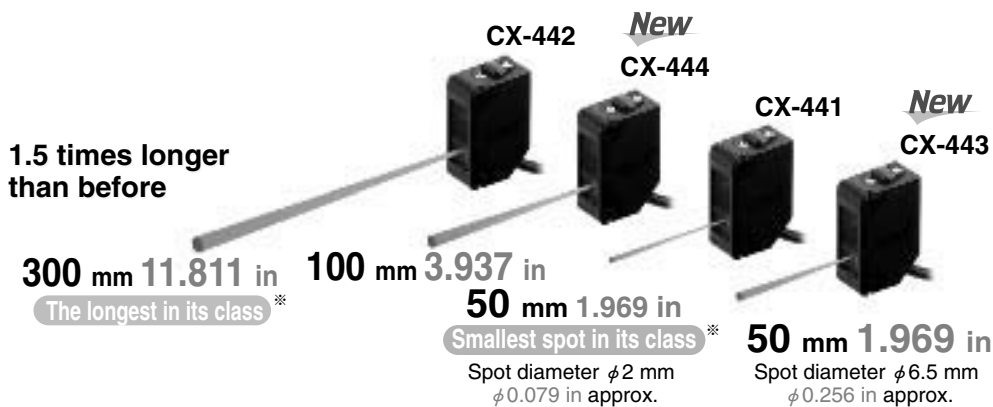
- Detecting transparent film



# CX-400



## Adjustable range reflective type



### High precision type

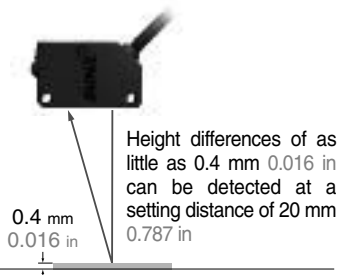
Highest performance in its class \*

#### CX-441/443

- Can sense 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.

2.5 times the sensing capability!



- Not affected by color. The difference in sensing range between black and white is 1 % or less. (Note)

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.

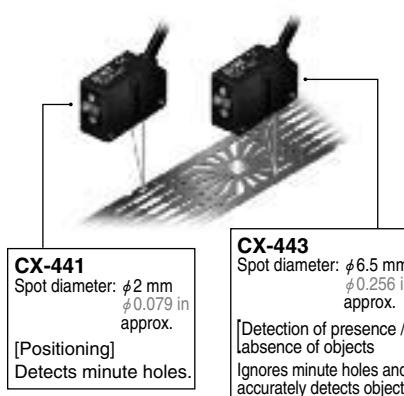
30 % higher sensing capability



Note: The difference in sensing range between black non-glossy paper (lightness: 5) and white non-glossy paper

- Select from 2 spot diameters as per the application

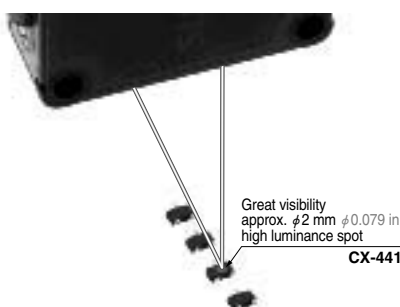
Within the choice of 50 mm 1.969 in sensing range sensors, we offer small approx. φ2 mm φ0.079 in spot type optimal for detecting minute object and large approx. φ6.5 mm φ0.256 in spot type capable of sensing object covered with holes and grooves.



Smallest spot in its class \*

### The bright spot makes beam axis alignment easy

These sensors realize a high luminance red spot that provides bright visibility. The sensing position can be checked at a glance. Because the CX-441 sensor has the smallest spot in its class, approx. φ2 mm φ0.079 in, even the minutest object can be accurately detected.



### Can be used for sensing minute differences

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!

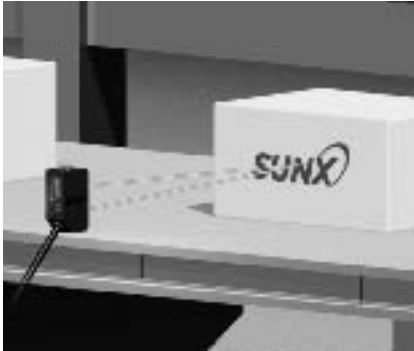
For details on the operation of the BGS / FGS functions, refer to p.24, 'PRECAUTIONS FOR PROPER USE'.

### The BGS function is best suited for the following case



#### 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



#### Background present

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

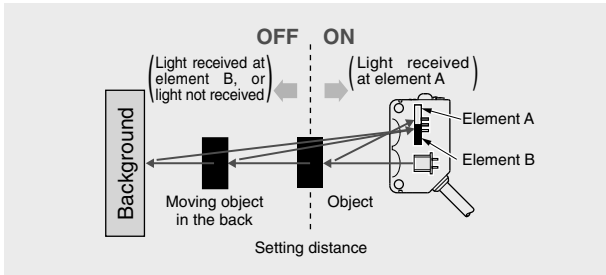


Unaffected by gloss, color or uneven surfaces when sensing objects present on a conveyor belt.



### 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.

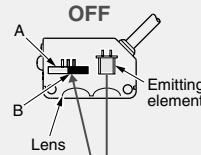


### FGS (Foreground suppression) function

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.

#### OFF in this condition only

##### Object absent

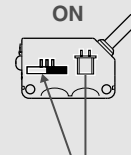


Conveyor

Light received at position B  
(A conveyor or other back-ground must be present)

#### ON in all other conditions

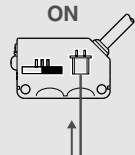
##### Object present



Conveyor

Light received at position A

##### For glossy object



Conveyor

Light is not received at position B, so a object is judged to be present

## Applications

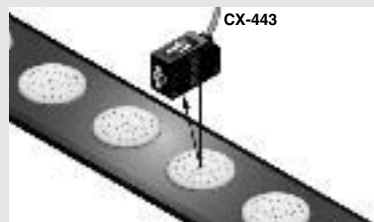
### • Small tablet sensing

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



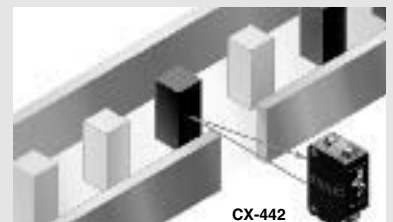
### • Biscuit sensing

Stable sensing even for thin objects. Uses FGS function.



### • Passage confirmation

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





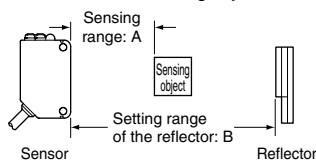
# CX-400

## ORDER GUIDE

| Type                        | Appearance | Sensing range                            | Model No.     |                 | Emitting element |
|-----------------------------|------------|------------------------------------------|---------------|-----------------|------------------|
|                             |            |                                          | NPN output    | PNP output      |                  |
| Thru-beam                   |            | 10 m 32.808 ft                           | <b>CX-411</b> | <b>CX-411-P</b> | Red LED          |
|                             |            | 15 m 49.213 ft                           | <b>CX-412</b> | <b>CX-412-P</b> | Infrared LED     |
| Retroreflective             |            | 3 m 9.843 ft (Note 1)                    | <b>CX-491</b> | <b>CX-491-P</b> | Red LED          |
|                             |            | 5 m 16.404 ft (Note 1)                   | <b>CX-493</b> | <b>CX-493-P</b> |                  |
|                             |            | 50 to 500 mm 1.969 to 19.685 in (Note 1) | <b>CX-481</b> | <b>CX-481-P</b> | Infrared LED     |
|                             |            | 0.1 to 2 m 0.328 to 6.562 in (Note 1)    | <b>CX-482</b> | <b>CX-482-P</b> |                  |
| Diffuse reflective          |            | 100 mm 3.937 in (Note 2)                 | <b>CX-424</b> | <b>CX-424-P</b> | Infrared LED     |
|                             |            | 300 mm 11.811 in (Note 2)                | <b>CX-421</b> | <b>CX-421-P</b> |                  |
|                             |            | 800 mm 31.496 in (Note 2)                | <b>CX-422</b> | <b>CX-422-P</b> |                  |
|                             |            | 70 to 200 mm 2.756 to 7.874 in (Note 2)  | <b>CX-423</b> | <b>CX-423-P</b> | Red LED          |
| Adjustable range reflective |            | 2 to 50 mm 0.079 to 1.969 in             | <b>CX-441</b> | <b>CX-441-P</b> | Red LED          |
|                             |            | 15 to 100 mm 0.591 to 3.937 in           | <b>CX-443</b> | <b>CX-443-P</b> |                  |
|                             |            | 20 to 300 mm 0.787 to 11.811 in          | <b>CX-444</b> | <b>CX-444-P</b> |                  |
|                             |            | 2 to 50 mm 0.079 to 1.969 in             | <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 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-482</b>                   |
|---|---------------------------------|----------------------------------|-------------------------------------|---------------------------------|
| A | 3 m<br>9.843 ft                 | 5 m<br>16.404 ft                 | 50 to 500 mm<br>1.969 to 19.685 in  | 0.1 to 2 m<br>0.328 to 6.562 ft |
| B | 0.1 to 3 m<br>0.328 to 9.843 ft | 0.1 to 5 m<br>0.328 to 16.404 ft | 100 to 500 mm<br>3.937 to 19.685 in | 0.8 to 2 m<br>2.625 to 6.562 ft |

2) The sensing range of the diffuse reflective type sensor is specified for white non-glossy paper (200 × 200 mm 7.874 × 7.874 in) as the object.

## ORDER GUIDE

### 0.5 m 1.640 ft / 5 m 16.404 ft cable length type, M8 plug-in connector type, M12 pigtailed type

0.5 m 1.640 ft / 5 m 16.404 ft cable length type (standard: 2 m 6.562 ft), M8 plug-in connector type and M12 pigtailed type are available.

| Type                        | Output                         | Standard        | 0.5 m 1.640 ft cable length type | 5 m 16.404 ft cable length type | M8 plug-in connector type (Note) | M12 pigtailed type (Note) |
|-----------------------------|--------------------------------|-----------------|----------------------------------|---------------------------------|----------------------------------|---------------------------|
| Thru-beam                   | NPN output type                | <b>CX-411</b>   | <b>CX-411-C05</b>                | <b>CX-411-C5</b>                | <b>CX-411-Z</b>                  | <b>CX-411-J</b>           |
|                             | PNP output type                | <b>CX-411-P</b> | <b>CX-411-P-C05</b>              | <b>CX-411-P-C5</b>              | <b>CX-411-P-Z</b>                | <b>CX-411-P-J</b>         |
|                             | Long sensing range             | NPN output type | <b>CX-412</b>                    | <b>CX-412-C05</b>               | <b>CX-412-Z</b>                  | <b>CX-412-J</b>           |
|                             |                                | PNP output type | <b>CX-412-P</b>                  | <b>CX-412-P-C05</b>             | <b>CX-412-P-Z</b>                | <b>CX-412-P-J</b>         |
| Retro-reflective            | With polarizing filters        | NPN output type | <b>CX-491</b>                    | <b>CX-491-C05</b>               | <b>CX-491-Z</b>                  | <b>CX-491-J</b>           |
|                             |                                | PNP output type | <b>CX-491-P</b>                  | <b>CX-491-P-C05</b>             | <b>CX-491-P-Z</b>                | <b>CX-491-P-J</b>         |
|                             | Long sensing range             | NPN output type | <b>CX-493</b>                    | <b>CX-493-C05</b>               | <b>CX-493-Z</b>                  | <b>CX-493-J</b>           |
|                             |                                | PNP output type | <b>CX-493-P</b>                  | <b>CX-493-P-C05</b>             | <b>CX-493-P-Z</b>                | <b>CX-493-P-J</b>         |
|                             | For transparent object sensing | NPN output type | <b>CX-481</b>                    | <b>CX-481-C05</b>               | <b>CX-481-Z</b>                  | <b>CX-481-J</b>           |
|                             |                                | PNP output type | <b>CX-481-P</b>                  | <b>CX-481-P-C05</b>             | <b>CX-481-P-Z</b>                | <b>CX-481-P-J</b>         |
|                             |                                | NPN output type | <b>CX-482</b>                    | <b>CX-482-C05</b>               | <b>CX-482-Z</b>                  | <b>CX-482-J</b>           |
|                             |                                | PNP output type | <b>CX-482-P</b>                  | <b>CX-482-P-C05</b>             | <b>CX-482-P-Z</b>                | <b>CX-482-P-J</b>         |
| Diffuse reflective          |                                | NPN output type | <b>CX-424</b>                    | <b>CX-424-C05</b>               | <b>CX-424-Z</b>                  | <b>CX-424-J</b>           |
|                             |                                | PNP output type | <b>CX-424-P</b>                  | <b>CX-424-P-C05</b>             | <b>CX-424-P-Z</b>                | <b>CX-424-P-J</b>         |
|                             |                                | NPN output type | <b>CX-421</b>                    | <b>CX-421-C05</b>               | <b>CX-421-Z</b>                  | <b>CX-421-J</b>           |
|                             |                                | PNP output type | <b>CX-421-P</b>                  | <b>CX-421-P-C05</b>             | <b>CX-421-P-Z</b>                | <b>CX-421-P-J</b>         |
|                             |                                | NPN output type | <b>CX-422</b>                    | <b>CX-422-C05</b>               | <b>CX-422-Z</b>                  | <b>CX-422-J</b>           |
|                             |                                | PNP output type | <b>CX-422-P</b>                  | <b>CX-422-P-C05</b>             | <b>CX-422-P-Z</b>                | <b>CX-422-P-J</b>         |
|                             | Narrow-view                    | NPN output type | <b>CX-423</b>                    | <b>CX-423-C05</b>               | <b>CX-423-Z</b>                  | <b>CX-423-J</b>           |
|                             |                                | PNP output type | <b>CX-423-P</b>                  | <b>CX-423-P-C05</b>             | <b>CX-423-P-Z</b>                | <b>CX-423-P-J</b>         |
| Adjustable range reflective | Small spot                     | NPN output type | <b>CX-441</b>                    | —                               | <b>CX-441-Z</b>                  | —                         |
|                             |                                | PNP output type | <b>CX-441-P</b>                  | —                               | <b>CX-441-P-Z</b>                | —                         |
|                             |                                | NPN output type | <b>CX-443</b>                    | —                               | <b>CX-443-Z</b>                  | —                         |
|                             |                                | PNP output type | <b>CX-443-P</b>                  | —                               | <b>CX-443-P-Z</b>                | —                         |
|                             |                                | NPN output type | <b>CX-444</b>                    | —                               | <b>CX-444-Z</b>                  | —                         |
|                             |                                | PNP output type | <b>CX-444-P</b>                  | —                               | <b>CX-444-P-Z</b>                | —                         |
|                             |                                | NPN output type | <b>CX-442</b>                    | —                               | <b>CX-442-Z</b>                  | —                         |
|                             |                                | PNP output type | <b>CX-442-P</b>                  | —                               | <b>CX-442-P-Z</b>                | —                         |

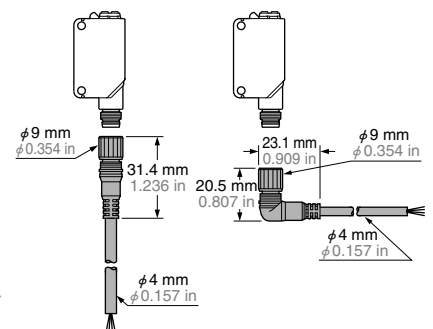
Note : Please order the suitable mating cable separately for M8 plug-in connector type and M12 pigtailed type.

