Amplifier Built-in
Compact Photoelectric Sensor
CX-400 SERIES Ver.2

World Standard

Upgraded to Increase Usability
Achieving low power consumption and high noise-resistance
The world standard CX-400 series

Sensors that are environmentally and user friendly.

The total lineup of 148 models covers through the inclusion of a newly developed custom integrated circuit. This CX-400 series upgrade achieves a significantly higher reliability in the same package as the older model.

Providing stable detection with low power consumption

Includes an analog CMOS processor ASIC

The lens material is made of a strong acrylic that resists the harmful effects of coolants. These sensors can be used with confidence even around metal processing machine that disperse oil mists.

<table>
<thead>
<tr>
<th>Test Oil</th>
<th>JIS Standard</th>
<th>Product Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water-insoluble cutting oil</td>
<td>2-5</td>
<td>Daphnecut AS-300 (Note)</td>
</tr>
<tr>
<td>Water-soluble cutting oil</td>
<td>W1-1</td>
<td>Yushiron Lubric HVGR (Note)</td>
</tr>
<tr>
<td></td>
<td>W2-1</td>
<td>Yushiroken S50N (Note)</td>
</tr>
</tbody>
</table>

1,000 hours; Immersion (depth 0 m); Insulation resistance 20 MD250 V

Note: Yushiron and Yushiroken are registered trademarks of Yushiro Chemical Industry Co., Ltd.

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

Demonstrating stable detection, even in harsh environments

Resistant to oil and coolant liquids

Strongly ethanol resistant

Incorporates a polycarbonate indicator cover that strongly resists ethanol. This makes it compatible with food processors that spray ethanol-based cleaning fluids.
Reducing environmental burdens further

**Up to 60% less power consumption**

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

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**Contributing to reduced carbon dioxide emissions**

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

The CX-400 contributes to **Approx. 84.6 t** annually in carbon dioxide reductions to the world.

---

**Upgrade 1**

Reducing environmental burdens further

**Upgrade 2**

Stronger noise resistance

**Stronger inverter countermeasures**

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

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**Upgrade 3**

Stronger output short-circuit resistance

**Stronger inverse wiring connection protection**

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

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**High Performance**

High performance For many applications

Thanks to its unique optics and specialized design, the CX-400’s electronic circuits allows for consistent sensing of minute 0.4 mm (0.016 in) differences or 10 μm (0.394 mil) ultra-thin film.

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**Save**

Thoroughly eliminating unnecessary waste, Reducing many environmental burdens

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

**Strong infrared beam**
CX-412/413

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

**Strong in dust and dirt**
CX-412/413

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

Even the thru-beam type is strong at mutual interference
CX-411

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

Interference prevention filter (Optional)

**Applications**

- Detecting box collapsing within the rail of stacker crane

**Retroreflective type**

**Strong against extraneous light and noise**
CX-491

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

**Two sensors can be mounted close together**
All models

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

**Long sensing range of 5 m 16.404 ft**
CX-493

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

CX-493: 5 m 16.404 ft
CX-491: 3 m 9.843 ft

**For transparent object sensing**

CX-482: 2 m 6.562 ft
CX-483: 1 m 3.281 ft
CX-481: 0.5 m 1.640 ft

CX-481/482/483

**Applications**

- Synchronizing sensor for image processing systems
Introducing transparent object sensing type sensor CX-48/g401

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

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

These sensors have a high luminance red LED spot beam which provides bright visibility enabling the sensing position to be checked at a glance. Because it achieved small beam spot approx. ø2 mm ø0.079 in at setting distance 100 mm 3.937 in, approx. ø5 mm ø0.197 in at setting distance 200 mm 7.874 in, even the minutest object can be accurately detected.