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

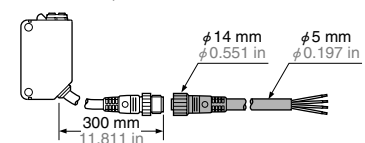
| Type                          | Model No. | Cable length      | Description   |
|-------------------------------|-----------|-------------------|---------------|
| For M8 plug-in connector type | Straight  | <b>CN-24A-C2</b>  | 2 m 6.562 ft  |
|                               |           | <b>CN-24A-C5</b>  | 5 m 16.404 ft |
|                               | Elbow     | <b>CN-24AL-C2</b> | 2 m 6.562 ft  |
|                               |           | <b>CN-24AL-C5</b> | 5 m 16.404 ft |
| For M12 pigtailed type        | 2-core    | <b>CN-22-C2</b>   | 2 m 6.562 ft  |
|                               |           | <b>CN-22-C5</b>   | 5 m 16.404 ft |
|                               | 4-core    | <b>CN-24-C2</b>   | 2 m 6.562 ft  |
|                               |           | <b>CN-24-C5</b>   | 5 m 16.404 ft |

#### 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



#### Package without reflector

NPN output type: **CX-491-Y**

PNP output type: **CX-491-P-Y**

#### Accessory

**RF-230** (Reflector)



# CX-400

## OPTIONS

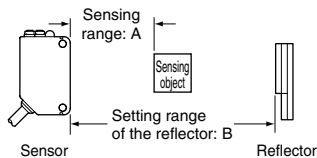
| Designation                                               | Model No.    |         | Slit size                      | Sensing range    |                    | Min. sensing object |                                |
|-----------------------------------------------------------|--------------|---------|--------------------------------|------------------|--------------------|---------------------|--------------------------------|
|                                                           | Slit         | Sensor  |                                | Slit on one side | Slit on both sides | Slit on one side    | Slit on both sides             |
| Round slit mask<br>(For thru-beam type sensor only)       | OS-CX-05     | CX-411□ | φ 0.5 mm<br>φ 0.020 in         | 400 mm 15.748 in | 20 mm 0.787 in     | φ 12 mm φ 0.472 in  | φ 0.5 mm<br>φ 0.020 in         |
|                                                           |              | CX-412□ |                                | 600 mm 23.622 in | 30 mm 1.181 in     |                     |                                |
|                                                           | OS-CX-1      | CX-411□ | φ 1 mm<br>φ 0.039 in           | 900 mm 35.433 in | 100 mm 3.937 in    | φ 12 mm φ 0.472 in  | φ 1 mm φ 0.039 in              |
|                                                           |              | CX-412□ |                                | 1.35 m 4.429 ft  | 150 mm 5.906 in    |                     |                                |
|                                                           | OS-CX-2      | CX-411□ | φ 2 mm<br>φ 0.079 in           | 2 m 6.562 ft     | 400 mm 15.748 in   | φ 12 mm φ 0.472 in  | φ 2 mm φ 0.079 in              |
|                                                           |              | CX-412□ |                                | 3 m 9.843 ft     | 600 mm 23.622 in   |                     |                                |
| Rectangular slit mask<br>(For thru-beam type sensor only) | OS-CX-05 × 6 | CX-411□ | 0.5 × 6 mm<br>0.020 × 0.236 in | 2 m 6.562 ft     | 400 mm 15.748 in   | φ 12 mm φ 0.472 in  | 0.5 × 6 mm<br>0.020 × 0.236 in |
|                                                           |              | CX-412□ |                                | 3 m 9.843 ft     | 600 mm 23.622 in   |                     |                                |
|                                                           | OS-CX-1 × 6  | CX-411□ | 1 × 6 mm<br>0.039 × 0.236 in   | 3 m 9.843 ft     | 1 m 3.281 ft       | φ 12 mm φ 0.472 in  | 1 × 6 mm<br>0.039 × 0.236 in   |
|                                                           |              | CX-412□ |                                | 4.5 m 14.764 ft  | 1.5 m 4.921 ft     |                     |                                |
|                                                           | OS-CX-2 × 6  | CX-411□ | 2 × 6 mm<br>0.079 × 0.236 in   | 5 m 16.404 ft    | 2 m 6.562 ft       | φ 12 mm φ 0.472 in  | 2 × 6 mm<br>0.079 × 0.236 in   |
|                                                           |              | CX-412□ |                                | 7.5 m 24.606 ft  | 3 m 9.843 ft       |                     |                                |

| Designation                                          | Model No.                | Sensing range                                    | Min. sensing object            |
|------------------------------------------------------|--------------------------|--------------------------------------------------|--------------------------------|
| Interference prevention filter<br>(For CX-441□ only) | PF-CX4-V<br>(Vertical)   | 5 m 16.404 ft<br>(Note 1)                        | φ 12 mm φ 0.472 in<br>(Note 1) |
|                                                      | PF-CX4-H<br>(Horizontal) | 5 m 16.404 ft<br>(Note 1)                        | φ 12 mm φ 0.472 in<br>(Note 1) |
| Reflector<br>(For retro-reflective type sensor only) | RF-210                   | CX-491□ 1 m 3.281 ft (Note 2)                    | φ 30 mm φ 1.181 in             |
|                                                      |                          | CX-493□ 1.5 m 4.921 ft (Note 2)                  |                                |
|                                                      |                          | CX-481□ —————                                    |                                |
|                                                      |                          | CX-482□ 0.1 to 0.6 m 0.328 to 1.969 ft (Note 2)  |                                |
|                                                      | RF-220                   | CX-491□ 1.5 m 4.921 ft (Note 2)                  | φ 35 mm φ 1.378 in             |
|                                                      |                          | CX-493□ 3 m 9.843 ft (Note 2)                    |                                |
|                                                      |                          | CX-481□ 50 to 300 mm 1.969 to 11.811 in (Note 2) |                                |
|                                                      |                          | CX-482□ 0.1 to 1.3 m 0.328 to 4.265 ft (Note 2)  |                                |

Notes: 1) Value when attached to 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' may vary depending on the shape of sensing object. Be sure to check the operation with the actual sensing object.

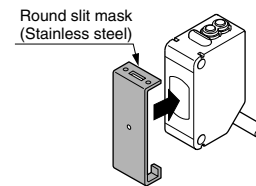


| Model No. |           | A                                  | B                                   |
|-----------|-----------|------------------------------------|-------------------------------------|
| Sensor    | Reflector |                                    |                                     |
| CX-481□   | RF-220    | 50 to 300 mm<br>1.969 to 11.811 in | 100 to 300 mm<br>3.937 to 11.811 in |
|           | RF-210    | 0.1 to 1.3 m<br>0.328 to 4.265 ft  | 0.5 to 1.3 m<br>1.640 to 4.265 ft   |
| CX-482□   | RF-220    | 0.1 to 0.6 m<br>0.328 to 1.969 ft  | 0.3 to 0.6 m<br>0.984 to 1.969 ft   |
|           | RF-210    |                                    |                                     |

### Round slit mask

#### • OS-CX-□

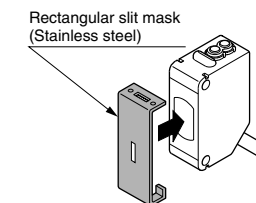
Fitted on the front face of the sensor with one-touch.



### Rectangular slit mask

#### • OS-CX-□ × 6

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

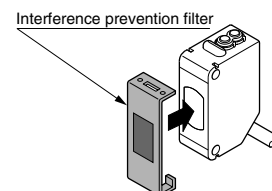


### Interference prevention filter

#### • PF-CX4-V

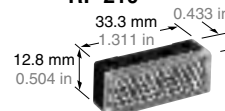
#### • PF-CX4-H

Two sets of CX-441□ can be mounted close together.

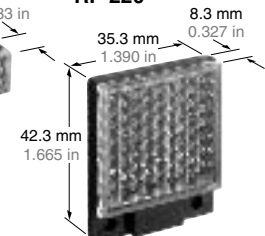


### Reflector

#### • RF-210



#### • RF-220



## OPTIONS

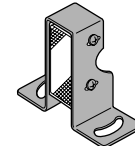
| Designation                     | Model No.        | Description                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reflector mounting bracket      | <b>MS-RF21-1</b> | Protective mounting bracket for <b>RF-210</b><br>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:<br/>0.5 m 1.640 ft [CX-491] □<br/>0.8 m 2.625 ft [CX-493] □</li> <li>Ambient temperature:<br/>− 25 to + 50 °C<br/>− 13 to + 122 °F</li> <li>Ambient humidity:<br/>35 to 85 % RH</li> </ul>                                                                                                                      |
|                                 | <b>RF-12</b>     | <ul style="list-style-type: none"> <li>Sensing range:<br/>0.7 m 2.297 ft [CX-491] □<br/>1.2 m 3.937 ft [CX-493] □<br/>0.1 to 0.6 m<br/>0.328 to 1.969 ft [CX-482] □</li> <li>Notes: 1) Keep the tape free from stress. If it is pressed too much, its capability may deteriorate.<br/>2) Do not cut the tape. It will deteriorate the sensing performance.</li> </ul> |
|                                 | <b>RF-13</b>     | <ul style="list-style-type: none"> <li>Sensing range:<br/>0.5 m 1.640 ft [CX-491] □<br/>0.8 m 2.625 ft [CX-493] □</li> <li>Ambient temperature: − 25 to + 55 °C<br/>− 13 to + 131 °F</li> <li>Ambient humidity: 35 to 85 % RH</li> </ul>                                                                                                                              |
| Sensor mounting bracket         | <b>MS-CX2-1</b>  | Foot angled mounting bracket<br>It can also be used for mounting <b>RF-210</b> .                                                                                                                                                                                                                                                                                      |
|                                 | <b>MS-CX2-2</b>  | Foot biangled mounting bracket<br>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 | <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                                                                                                                                                                                                                                                                                                                                              |
| Sensor checker                  | <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                                                                                                                                                                                                                                  |

Notes: 1) The plug-in connector type sensor does not allow use of some sensor mounting brackets because of the protrusion of the connector.

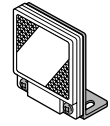
### Reflector mounting bracket

• **MS-RF21-1**

• **MS-RF22**

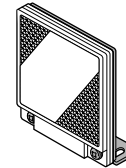


Two M3 (length 12 mm 0.472 in) screws with washers are attached.



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

• **MS-RF23**



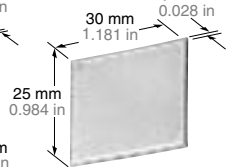
Two M4 (length 10 mm 0.394 in) screws with washers are attached.

### Reflective tape

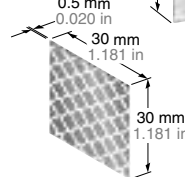
• **RF-11**



• **RF-12**

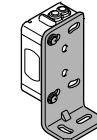


• **RF-13**



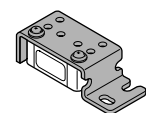
### Sensor mounting bracket

• **MS-CX2-1**



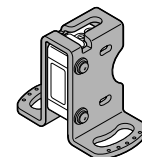
Two M3 (length 12 mm 0.472 in) screws with washers are attached.

• **MS-CX2-2**



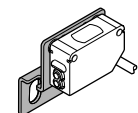
Two M3 (length 12 mm 0.472 in) screws with washers are attached.

• **MS-CX2-4**



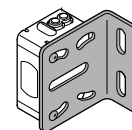
Two M3 (length 14 mm 0.551 in) screws with washers are attached.

• **MS-CX2-5**



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

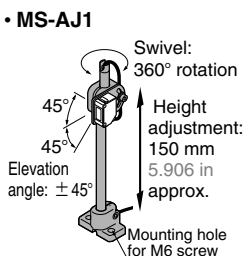
• **MS-CX-3**



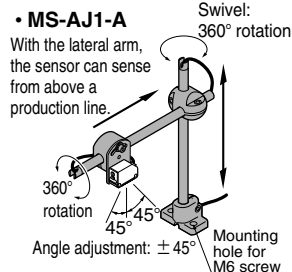
Two M3 (length 12 mm 0.472 in) screws with washers are attached.

### Universal sensor mounting stand

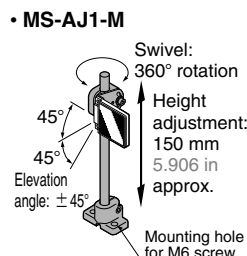
• **MS-AJ1**



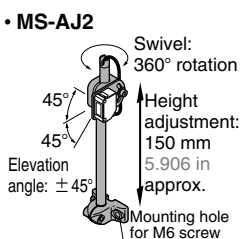
• **MS-AJ1-A**



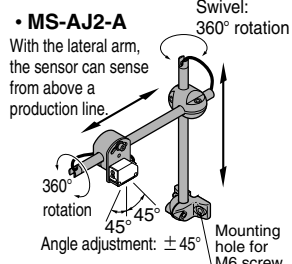
• **MS-AJ1-M**



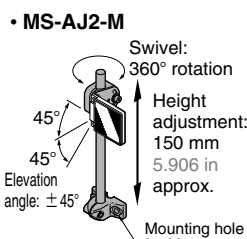
• **MS-AJ2**



• **MS-AJ2-A**

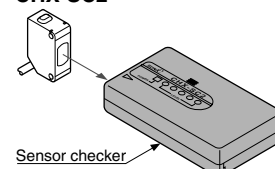


• **MS-AJ2-M**



### Sensor checker

• **CHX-SC2**

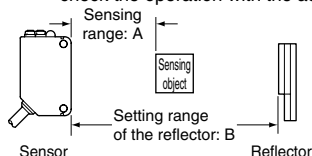


# CX-400

## SPECIFICATIONS

|                                               |                          | Type       | Thru-beam                                                                                                                                                                                                                                                |                                                   | Retroreflective                                                                     |                                                                           |                                                                                        |                                          | Diffuse reflective                                                                                                                                                                                                                                             |                              |                              |                                                                                                           |
|-----------------------------------------------|--------------------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------|----------------------------------------------------------------------------------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|------------------------------|-----------------------------------------------------------------------------------------------------------|
|                                               |                          |            |                                                                                                                                                                                                                                                          | Long sensing range                                | With polarizing filters                                                             | Long sensing range                                                        | For transparent object sensing                                                         |                                          |                                                                                                                                                                                                                                                                |                              |                              | Narrow-view                                                                                               |
|                                               |                          |            |                                                                                                                                                                                                                                                          |                                                   |                                                                                     |                                                                           |                                                                                        |                                          |                                                                                                                                                                                                                                                                |                              |                              |                                                                                                           |
| Item                                          | Model No.                | NPN output | CX-411                                                                                                                                                                                                                                                   | CX-412                                            | CX-491                                                                              | CX-493                                                                    | CX-481                                                                                 | CX-482                                   | CX-424                                                                                                                                                                                                                                                         | CX-421                       | CX-422                       | CX-423                                                                                                    |
|                                               |                          | PNP output | CX-411-P                                                                                                                                                                                                                                                 | CX-412-P                                          | CX-491-P                                                                            | CX-493-P                                                                  | CX-481-P                                                                               | CX-482-P                                 | CX-424-P                                                                                                                                                                                                                                                       | CX-421-P                     | CX-422-P                     | CX-423-P                                                                                                  |
| Sensing range                                 |                          |            | 10 m<br>32.808 ft                                                                                                                                                                                                                                        | 15 m<br>49.213 ft                                 | 3 m<br>9.843 ft (Note 1)                                                            | 5 m<br>16.404 ft (Note 1)                                                 | 50 to 500 mm<br>1.969 to 19.685 in (Note 1)                                            | 0.1 to 2 m<br>0.328 to 6.562 ft (Note 1) | 100 mm<br>3.937 in (Note 2)                                                                                                                                                                                                                                    | 300 mm<br>11.811 in (Note 2) | 800 mm<br>31.496 in (Note 2) | 70 to 200 mm<br>2.756 to 7.874 in (Note 2)                                                                |
| Sensing object                                |                          |            | φ 12 mm φ 0.472 in<br>or more opaque<br>object (Note 3)                                                                                                                                                                                                  |                                                   | φ 50 mm φ 1.969 in<br>or more opaque,<br>translucent or specular<br>object (Note 1) | φ 50 mm φ 1.969 in<br>or more opaque or<br>translucent object<br>(Note 1) | φ 50 mm φ 1.969 in<br>or more transparent,<br>translucent or<br>opaque object (Note 1) |                                          | Opaque, translucent or<br>transparent object                                                                                                                                                                                                                   |                              |                              | Opaque, translucent<br>or transparent object<br>(Min. sensing object: φ 0.5 mm<br>φ 0.020 in copper wire) |
| Hysteresis                                    |                          |            |                                                                                                                                                                                                                                                          |                                                   |                                                                                     |                                                                           |                                                                                        |                                          | 15 % or less of operation distance                                                                                                                                                                                                                             |                              |                              |                                                                                                           |
| 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: 20 mA or less<br>Receiver: 20 mA or less                                                                                                                                                                                                        | Emitter: 25 mA or less<br>Receiver: 20 mA or less | 20 mA or less                                                                       |                                                                           |                                                                                        | 25 mA or less                            | 25 mA or less                                                                                                                                                                                                                                                  |                              |                              | 20 mA or less                                                                                             |
| Output                                        |                          |            | <NPN output type><br>NPN open-collector transistor<br>• Maximum sink current: 100 mA<br>• Applied voltage: 30 V DC or less (between output and 0 V)<br>• Residual voltage: 1 V or less (at 100 mA sink current)<br>0.4 V or less (at 16 mA sink current) |                                                   |                                                                                     |                                                                           |                                                                                        |                                          | <PNP output type><br>PNP open-collector transistor<br>• Maximum source current: 100 mA<br>• Applied voltage: 30 V DC or less (between output and + V)<br>• Residual voltage: 1 V or less (at 100 mA source current)<br>0.4 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                                                                                                                                                                                                                                             |                                                   |                                                                                     |                                                                           |                                                                                        |                                          |                                                                                                                                                                                                                                                                |                              |                              |                                                                                                           |
| 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.)                  |                                                                           |                                                                                        |                                          |                                                                                                                                                                                                                                                                |                              |                              |                                                                                                           |
| Environmental resistance                      | 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      |            | Sunlight:10,000 ℓx at the light-receiving face, Incandescent light: 3,000 ℓx at the light-receiving face                                                                                                                                                 |                                                   |                                                                                     |                                                                           |                                                                                        |                                          |                                                                                                                                                                                                                                                                |                              |                              |                                                                                                           |
|                                               | EMC                      |            | EN 60947-5-2                                                                                                                                                                                                                                             |                                                   |                                                                                     |                                                                           |                                                                                        |                                          |                                                                                                                                                                                                                                                                |                              |                              |                                                                                                           |
|                                               | Voltage withstandability |            | 1,000 V AC for one min. between all supply terminals connected together and enclosure                                                                                                                                                                    |                                                   |                                                                                     |                                                                           |                                                                                        |                                          |                                                                                                                                                                                                                                                                |                              |                              |                                                                                                           |
|                                               | Insulation resistance    |            | 20 M Ω , 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 for three times each                                                                                                                                                           |                                                   |                                                                                     |                                                                           |                                                                                        |                                          |                                                                                                                                                                                                                                                                |                              |                              |                                                                                                           |
| Emitting element (modulated)                  |                          |            | Red LED                                                                                                                                                                                                                                                  | Infrared LED                                      | Red LED                                                                             |                                                                           |                                                                                        | Infrared LED                             |                                                                                                                                                                                                                                                                |                              |                              | Red LED                                                                                                   |
| Material                                      |                          |            | Enclosure: PBT (polybutylene terephthalate), Lens: acrylic (CX-48□: polycarbonate), Front 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                                        |                          |            | 50 g approx. (Emitter of thru-beam type: 45 g approx.)                                                                                                                                                                                                   |                                                   |                                                                                     |                                                                           |                                                                                        |                                          |                                                                                                                                                                                                                                                                |                              |                              |                                                                                                           |
| Accessories                                   |                          |            |                                                                                                                                                                                                                                                          |                                                   | RF-230 (Reflector): 1 pc.                                                           |                                                                           |                                                                                        |                                          |                                                                                                                                                                                                                                                                |                              |                              |                                                                                                           |

Notes: 1) 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 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.



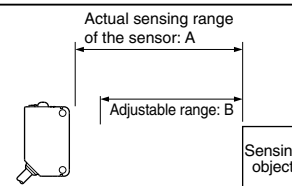
|   | CX-491□                         | CX-493□                          | CX-481□                             | CX-482□                         |
|---|---------------------------------|----------------------------------|-------------------------------------|---------------------------------|
| A | 3 m 9.843 ft                    | 5 m 16.404 ft                    | 50 to 500 mm<br>1.969 to 19.685 in  | 0.1 to 2 m<br>0.328 to 6.562 ft |
| B | 0.1 to 3 m<br>0.328 to 9.843 ft | 0.1 to 5 m<br>0.328 to 16.404 ft | 100 to 500 mm<br>3.937 to 19.685 in | 0.8 to 2 m<br>2.625 to 6.562 ft |

- 2) The sensing range of the diffuse reflective type sensor is specified for white non-glossy paper (200 × 200 mm 7.874 × 7.874 in) as the object.  
3) If slit masks (optional) are fitted, an object of φ 0.5 mm φ 0.020 in (using round slit mask) can be detected.

## SPECIFICATIONS

| Item                                                |                          | Model No.                                                                                                                                                                                                                                                | Type                                                                                           |                                                                                                                                 |                                                                                                                                                                                                                                                                |                                                            |                                                                |        |
|-----------------------------------------------------|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|----------------------------------------------------------------|--------|
|                                                     |                          |                                                                                                                                                                                                                                                          |                                                                                                | Small spot                                                                                                                      | Adjustable range reflective                                                                                                                                                                                                                                    |                                                            |                                                                |        |
|                                                     |                          |                                                                                                                                                                                                                                                          |                                                                                                |                                                                                                                                 | NPN output                                                                                                                                                                                                                                                     | CX-441                                                     | CX-443                                                         | CX-444 |
|                                                     |                          |                                                                                                                                                                                                                                                          | PNP output                                                                                     | CX-441-P                                                                                                                        | CX-443-P                                                                                                                                                                                                                                                       | CX-444-P                                                   | CX-442-P                                                       |        |
| Adjustable range (Note 1)                           |                          |                                                                                                                                                                                                                                                          |                                                                                                | 20 to 50 mm 0.787 to 1.969 in                                                                                                   |                                                                                                                                                                                                                                                                |                                                            | 20 to 100 mm 0.787 to 3.937 in 40 to 300 mm 1.575 to 11.811 in |        |
| Sensing range (with white non-glossy paper)         |                          |                                                                                                                                                                                                                                                          |                                                                                                | 2 to 50 mm 0.079 to 1.969 in                                                                                                    |                                                                                                                                                                                                                                                                |                                                            | 15 to 100 mm 0.591 to 3.937 in 20 to 300 mm 0.787 to 11.811 in |        |
| Hysteresis                                          |                          |                                                                                                                                                                                                                                                          |                                                                                                | 2 % or less of operation distance 5 % or less of operation distance                                                             |                                                                                                                                                                                                                                                                |                                                            |                                                                |        |
| Repeatability                                       |                          |                                                                                                                                                                                                                                                          |                                                                                                | Along sensing axis: 1 mm 0.039 in or less, Perpendicular to sensing axis: 0.2 mm 0.008 in or less (with white non-glossy paper) |                                                                                                                                                                                                                                                                |                                                            |                                                                |        |
| Supply voltage                                      |                          |                                                                                                                                                                                                                                                          |                                                                                                | 12 to 24 V DC ± 10 % Ripple P-P 10 % or less                                                                                    |                                                                                                                                                                                                                                                                |                                                            |                                                                |        |
| Current consumption                                 |                          |                                                                                                                                                                                                                                                          |                                                                                                | 25 mA or less                                                                                                                   |                                                                                                                                                                                                                                                                |                                                            |                                                                |        |
| Output                                              |                          | <NPN output type><br>NPN open-collector transistor<br>• Maximum sink current: 100 mA<br>• Applied voltage: 30 V DC or less (between output and 0 V)<br>• Residual voltage: 1 V or less (at 100 mA sink current)<br>0.4 V or less (at 16 mA sink current) |                                                                                                |                                                                                                                                 | <PNP output type><br>PNP open-collector transistor<br>• Maximum source current: 100 mA<br>• Applied voltage: 30 V DC or less (between output and + V)<br>• Residual voltage: 1 V or less (at 100 mA source current)<br>0.4 V or less (at 16 mA source current) |                                                            |                                                                |        |
|                                                     |                          | 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 2)                                                                 |                                                                                                                                                                                                                                                                |                                                            |                                                                |        |
| Distance adjuster                                   |                          |                                                                                                                                                                                                                                                          |                                                                                                | 5-turn mechanical adjuster                                                                                                      |                                                                                                                                                                                                                                                                |                                                            |                                                                |        |
| Sensing mode                                        |                          |                                                                                                                                                                                                                                                          |                                                                                                | BGS / FGS functions Switchable with wiring of sensing mode selection input                                                      |                                                                                                                                                                                                                                                                |                                                            |                                                                |        |
| Automatic interference prevention function (Note 3) |                          |                                                                                                                                                                                                                                                          |                                                                                                | Incorporated                                                                                                                    |                                                                                                                                                                                                                                                                |                                                            |                                                                |        |
| Environmental resistance                            | 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      |                                                                                                                                                                                                                                                          |                                                                                                | Sunlight:10,000 ℓx at the light-receiving face, Incandescent light: 3,000 ℓx at the light-receiving face                        |                                                                                                                                                                                                                                                                |                                                            |                                                                |        |
|                                                     | EMC                      |                                                                                                                                                                                                                                                          |                                                                                                | EN 60947-5-2                                                                                                                    |                                                                                                                                                                                                                                                                |                                                            |                                                                |        |
|                                                     | Voltage withstandability |                                                                                                                                                                                                                                                          |                                                                                                | 1,000 V AC for one min. between all supply terminals connected together and enclosure                                           |                                                                                                                                                                                                                                                                |                                                            |                                                                |        |
|                                                     | Insulation resistance    |                                                                                                                                                                                                                                                          |                                                                                                | 20 M Ω , or more, with 250 V DC megger between all supply terminals connected together and enclosure                            |                                                                                                                                                                                                                                                                |                                                            |                                                                |        |
|                                                     | Vibration resistance     |                                                                                                                                                                                                                                                          |                                                                                                | 10 to 500 Hz frequency, 3 mm 0.118 in double amplitude 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 for three times each |                                                                                                                                 |                                                                                                                                                                                                                                                                |                                                            |                                                                |        |
| Emitting element                                    |                          |                                                                                                                                                                                                                                                          |                                                                                                | Red LED (modulated)                                                                                                             |                                                                                                                                                                                                                                                                |                                                            |                                                                |        |
| Spot diameter                                       |                          |                                                                                                                                                                                                                                                          |                                                                                                | φ 2 mm φ 0.079 in approx.<br>(at 50 mm 1.969 in distance)                                                                       | φ 6.5 mm φ 0.256 in approx.<br>(at 50 mm 1.969 in distance)                                                                                                                                                                                                    | φ 9 mm φ 0.354 in approx.<br>(at 100 mm 3.937 in distance) | □ 15 mm □ 0.591 in approx.<br>(at 300 mm 11.811 in distance)   |        |
| Material                                            |                          |                                                                                                                                                                                                                                                          |                                                                                                | Enclosure: PBT (Polybutylene terephthalate), Front cover: Polycarbonate, Indicator cover: Polycarbonate                         |                                                                                                                                                                                                                                                                |                                                            |                                                                |        |
| Cable                                               |                          |                                                                                                                                                                                                                                                          |                                                                                                | 0.2 mm <sup>2</sup> 4-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.                                   |                                                                                                                                                                                                                                                                |                                                            |                                                                |        |
| Weight                                              |                          |                                                                                                                                                                                                                                                          |                                                                                                | 55 g approx.                                                                                                                    |                                                                                                                                                                                                                                                                |                                                            |                                                                |        |

- Notes: 1) 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.
- 2) Refer to 'Stability indicator' (p.182) of 'PRECAUTIONS FOR PROPER USE' for the details of operation indicator.
- 3) 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.



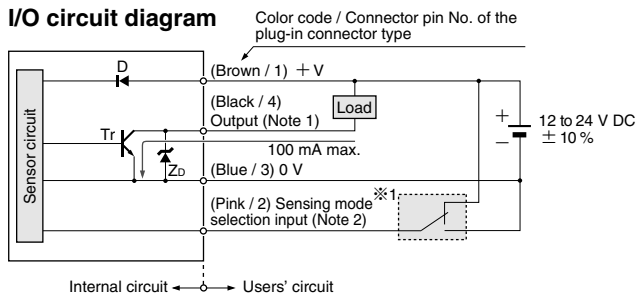
|   | CX-441□/443□                     | CX-444□                           | CX-442□                            |
|---|----------------------------------|-----------------------------------|------------------------------------|
| A | 2 to 50 mm<br>0.079 to 1.969 in  | 15 to 100 mm<br>0.591 to 3.937 in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

# CX-400

## I/O CIRCUIT AND WIRING DIAGRAMS

### NPN output type

#### I/O circuit diagram



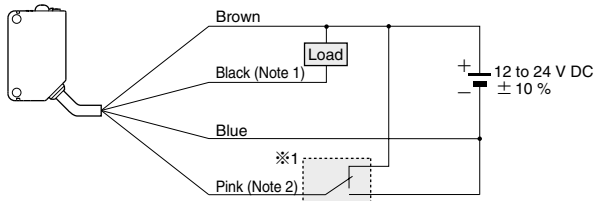
- Notes: 1) The emitter of the thru-beam type sensor does not incorporate the output.  
 2) Sensing mode selection input is incorporated only for the **CX-44□** adjustable range reflective type. When using the **CX-44□**, be sure to wire the sensing mode selection input (pink / 2).