**Reduction of volume adjustment labor All models**

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

**Twice the sensing range!**

Introducing transparent object sensing type sensor CX-48/g401

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

<table>
<thead>
<tr>
<th>Sensing object</th>
<th>Sensing object size (mm)</th>
<th>f</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass sheet</td>
<td>ø50</td>
<td>ø1.969</td>
<td>t=0.7</td>
</tr>
<tr>
<td>Cylindrical glass</td>
<td>ø50</td>
<td>ø1.969</td>
<td>t=1.3</td>
</tr>
<tr>
<td>Acrylic board</td>
<td>ø50</td>
<td>ø1.969</td>
<td>t=1.0</td>
</tr>
<tr>
<td>Styrol (Pogo case)</td>
<td>ø50</td>
<td>ø1.969</td>
<td>t=0.9</td>
</tr>
<tr>
<td>Food wrapping film</td>
<td>ø50</td>
<td>ø1.969</td>
<td>t=10 μm</td>
</tr>
<tr>
<td>Cigarette case film</td>
<td>ø50</td>
<td>ø1.969</td>
<td>t=20 μm</td>
</tr>
<tr>
<td>Vinyl bag</td>
<td>ø50</td>
<td>ø1.969</td>
<td>t=30 μm</td>
</tr>
<tr>
<td>Pet bottle (500ml)</td>
<td>ø66</td>
<td>ø2.598</td>
<td></td>
</tr>
</tbody>
</table>

Reflect setting range:
CX-481: 300 to 500 mm 11.811 to 19.685 in
CX-482: 1 to 2 m 3.937 to 6.552 ft
CX-483: 500 to 1,000 mm 19.685 to 39.370 in

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

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

f : Length of cylindrical glasses

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

Applications

- Detecting pins in the case
- Detecting glossy electric appliances
- Detecting plastic bottles stacked on pallets
- Passage confirmation of object on a conveyor belt
- Detecting transparent film

18/07/2011
Adjustable range reflective type

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

30% higher sensing capability
The difference in sensing range 1% or less between non-glossy white paper with a setting distance of 50 mm 1.969 in and non-glossy gray paper with a brightness level of 5.

High precision type

Can sense height differences as small as 0.4 mm 0.016 in, with hysteresis of 2% or less
An advanced optical system provides sensing performance that is approx. 2.5 times than conventional models. Even ultra-small differences of 0.4 mm 0.016 in can be detected accurately.

2.5 times the sensing capability!
The difference in sensing range 1% or less between non-glossy white paper with a setting distance of 20 mm 0.787 in and non-glossy gray paper with a brightness level of 5.

30% higher sensing capability
The difference in sensing range 1% or less between non-glossy white paper with a setting distance of 50 mm 1.969 in and non-glossy gray paper with a brightness level of 5.

Select from 2 spot diameters as per application
Within the choice of 50 mm 1.969 in sensing range sensors, we offer small spot type of approx. ø2 mm ø0.079 in optimal for detecting minute objects and large spot type of approx. ø6.5 mm ø0.256 in capable of sensing objects covered with holes and grooves.

The bright spot makes beam axis alignment easy
All models
These sensors have a high luminance red spot that provides bright visibility. The sensing position can be checked at a glance. Because the CX-441 sensor has a small spot beam, at approx. ø2 mm ø0.079 in, even the minutest object can be accurately detected.

Can be used for sensing minute differences
All models
Equipped with a 5-turn adjuster so that even challenging range settings can be handled with ease.

CX-442
1.5 times longer than before
300 mm 11.811 in

CX-444
50 mm 1.969 in
Spot diameter ø2 mm ø0.079 in approx.

CX-441
100 mm 3.937 in
50 mm 1.969 in
Spot diameter ø6.5 mm ø0.256 in approx.

CX-443

18/07/2011
BGS / FGS functions make even the most challenging settings possible!

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

**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.

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

**Applications**

- Small tablet detection
  Detects minute objects unaffected by glossy background objects. Uses FGS function.
  - CX-441

- Biscuit detection
  Stable sensing even for thin objects. Uses FGS function.
  - CX-443

- Passage confirmation
  Not affected by color variations in objects and background objects. Uses BGS function.
  - CX-442

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**The FGS function is best suited for the following case**