※1

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

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

#### Wiring diagram



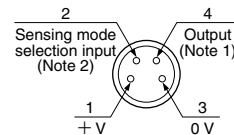
- Notes: 1) The emitter of the thru-beam type sensor does not incorporate the black wire.  
 2) The pink wire is incorporated only for the **CX-44□** adjustable range reflective type. When using the **CX-44□**, be sure to wire the pink wire.

※1

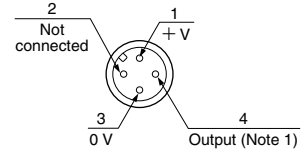
- Sensing mode selection input  
BGS function: Connect to 0 V  
FGS function: Connect to +V

#### Connector pin position

##### M8 plug-in connector type



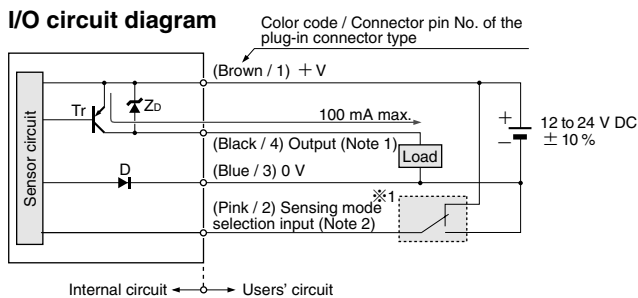
##### M12 pigtailed type



- 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).

### PNP output type

#### I/O circuit diagram



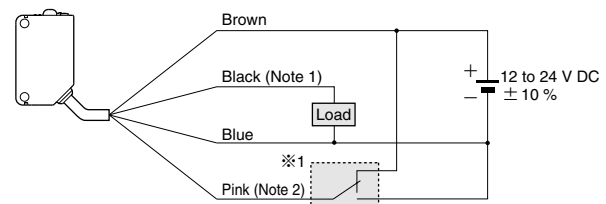
- Notes: 1) The emitter of the thru-beam type sensor does not incorporate the output.  
 2) Sensing mode selection input is incorporated only for the **CX-44□-P** adjustable range reflective type. When using the **CX-44□-P**, be sure to wire the sensing mode selection input (pink / 2).

※1

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

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

#### Wiring diagram



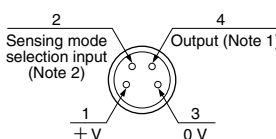
- Notes: 1) The emitter of the thru-beam type sensor does not incorporate the black wire.  
 2) The pink wire is incorporated only for the **CX-44□-P** adjustable range reflective type. When using the **CX-44□-P**, be sure to wire the pink wire.

※1

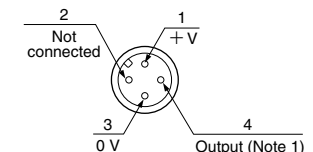
- Sensing mode selection input  
BGS function: Connect to 0 V  
FGS function: Connect to +V

#### Connector pin position

##### M8 plug-in connector type



##### M12 pigtailed type



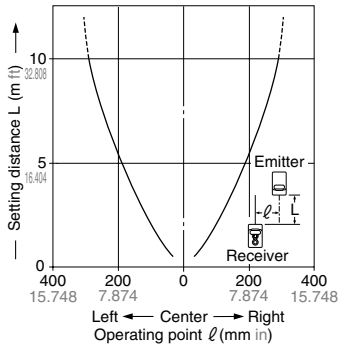
- Notes: 1) The emitter of the thru-beam type sensor does not incorporate the output.  
 2) Sensing mode selection input is incorporated only for the **CX-44□-P** adjustable range reflective type. When using the **CX-44□-P**, be sure to wire the sensing mode selection input (pink / 2).

## SENSING CHARACTERISTICS (TYPICAL)

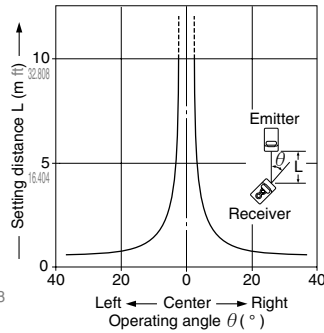
### CX-411

Thru-beam type

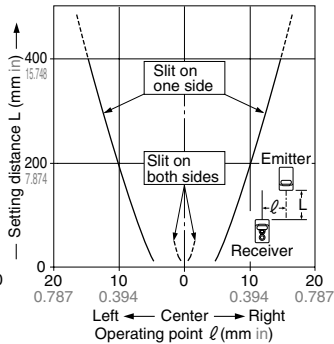
#### Parallel deviation



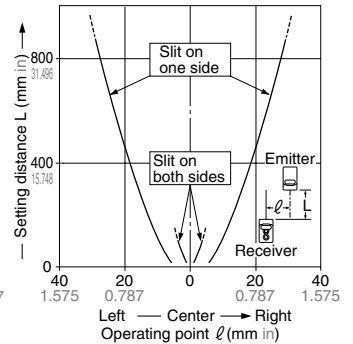
#### Angular deviation



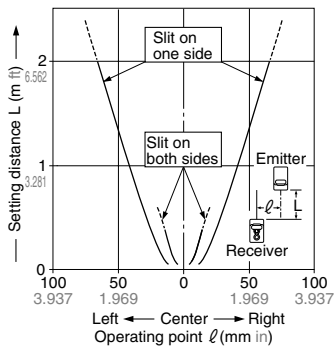
#### Parallel deviation with round slit masks ( $\phi 0.5$ mm $\phi 0.020$ in)



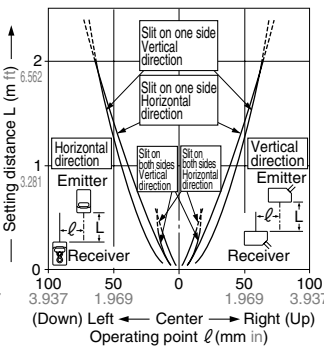
#### Parallel deviation with round slit masks ( $\phi 1$ mm $\phi 0.039$ in)



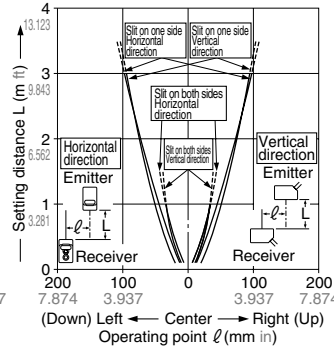
#### Parallel deviation with round slit masks ( $\phi 2$ mm $\phi 0.079$ in)



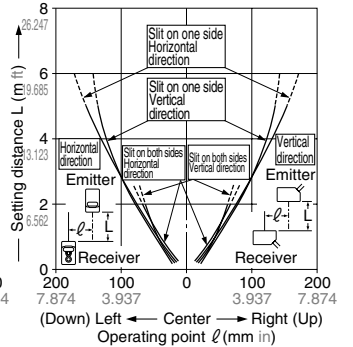
#### Parallel deviation with rectangular slit masks ( $0.5 \times 6$ mm $0.020 \times 0.236$ in)



#### Parallel deviation with rectangular slit masks ( $1 \times 6$ mm $0.039 \times 0.236$ in)



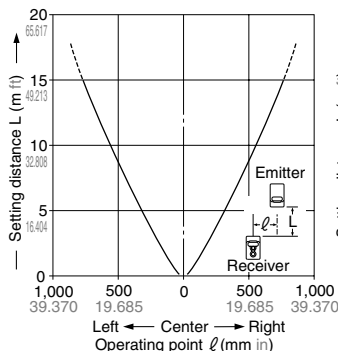
#### Parallel deviation with rectangular slit masks ( $2 \times 6$ mm $0.079 \times 0.236$ in)



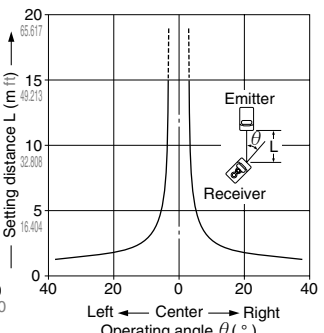
### CX-412

Thru-beam type

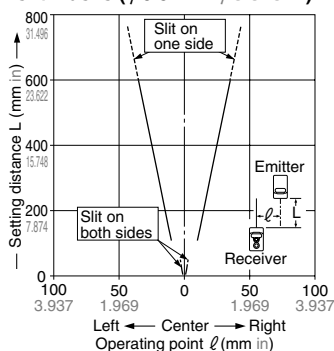
#### Parallel deviation



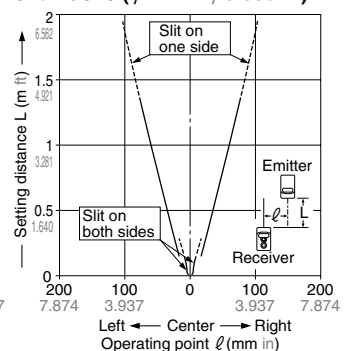
#### Angular deviation



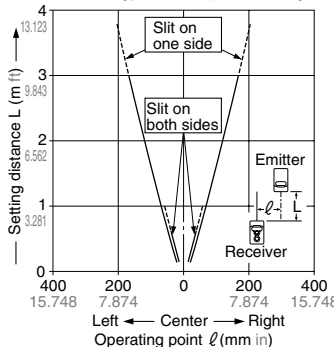
#### Parallel deviation with round slit masks ( $\phi 0.5$ mm $\phi 0.020$ in)



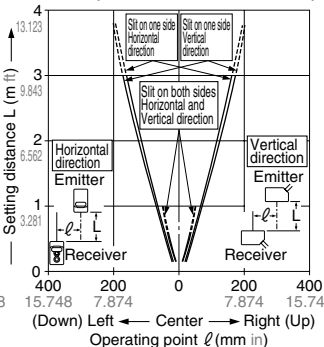
#### Parallel deviation with round slit masks ( $\phi 1$ mm $\phi 0.039$ in)



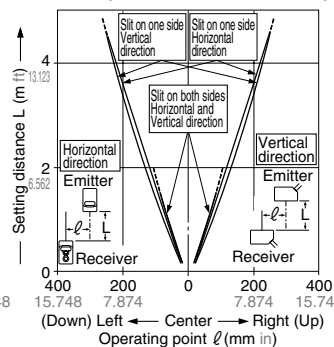
#### Parallel deviation with round slit masks ( $\phi 2$ mm $\phi 0.079$ in)



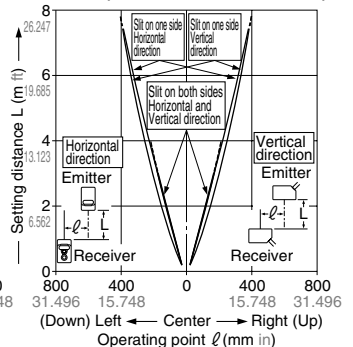
#### Parallel deviation with rectangular slit masks ( $0.5 \times 6$ mm $0.020 \times 0.236$ in)



#### Parallel deviation with rectangular slit masks ( $1 \times 6$ mm $0.039 \times 0.236$ in)



#### Parallel deviation with rectangular slit masks ( $2 \times 6$ mm $0.079 \times 0.236$ in)



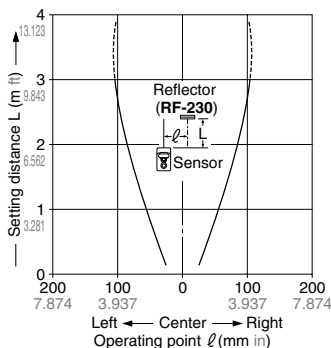


# CX-400

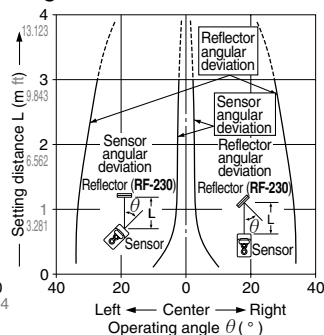
## SENSING CHARACTERISTICS (TYPICAL)

### CX-491 □ Retroreflective type

#### Parallel deviation

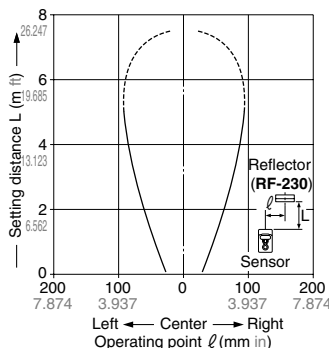


#### Angular deviation

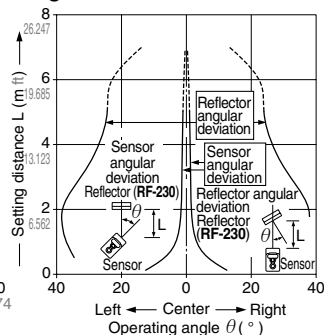


### CX-493 □ Retroreflective type

#### Parallel deviation

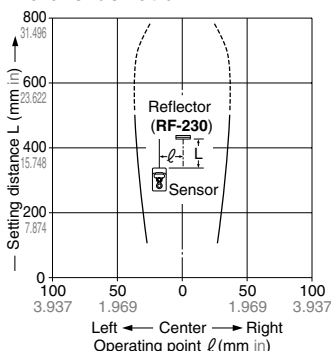


#### Angular deviation

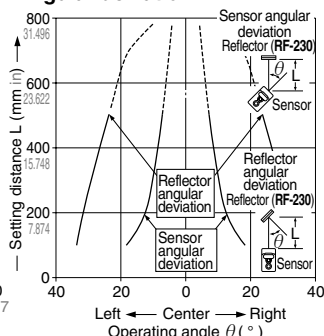


### CX-481 □ Retroreflective type

#### Parallel deviation

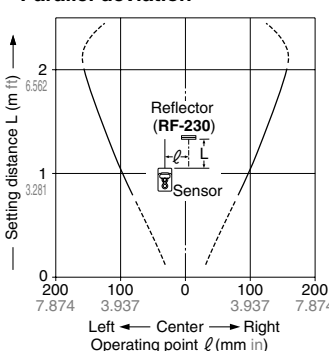


#### Angular deviation

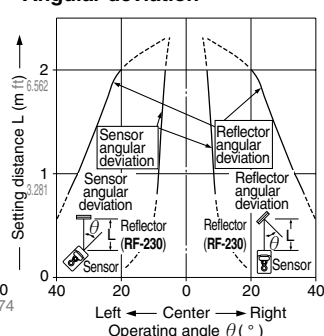


### CX-482 □ Retroreflective type

#### Parallel deviation

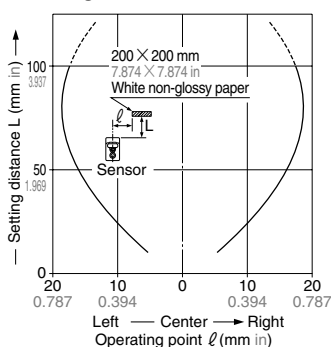


#### Angular deviation

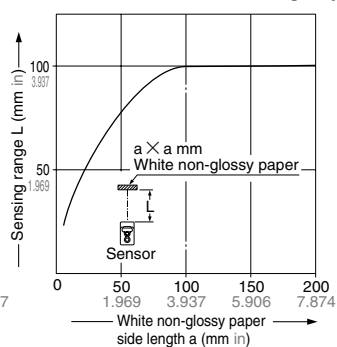


### CX-424 □ Diffuse reflective type

#### Sensing field



#### Correlation between sensing object size and sensing range

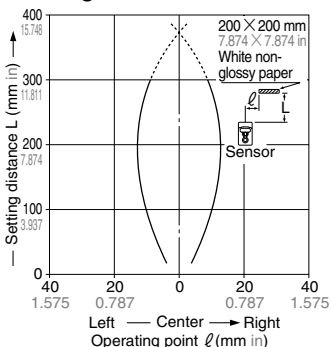


As the sensing object size becomes smaller than the standard size (white non-glossy paper 200×200 mm 7.874×7.874 in), the sensing range shortens, as shown in the left graph.