**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.

---

**OG OFFON**

OFF in this condition only

ON in all other conditions

Object absent

Object present

For glossy object

Setting distance
# ORDER GUIDE

## Standard type

<table>
<thead>
<tr>
<th>Type</th>
<th>Appearance</th>
<th>Sensing range</th>
<th>Model No. (Note 1)</th>
<th>Output operation</th>
<th>Emitting element</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thru-beam</td>
<td></td>
<td>10 m 32.808 ft</td>
<td>CX-411 CX-411-P</td>
<td></td>
<td>Red LED</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15 m 49.213 ft</td>
<td>CX-412 CX-412-P</td>
<td></td>
<td>Infrared LED</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30 m 98.425 ft</td>
<td>CX-411 CX-411-P</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long sensing range</td>
<td></td>
<td>3 m 9.843 ft</td>
<td>CX-491 CX-491-P</td>
<td></td>
<td>Red LED</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 m 16.404 ft</td>
<td>CX-493 CX-493-P</td>
<td></td>
<td>Infrared LED</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50 to 500 mm 1.969 to 19.685 in</td>
<td>CX-481 CX-481-P</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>50 to 1,000 mm 1.969 to 39.37 in</td>
<td>CX-483 CX-483-P</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.1 to 2 m 0.328 to 6.562 ft</td>
<td>CX-482 CX-482-P</td>
<td></td>
<td>Switchable either Light-ON or Dark-ON</td>
</tr>
<tr>
<td>Retroreflective</td>
<td></td>
<td>100 mm 3.937 in</td>
<td>CX-424 CX-424-P</td>
<td></td>
<td>Infrared LED</td>
</tr>
<tr>
<td>For transparent</td>
<td></td>
<td>300 mm 11.811 in</td>
<td>CX-421 CX-421-P</td>
<td></td>
<td>Red LED</td>
</tr>
<tr>
<td>object sensing</td>
<td></td>
<td>800 mm 31.496 in</td>
<td>CX-422 CX-422-P</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diffuse reflective</td>
<td></td>
<td>70 to 300 mm 2.756 to 11.811 in</td>
<td>CX-423 CX-423-P</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Narrow view</td>
<td></td>
<td>2 to 50 mm 0.079 to 1.969 in</td>
<td>CX-441 CX-441-P</td>
<td></td>
<td>Red LED</td>
</tr>
<tr>
<td>Adjustable range</td>
<td></td>
<td>15 to 100 mm 0.591 to 3.937 in</td>
<td>CX-444 CX-444-P</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reflective</td>
<td></td>
<td>20 to 300 mm 0.787 to 11.811 in</td>
<td>CX-442 CX-442-P</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

**Notes:**
1) The model No. with “E” shown on the label affixed to the thru-beam type sensor is the emitter, “D” shown on the label is the receiver. (e.g.) Emitter of CX-411: CX-411E, Receiver of CX-411: CX-411D
2) The sensing range of the retroreflective type sensor is specified for the RF-230 reflector. The sensing range represents the actual sensing range of the sensor. The sensing ranges itemized in “A” of the table below may vary depending on the shape of sensing object. Be sure to check the operation with the actual sensing object.

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Setting range of the reflector: B</th>
<th>Reflective</th>
<th>Sensing range: A</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0 to 3 m</td>
<td>0 to 0.328 m</td>
<td>0.079 to 1.969 m</td>
</tr>
<tr>
<td></td>
<td>0 to 9.843 ft</td>
<td>0 to 5 m</td>
<td>1.969 to 39.37 in</td>
</tr>
<tr>
<td></td>
<td>0 to 16.404 ft</td>
<td>50 to 100 mm</td>
<td>1.969 to 39.37 in</td>
</tr>
<tr>
<td></td>
<td>50 to 500 mm</td>
<td>500 to 1,000 mm</td>
<td>1.969 to 39.37 in</td>
</tr>
<tr>
<td></td>
<td>50 to 1,000 mm</td>
<td>500 to 1,000 mm</td>
<td>1.969 to 39.37 in</td>
</tr>
<tr>
<td>B</td>
<td>0.1 to 2 m</td>
<td>0.328 to 6.562 ft</td>
<td>0.8 to 2 m</td>
</tr>
<tr>
<td></td>
<td>0.1 to 3 m</td>
<td>0.328 to 6.562 ft</td>
<td>0.8 to 2 m</td>
</tr>
<tr>
<td></td>
<td>0.1 to 5 m</td>
<td>0.328 to 6.562 ft</td>
<td>0.8 to 2 m</td>
</tr>
</tbody>
</table>