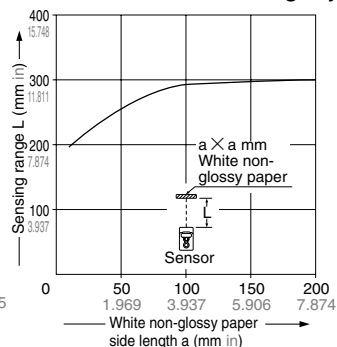
(For plotting the left graph, the sensitivity has been set such that a 200×200 mm 7.874×7.874 in white non-glossy paper is just detectable at a distance of 100 mm 3.937 in.)

### CX-421 □ Diffuse reflective type

#### Sensing field



#### Correlation between sensing object size and sensing range



As the sensing object size becomes smaller than the standard size (white non-glossy paper 200×200 mm 7.874×7.874 in), the sensing range shortens, as shown in the left graph.

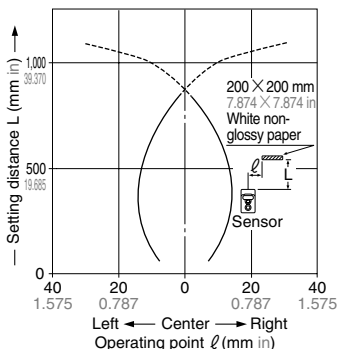
(For plotting the left graph, the sensitivity has been set such that a 200×200 mm 7.874×7.874 in white non-glossy paper is just detectable at a distance of 300 mm 11.811 in.)

## SENSING CHARACTERISTICS (TYPICAL)

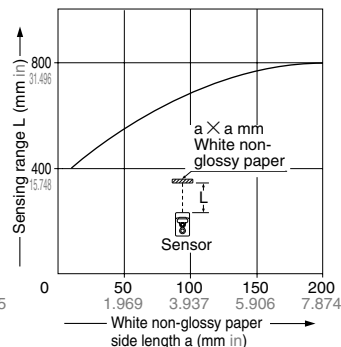
### CX-422

Diffuse reflective type

#### Sensing field



#### Correlation between sensing object size and sensing range



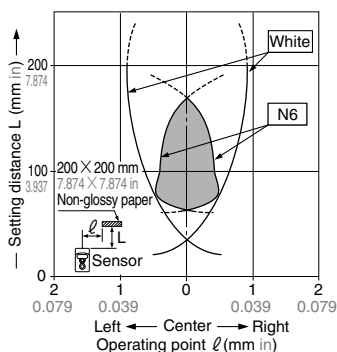
As the sensing object size becomes smaller than the standard size (white non-glossy paper 200 × 200 mm 7.874 × 7.874 in), the sensing range shortens, as shown in the left graph.

For plotting the left graph, the sensitivity has been set such that a 200 × 200 mm 7.874 × 7.874 in white non-glossy paper is just detectable at a distance of 800 mm 31.496 in.

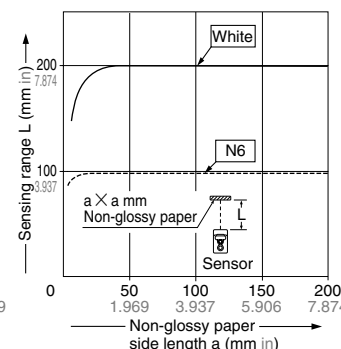
### CX-423

Diffuse reflective type

#### Sensing field



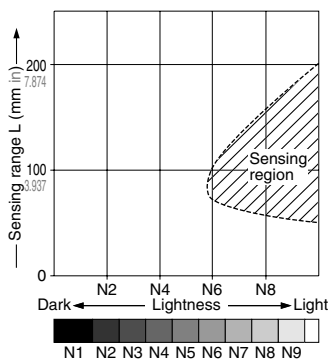
#### Correlation between sensing object size and sensing range



As the sensing object size becomes smaller than the standard size (white non-glossy paper 200 × 200 mm 7.874 × 7.874 in), the sensing range shortens, as shown in the left graph.

For plotting the left graph, the sensitivity has been set such that a 200 × 200 mm 7.874 × 7.874 in white non-glossy paper is just detectable at a distance of 200 mm 7.874 in.

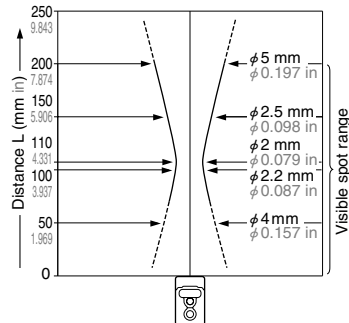
#### Correlation between lightness and sensing range



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

(Lightness shown on the left may differ slightly from the actual object condition.)

#### Emitted beam



# CX-400

## SENSING CHARACTERISTICS (TYPICAL)

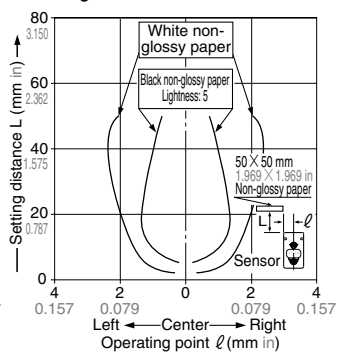
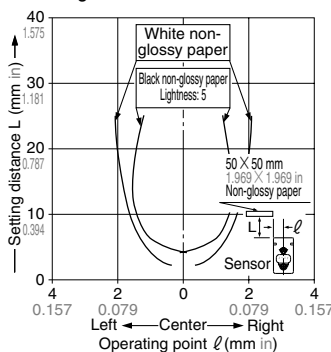
### CX-441

Adjustable range reflective type

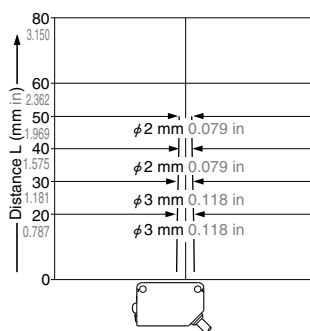
#### Sensing fields

• Setting distance: 25 mm 0.984 in

• Setting distance: 50 mm 1.969 in

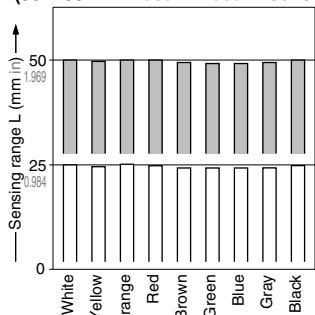


#### Emitted beam



#### Correlation between color

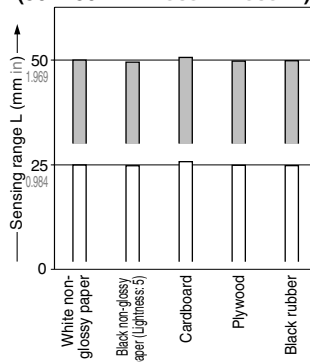
(50 X 50 mm 1.969 X 1.969 in construction paper) and sensing range



These bars indicate the sensing range with the respective colors when the distance adjuster is set to a sensing range of 50 mm 1.969 in and 25 mm 0.984 in long, respectively, with white color. The sensing range also varies depending on material.

#### Correlation between material

(50 X 50 mm 1.969 X 1.969 in) and sensing range



These bars indicate the sensing range with the respective objects when the distance adjuster is set to a sensing range of 50 mm 1.969 in and 25 mm 0.984 in long, respectively, with white non-glossy paper.

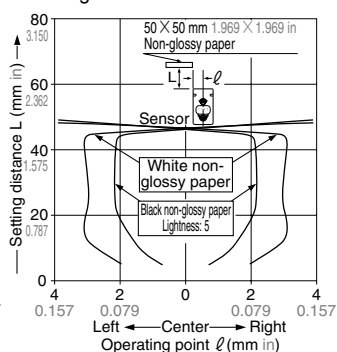
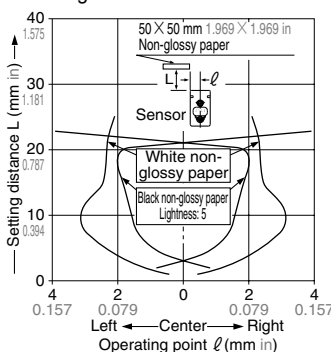
### CX-443

Adjustable range reflective type

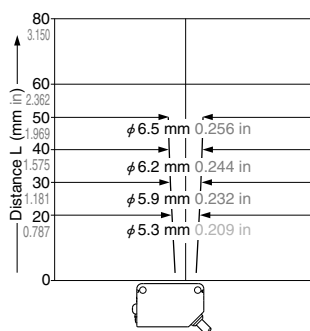
#### Sensing fields

• Setting distance: 25 mm 0.984 in

• Setting distance: 50 mm 1.969 in

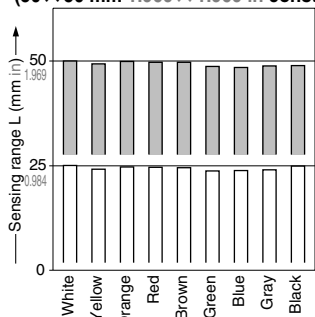


#### Emitted beam



#### Correlation between color

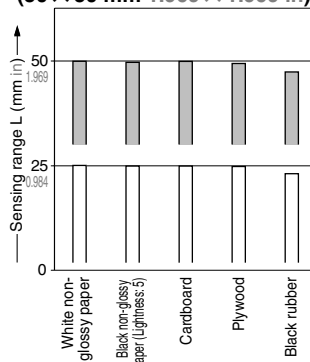
(50 X 50 mm 1.969 X 1.969 in construction paper) and sensing range



These bars indicate the sensing range with the respective colors when the distance adjuster is set to a sensing range of 50 mm 1.969 in and 25 mm 0.984 in long, respectively, with white color. The sensing range also varies depending on material.

#### Correlation between material

(50 X 50 mm 1.969 X 1.969 in) and sensing range



These bars indicate the sensing range with the respective objects when the distance adjuster is set to a sensing range of 50 mm 1.969 in and 25 mm 0.984 in long, respectively, with white non-glossy paper.

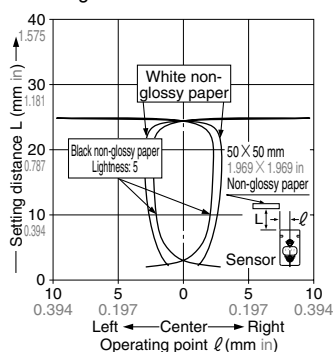
## SENSING CHARACTERISTICS (TYPICAL)

### CX-444

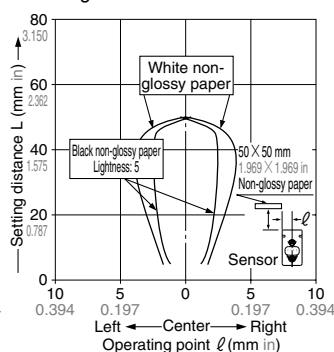
Adjustable range reflective type

#### Sensing fields

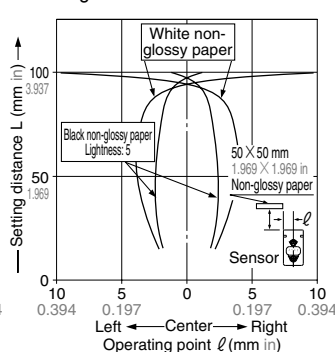
• Setting distance: 25 mm 0.984 in



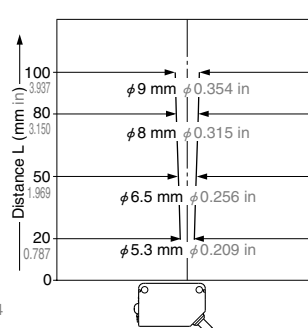
• Setting distance: 50 mm 1.969 in



• Setting distance: 100 mm 3.937 in

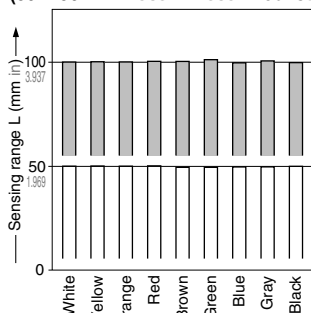


#### Emitted beam



#### Correlation between color

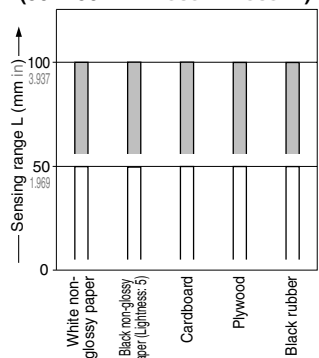
(50 x 50 mm 1.969 x 1.969 in construction paper) and sensing range



These bars indicate the sensing range with the respective colors when the distance adjuster is set to a sensing range of 100 mm 3.937 in, 50 mm 1.969 in long, respectively, with white color. The sensing range also varies depending on material.

#### Correlation between material

(50 x 50 mm 1.969 x 1.969 in) and sensing range



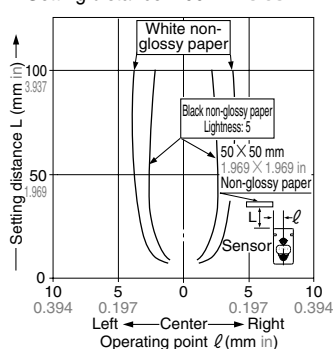
These bars indicate the sensing range with the respective objects when the distance adjuster is set to a sensing range of 100 mm 3.937 in, 50 mm 1.969 in long, respectively, with white non-glossy paper.

### CX-442

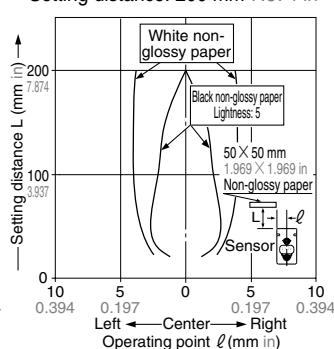
Adjustable range reflective type

#### Sensing fields

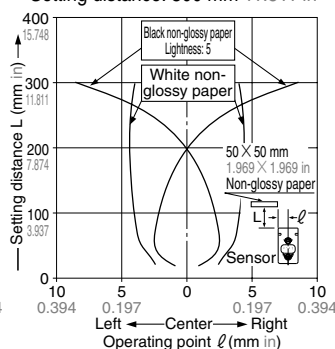
• Setting distance: 100 mm 3.937 in



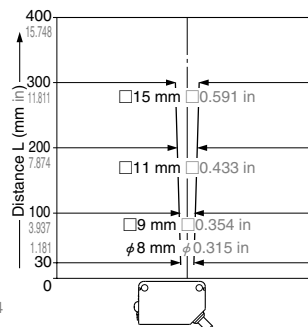
• Setting distance: 200 mm 7.874 in



• Setting distance: 300 mm 11.811 in

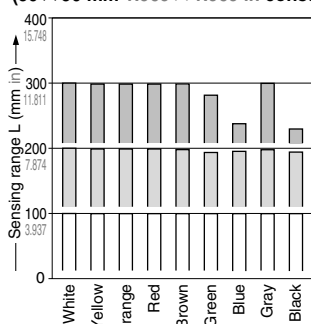


#### Emitted beam



#### Correlation between color

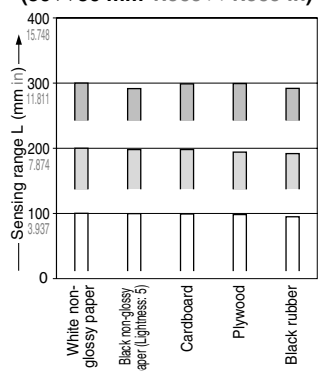
(50 x 50 mm 1.969 x 1.969 in construction paper) and sensing range



These bars indicate the sensing range with the respective colors when the distance adjuster is set to a sensing range of 300 mm 11.811 in, 200 mm 7.874 in and 100 mm 3.937 in long, respectively, with white color. The sensing range also varies depending on material.

#### Correlation between material

(50 x 50 mm 1.969 x 1.969 in) and sensing range



These bars indicate the sensing range with the respective objects when the distance adjuster is set to a sensing range of 300 mm 11.811 in, 200 mm 7.874 in and 100 mm 3.937 in long, respectively, with white non-glossy paper.

# CX-400

## PRECAUTIONS FOR PROPER USE

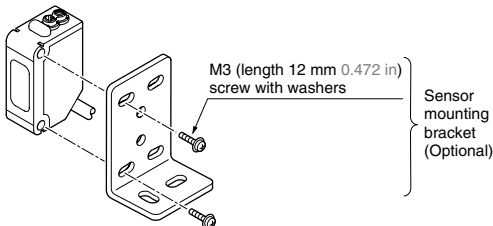
### All models



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

### Mounting

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

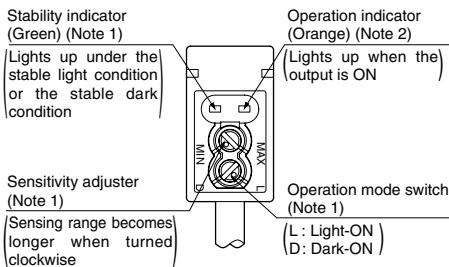


### Wiring

- 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.

CX-41 ☐/42 ☐  
CX-49 ☐/48 ☐

### Functional description



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

### Operation mode switch

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

### Beam alignment

#### Thru-beam type sensor

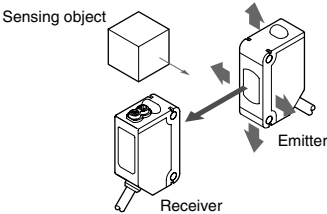
- ① Set the operation mode switch to the Light-ON mode position (L side).
- ② Placing the emitter and the receiver face to face along a straight line, move the emitter in the up, down, left and right directions, in order to determine the range of the light received condition with the help of the operation indicator (orange). Then, set the emitter at the center of this range.

- 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

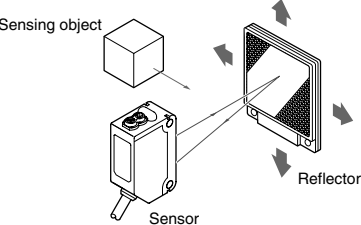
- Do not use during the initial transient time (50 ms) after the power supply is switched on.
- Take care that the sensor is not directly exposed to fluorescent light from a rapid-starter lamp or a high frequency lighting device, as it may affect the sensing performance.
- This sensor is suitable for 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.

- ③ Similarly, adjust for up, down, left and right angular movement of the emitter.
- ④ Further, perform the angular adjustment for the receiver also.
- ⑤ Check that the stability indicator (green) lights up.
- ⑥ Choose the operation mode, Light-ON or Dark-ON, as per your requirement, with the operation mode switch.



### Retroreflective type sensor

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



## PRECAUTIONS FOR PROPER USE

CX-41□/42□  
CX-49□/48□

### 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 ① 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 ② where the sensor just returns to the 'Dark' state operation.<br>(If the sensor does not enter the 'Light' state operation even when the sensitivity adjuster is turned fully clockwise, the position is point ③.) |
| ④    |                      | The position at the middle of point ① and ③ is the optimum sensing position.                                                                                                                                                                                                                                                                                                           |

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

|                         | Light received condition | Dark condition |
|-------------------------|--------------------------|----------------|
| Thru-beam type          |                          |                |
| Retroreflective type    |                          |                |
| Diffuse reflective type |                          |                |

### Relation between output and indicators

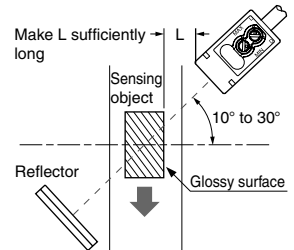
| In case of Light-ON |                     |        | Sensing condition        | In case of Dark-ON |                     |                     |
|---------------------|---------------------|--------|--------------------------|--------------------|---------------------|---------------------|
| Stability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

●, ● : lights up ● : lights off

### Retroreflective type sensor (except CX-491□)

- 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.



### Retroreflective type sensor with polarizing filters (CX-491□)

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

#### Example of sensing objects

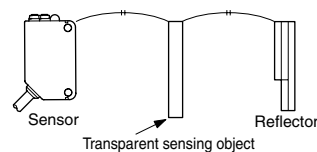
- Can wrapped by clear film
- Aluminum sheet covered by plastic film
- Gold or silver color (specular) label or wrapping paper

#### Steps

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

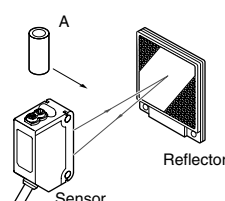
### Retroreflective type sensor for transparent object sensing (CX-48□)

- Optimum sensing is possible when the position of the transparent sensing object is set at the center of the sensor and the reflector. If the sensing position is set near the sensor or the reflector, the sensing may be unstable. In this case, set the sensing position at the center of the sensor and the reflector.

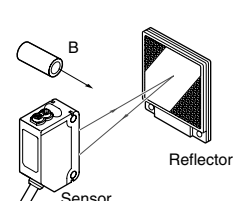


- When the sensor detects an uneven plastic receptacle or glass bottle, the received-light amount may differ with the sensing position or direction. Adjust the sensitivity after confirming the stable sensing condition by turning the sensing object, etc.
- When sensing pipe-shaped transparent sensing object, set it in a standing, not lying, position as shown in Figure A. The sensor may fail to detect a lying object as shown in Figure B.

#### <Correct>



#### <Incorrect>



# CX-400

## PRECAUTIONS FOR PROPER USE

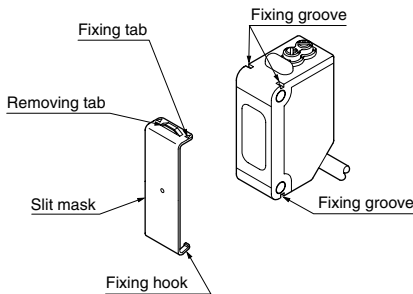
### CX-41□

#### Slit mask (Optional)

- 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.

#### 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.

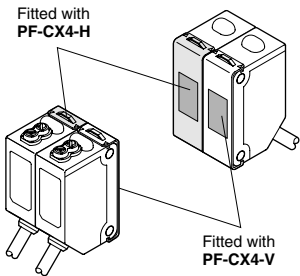


#### How to remove

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

#### Interference prevention filter (Optional) (Exclusively for CX-411□)

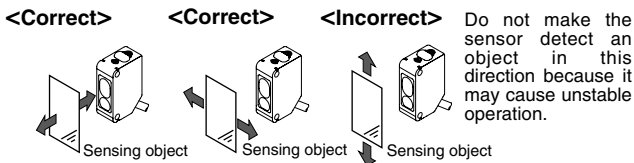
- By mounting interference prevention filters (PF-CX4-□), two sets of CX-411□ can be mounted close together. However, the sensing range is reduced when the interference prevention filter is mounted.
- The filters can be mounted by the same method as for the slit masks.
- The two sets of sensors should be fitted with different types of interference prevention filters. Interference prevention does not work if the filters are mounted for emitters only, receivers only or if the same model No. of interference prevention filters are mounted on both sets of sensors.



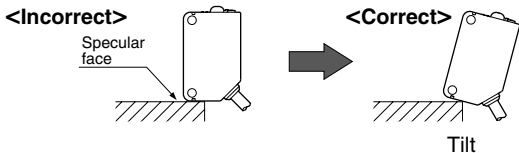
### CX-44□

#### Mounting

- Care must be taken regarding the sensor mounting direction with respect to the object's direction of movement.



- When detecting a specular object (aluminum or copper foil, etc.) or an object having a glossy surface or coating, please take care that there are cases when the object may not be detected due to a change in angle, wrinkles on the object surface, etc.
- When a specular body is present below the sensor, use the sensor by tilting it slightly upwards to avoid wrong operation.



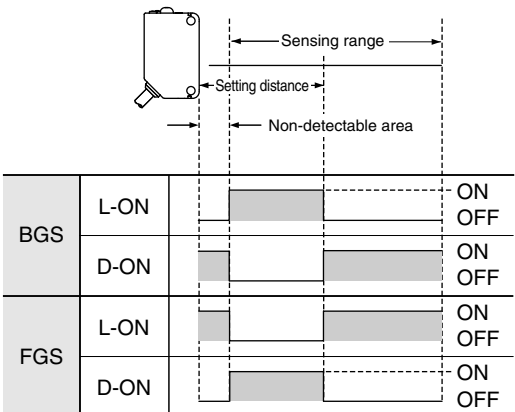
- If a specular body is present in the background, wrong operation may be caused due to a small change in the angle of the background body. In that case, install the sensor at an inclination and confirm the operation with the actual sensing object.
- Take care that there is a non-detectable area right in front of the sensor.

#### Operation mode switch

| Operation mode switch | Description                                                                                              |
|-----------------------|----------------------------------------------------------------------------------------------------------|
|                       | Detection-ON mode is obtained when the operation mode switch is turned fully clockwise (L side).         |
|                       | Detection-OFF mode is obtained when the operation mode switch is turned fully counterclockwise (D side). |

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

- Depending on whether you select the BGS or FGS function, the output operation changes as follows.



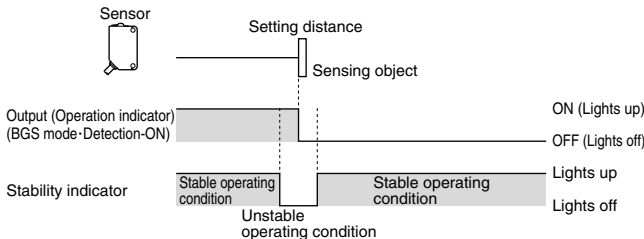
## PRECAUTIONS FOR PROPER USE

### CX-44□

#### Stability indicator

- Since the CX-44□ uses a 2-segment photodiode as its receiving element, and sensing is done based on the difference in the incident beam angle of the reflected beam from the sensing object, the output and the operation indicator (orange) operate according to the object distance.

Furthermore, the stability indicator (green) shows the margin of the setting distance.

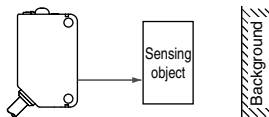


#### BGS / FGS functions

- This sensor incorporates BGS / FGS functions. Select either BGS or FGS function depending on the positions of the background and sensing object.

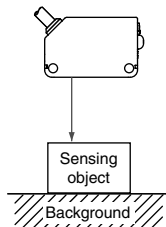
##### BGS function

- This function is used when the sensing object is apart from the background.



##### FGS function

- This function is used when the sensing object contacts the background or the sensing object is glossy, etc.



#### Distance adjustment



- When this product is used, be sure to carry out the distance adjustment.
- Since the distance adjuster of this sensor is a 5-turn adjuster, when the point (A) and (B) is adjusted as explained in the table right, there may be more than 1 turn between the point (A) and (B). Therefore, make sure to remember the turns of both points to find the optimum position.
- Be sure to wire the sensing mode selection input (Pink / 2) before distance adjustment. If the wiring is done after the distance adjustment, the sensing area is changed.

- Turn the distance adjuster gradually and lightly with a 'minus' screwdriver (please arrange separately). In order to protect itself, the distance adjuster idles if turned fully. If the adjuster is idled when distance adjustment is done, carry out the adjustment again.

#### BGS function

| Step | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Distance adjuster |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| ①    | Turn the distance adjuster fully counterclockwise to the minimum sensing range position. (CX-441□/443□/444□: 20 mm 0.787 in approx., CX-442□: 40 mm 1.575 in approx.)                                                                                                                                                                                                                                                                                                                                                                                                      | Turn fully        |
| ②    | Place an object at the required distance from the sensor, turn the distance adjuster gradually clockwise, and find out point (A) where the sensor changes to the detecting condition.                                                                                                                                                                                                                                                                                                                                                                                      |                   |
| ③    | Remove the object, turn the adjuster clockwise further until the sensor goes into the non-detecting state again. Once it has entered, turn the distance adjuster backward until the sensor returns to the non-detecting condition. This position is designated as point (B). When the sensor does not go into the detecting condition even if the adjuster is turned fully clockwise, the position where the adjuster was fully turned is regarded as the point (B).<br>(There may be more than 1 turn between point (A) and (B), since this sensor incorporates a 5-turn) |                   |
| ④    | The optimum position to stably detect objects is the center point between (A) and (B).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Optimum position  |

#### FGS function

| Step | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Distance adjuster |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| ①    | Turn the distance adjuster fully clockwise to the maximum sensing range position. (CX-441□/443□: 50 mm 1.969 in approx., CX-444□: 100 mm 3.937 in approx., CX-442□: 300 mm 11.811 in approx.)                                                                                                                                                                                                                                                                                                                                                                                                                                | Turn fully        |
| ②    | In the state where the sensor detects the background, turn the distance adjuster gradually counterclockwise, and find out point (A) where the sensor changes to the non-detecting condition.                                                                                                                                                                                                                                                                                                                                                                                                                                 |                   |
| ③    | Place an object at the required distance from the sensor, turn the adjuster counterclockwise further until the sensor goes into the non-detecting condition again. Once entered, turn the distance adjuster backward until the sensor returns to the detecting condition. This position is designated as point (B). When the sensor does not go into the non-detecting condition even if the adjuster is turned fully counterclockwise, the position where the adjuster was fully turned is regarded as the point (B).<br>(There may be more than 1 turn between point (A) and (B), since this sensor incorporates a 5-turn) |                   |
| ④    | The optimum position to stably detect objects is the center point between (A) and (B).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Optimum position  |

#### Others

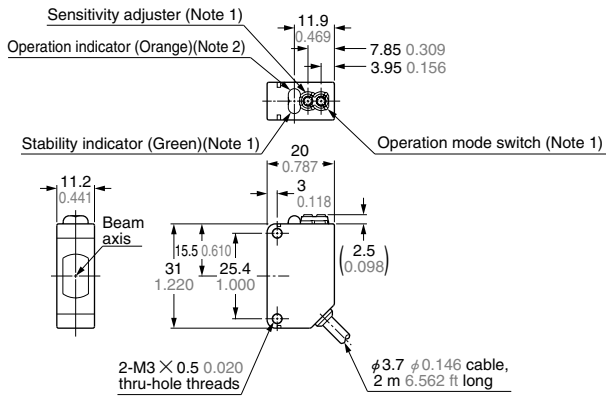
- Its distance adjuster is mechanically operated. Do not drop; avoid other shocks.



# CX-400

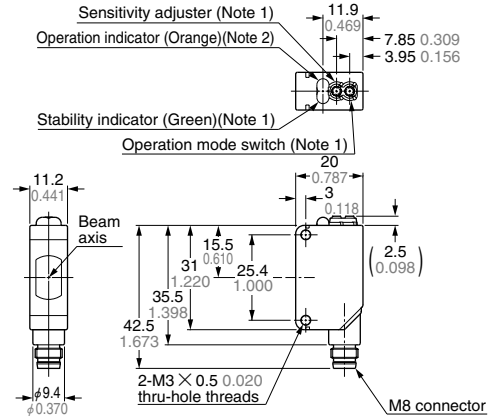
## DIMENSIONS (Unit: mm in)

### CX-41□ Sensor



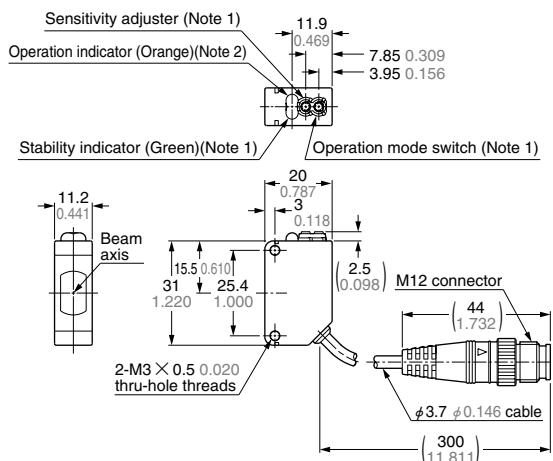
Notes: 1) Not incorporated on the emitter.  
2) It is the power indicator (green) on the emitter.

### CX-41□-Z Sensor



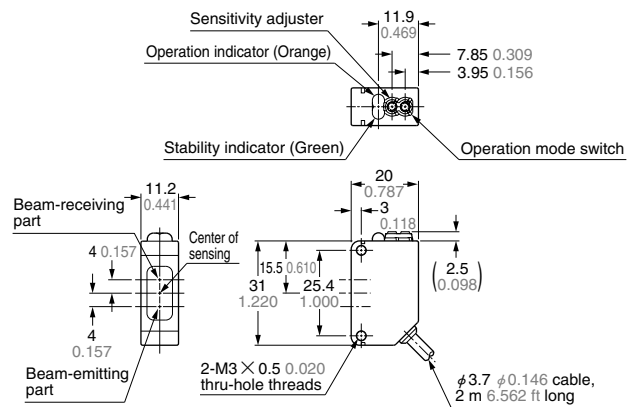
Notes: 1) Not incorporated on the emitter.  
2) It is the power indicator (green) on the emitter.

### CX-41□-J Sensor

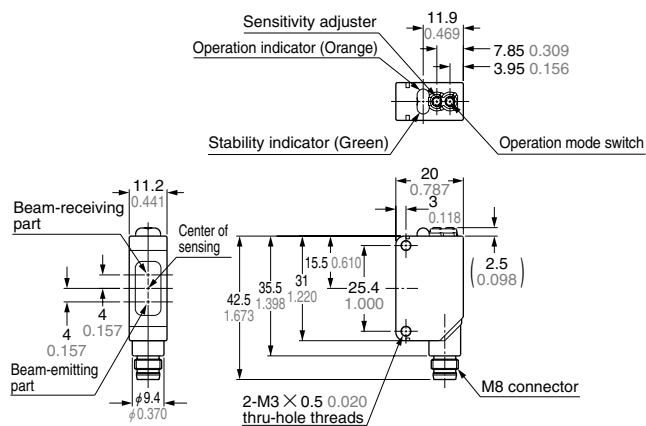


Notes: 1) Not incorporated on the emitter.  
2) It is the power indicator (green) on the emitter.

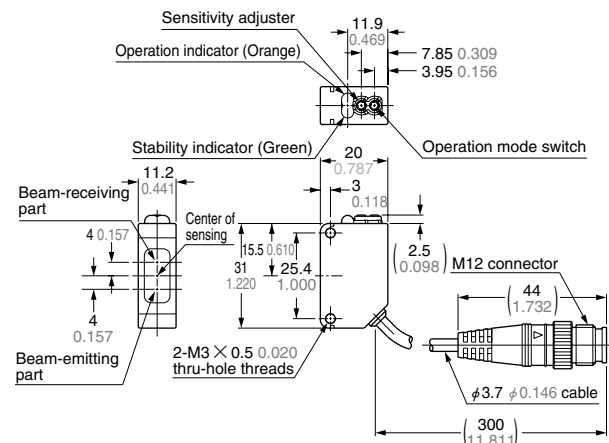
### CX-49□ CX-48□ CX-42□ Sensor



### CX-49□-Z CX-48□-Z CX-42□-Z Sensor

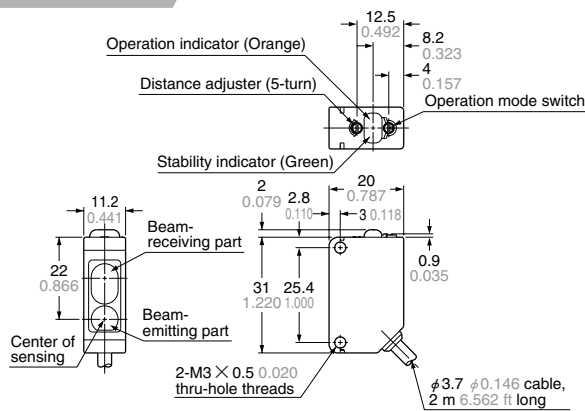


### CX-49□-J CX-48□-J CX-42□-J Sensor

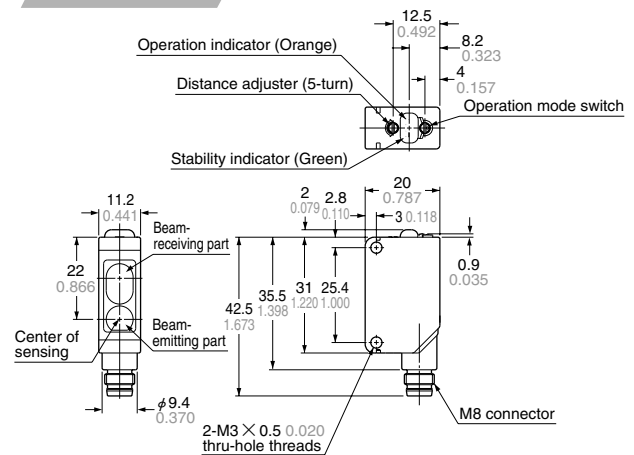


## DIMENSIONS (Unit: mm in)

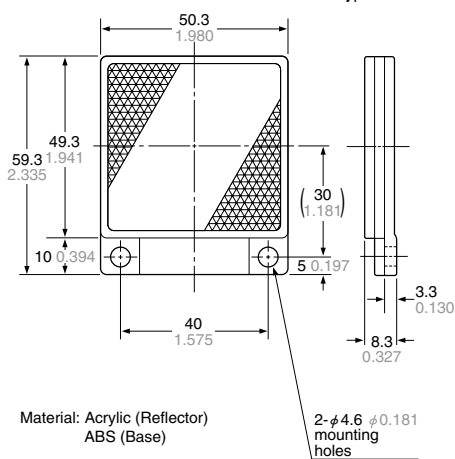
### CX-44□ Sensor



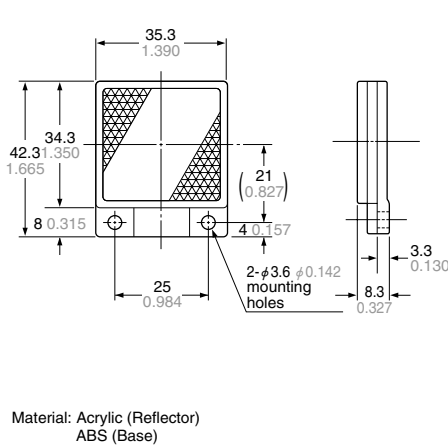
### CX-44□-Z Sensor



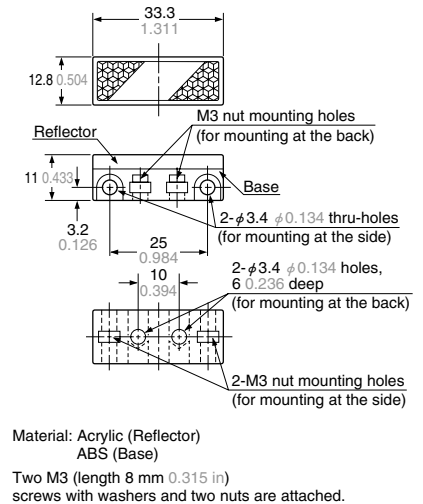
### RF-230 Reflector (Accessory for the retroreflective type sensor)



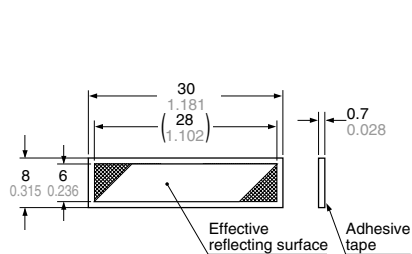
### RF-220 Reflector (Optional)



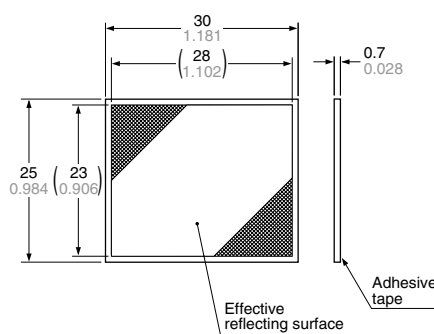
### RF-210 Reflector (Optional)



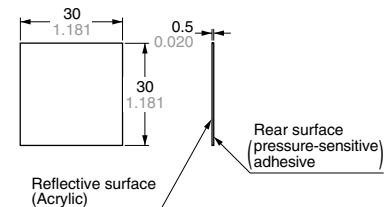
### RF-11 Reflective tape (Optional)



### RF-12 Reflective tape (Optional)



### RF-13 Reflective tape (Optional)



Material: Acrylic

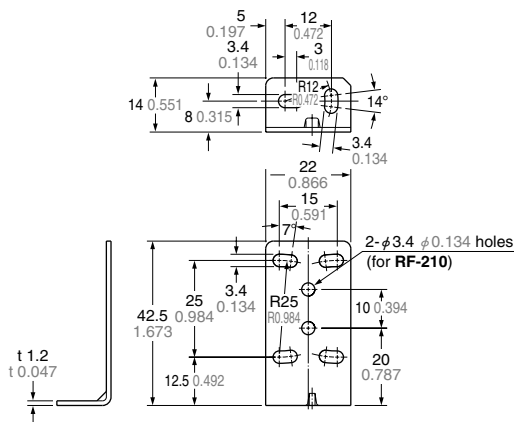
Material: Acrylic

# CX-400

## DIMENSIONS (Unit: mm in)

### MS-CX2-1

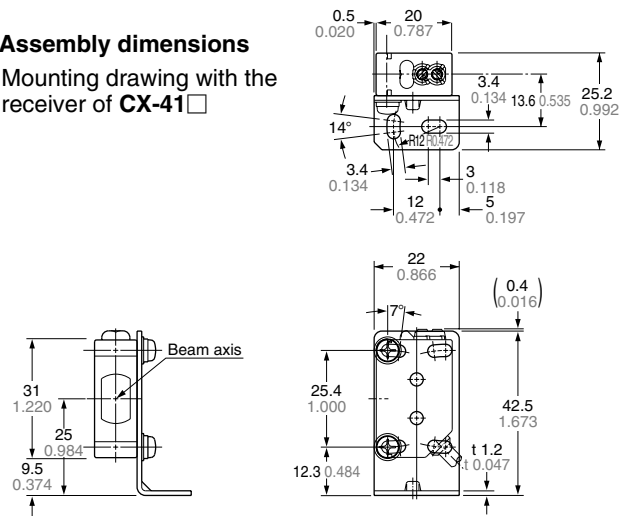
#### Sensor mounting bracket (Optional)



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

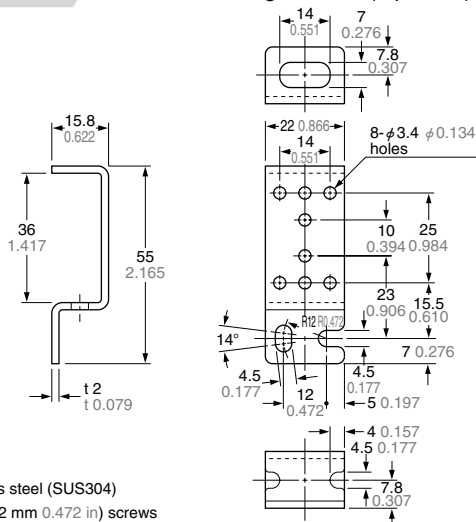
#### Assembly dimensions

Mounting drawing with the receiver of CX-41



### MS-CX2-2

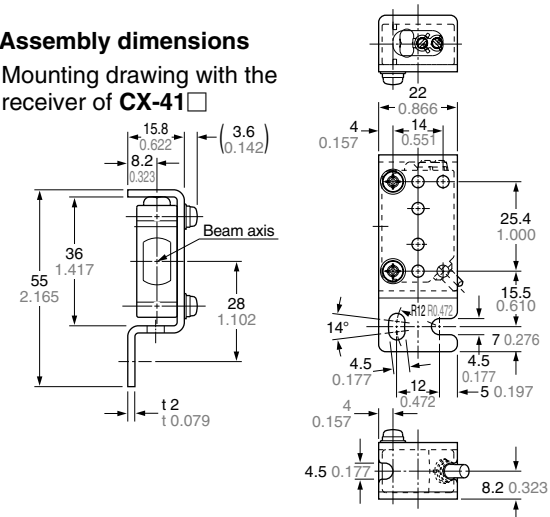
#### Sensor mounting bracket (Optional)



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

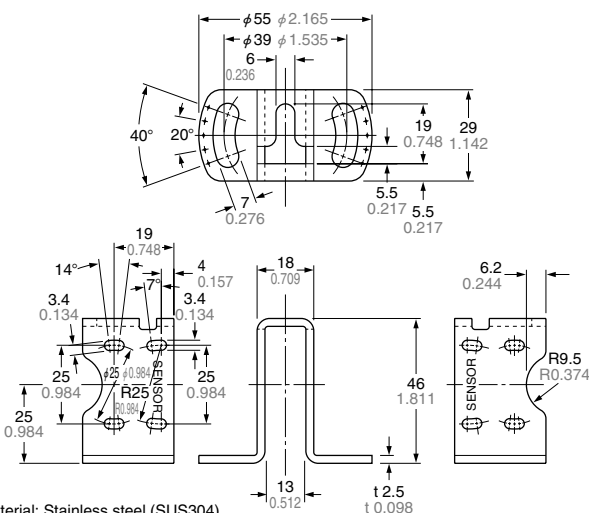
#### Assembly dimensions

Mounting drawing with the receiver of CX-41



### MS-CX2-4

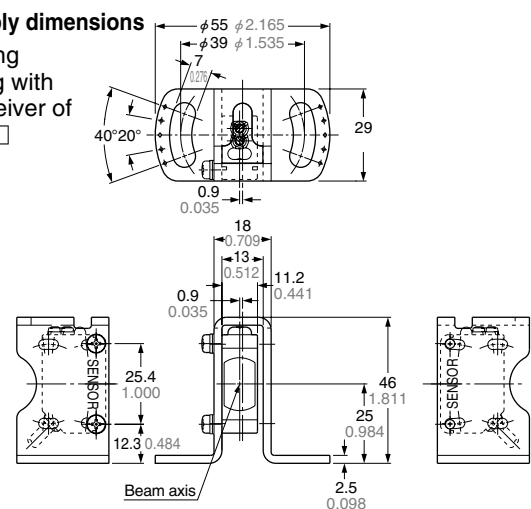
#### Sensor mounting bracket (Optional)



Material: Stainless steel (SUS304)  
Two M3 (length 14 mm 0.551 in) screws with washers are attached.

#### Assembly dimensions

Mounting drawing with the receiver of CX-41





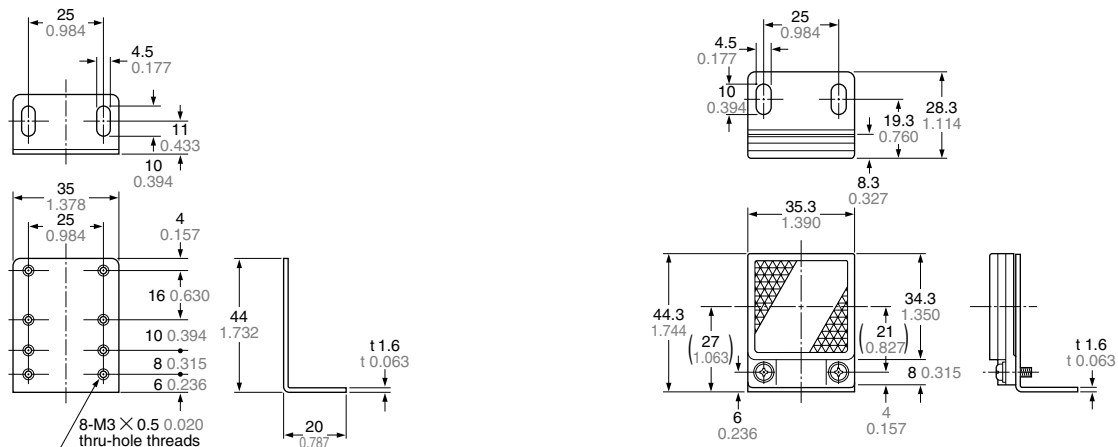
# CX-400

## DIMENSIONS (Unit: mm in)

### MS-RF22

Reflector mounting bracket for RF-220 (Optional)

#### Assembly dimensions



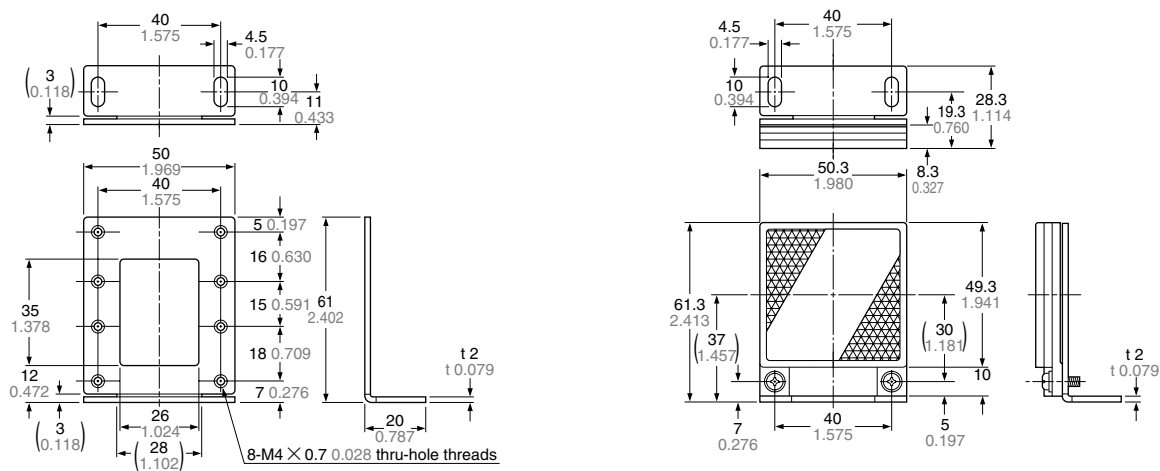
Material: Cold rolled carbon steel (SPCC)  
(Uni-chrome plated)

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

### MS-RF23

Reflector mounting bracket for RF-230 (Optional)

#### Assembly dimensions



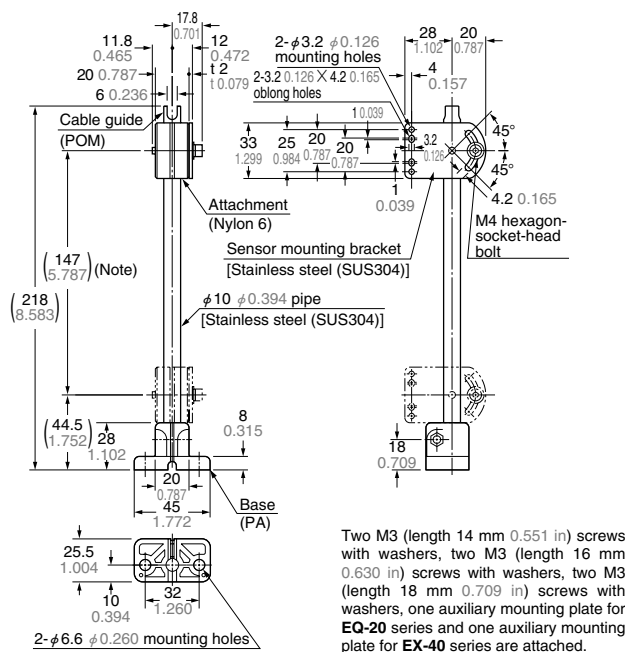
Material: Cold rolled carbon steel (SPCC)  
(Uni-chrome plated)

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

## DIMENSIONS (Unit: mm in)

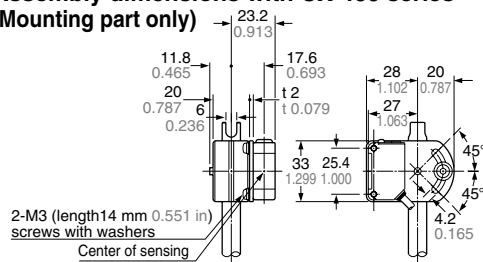
### MS-AJ1

Universal sensor mounting stand (Optional)



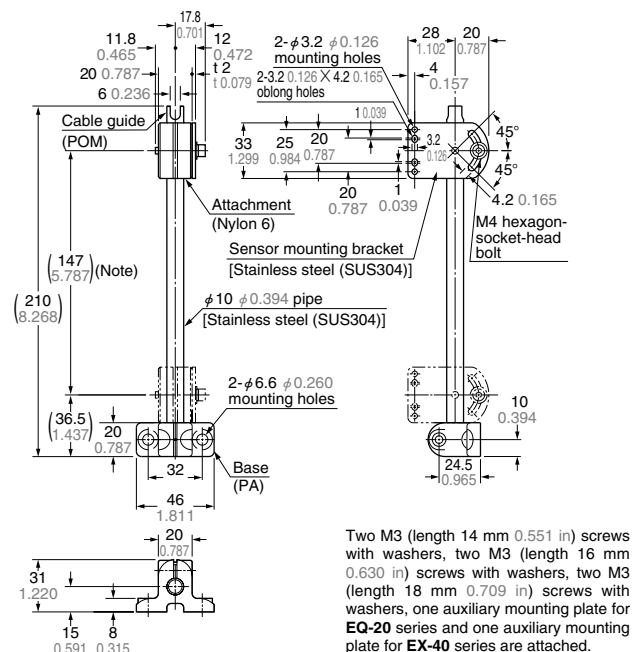
Note: The dimensions in the brackets indicate the adjustable range of the movable part.

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



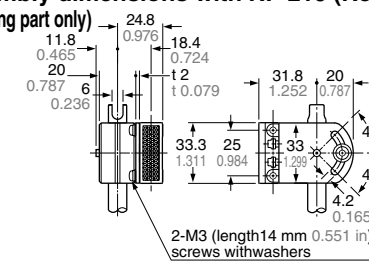
### MS-AJ2

Universal sensor mounting stand (Optional)



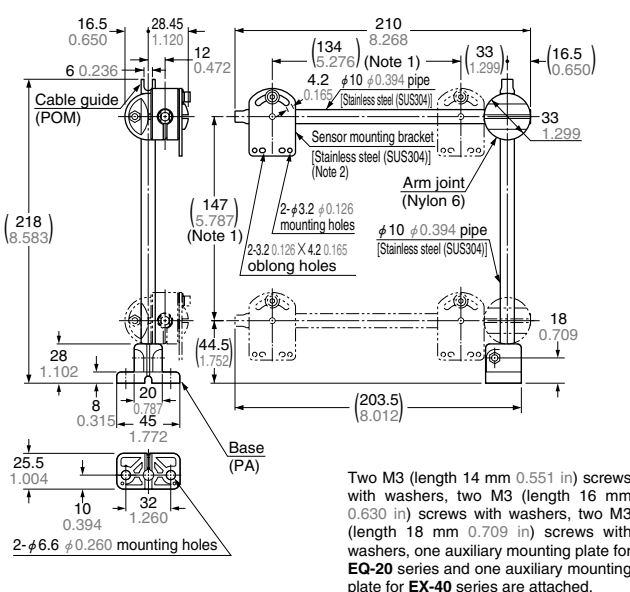
Note: The dimensions in the brackets indicate the adjustable range of the movable part.

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



### MS-AJ1-A

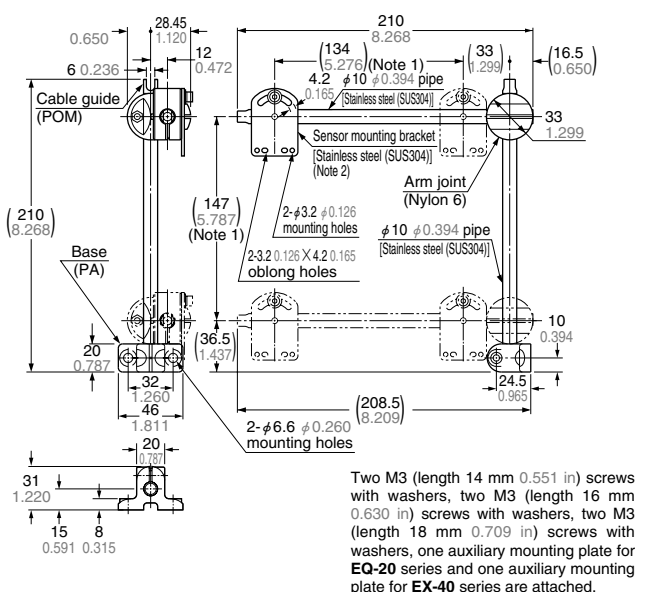
Universal sensor mounting stand (Optional)



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

### MS-AJ2-A

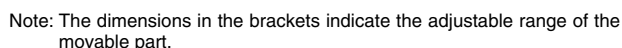
Universal sensor mounting stand (Optional)



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

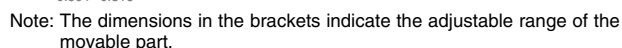
### DIMENSIONS (Unit: mm in)

Universal sensor mounting stand (Optional)



Technical drawing of the M4 hexagon-socket-head bolt assembly. The drawing shows a side view and a top view. The side view shows a bolt with a hexagonal head and a threaded shank. Dimensions include: total length 55.3 (2.177), head width 38 (1.496), head thickness 11.8 (0.465), shank diameter 12 (0.472), and a distance of 20 (0.787) from the head to the start of the thread. The top view shows the hexagonal head with a width of 50 (1.969) and a distance of 28 (1.102) from the center to the edge. The threaded shank has a diameter of 28 (1.102) and a length of 45.3 (1.783). The bolt is labeled "M4 hexagon-socket-head bolt".

Universal sensor mounting stand (Optional)



Technical drawing of a 2-M4 hexagon-socket-head bolt assembly. The drawing shows a side view and a top view. The side view shows a bolt with a hexagonal head and a threaded shank. The top view shows the hexagonal head with dimensions for the hexagon and the bolt. Dimensions are given in millimeters and inches. The bolt is labeled "2-M4 (length 8 mm 0.315 in) screws with washers". The hexagon-socket-head bolt is labeled "M4 hexagon-socket-head bolt".

Dimensions (mm and inches):

- 71.3 (2.807)
- 47 (1.850)
- 20 (0.787)
- 11.8 (0.465)
- 50.3 (1.980)
- 37 (1.457)
- 61.3 (2.413)
- 28 (1.102)
- 36.3 (1.429)
- 20 (0.787)
- 4.2 (0.165)
- t 2 (t 0.079)
- 45°
- 45°

Our Nagoya Head Office and Factory acquired ISO 14001 certification in September 1999. Now and into the future, we will continuously improve environmental management systems based on our Environment Policy, which focuses on the promotion of environmentally friendly business activities and product development.