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### ORDER GUIDE

#### NEW

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

<table>
<thead>
<tr>
<th>Type</th>
<th>Appearance</th>
<th>Sensing range</th>
<th>Model No.(Note 1)</th>
<th>Output operation</th>
<th>Emitting element</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thru-beam</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 m 32.808 ft</td>
<td>CX-411A-C05</td>
<td>PNP output</td>
<td>Light-ON</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CX-411A-P-C05</td>
<td>PNP output</td>
<td>Light-ON</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15 m 49.213 ft</td>
<td>CX-412A-C05</td>
<td>PNP output</td>
<td>Infrared LED</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CX-412A-P-C05</td>
<td>PNP output</td>
<td>Infrared LED</td>
</tr>
<tr>
<td>Retroreflective</td>
<td>Optional (Note 2)</td>
<td>3 m 9.843 ft (Note 3)</td>
<td>CX-491A-C05-Y</td>
<td>PNP output</td>
<td>Red LED</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CX-491A-P-C05-Y</td>
<td>PNP output</td>
<td>Red LED</td>
</tr>
</tbody>
</table>

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

---

**Notes:**

1. The model No. with “E” shown on the label affixed to the thru-beam type sensor is the emitter, “D” shown on the label is the receiver.
2. Emitter of CX-411A-C05, CX-411E, Receiver of CX-411A-C05. CX-411AD
3. The reflector is sold separately.
4. The sensing range of the retroreflective type sensor is specified for the RF-230 (optional) reflector. The sensing range represents the actual sensing range of the sensor. The sensing 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.

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Setting range of the reflector: B (Optional)</th>
<th>Reflector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensing range: A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Range</th>
<th>Reflexed Reflection</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 3 m</td>
<td>0 to 9.843 ft</td>
</tr>
<tr>
<td>0.1 to 3 m</td>
<td>0.328 to 9.843 ft</td>
</tr>
</tbody>
</table>

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ORDER GUIDE

0.5 m 1.640 ft / 5 m 16.4 ft cable length types
0.5 m 1.640 ft / 5 m 16.404 ft cable length types (standard: 2 m 6.562 ft, basic: 0.5 m 1.640 in) are also available.
When ordering this type, suffix “-C05” for the 0.5 m 1.640 ft cable length type, “-C5” for the 5 m 16.404 ft cable length type to the model No. (Excluding CX-44 and basic type.)
(e.g.) 0.5 m 1.640 ft cable length type of CX-411-P is “CX-411-P-C05”
5 m 16.404 ft cable length type of CX-411-P is “CX-411-P-C5”

M8 plug-in connector type, M12 pigtailed type
M8 plug-in connector type and M12 pigtailed type are also available.
When ordering this type, suffix “-Z” for the M8 connector type, “-J” for the M12 pigtailed type to the model No.
(Please note that M12 pigtailed type is not available for CX-44. Excluding basic type.)
(e.g.) M8 connector type of CX-411-P is “CX-411-P-Z”
M12 pigtailed type of CX-411-P is “CX-411-P-J”

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

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

Package without reflector
NPN output type: CX-491-Y
PNP output type: CX-491-P-Y

Accessory
• RF-230 (Reflector)
### OPTIONS

<table>
<thead>
<tr>
<th>Designation</th>
<th>Model No.</th>
<th>Slit size</th>
<th>Sensing range</th>
<th>Min. sensing object</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Slit mask</td>
<td>Sensor</td>
<td>Slit on one side</td>
<td>Slit on both sides</td>
</tr>
<tr>
<td>Round slit mask</td>
<td>OS-CX-05</td>
<td>CX-411-1</td>
<td>ø0.5 mm ø0.020 in</td>
<td>400 mm 15.748 in</td>
</tr>
<tr>
<td></td>
<td>OS-CX-1</td>
<td>CX-411-1</td>
<td>ø1 mm ø0.039 in</td>
<td>900 mm 35.433 in</td>
</tr>
<tr>
<td></td>
<td>OS-CX-2</td>
<td>CX-411-1</td>
<td>ø2 mm ø0.079 in</td>
<td>2 m 6.562 ft</td>
</tr>
<tr>
<td></td>
<td>OS-CX-05×6</td>
<td>CX-411-1</td>
<td>ø6 mm 0.200×0.236 in</td>
<td>2 m 6.562 ft</td>
</tr>
<tr>
<td></td>
<td>OS-CX-1×6</td>
<td>CX-411-1</td>
<td>ø6 mm 0.399×0.236 in</td>
<td>3 m 9.843 ft</td>
</tr>
<tr>
<td></td>
<td>OS-CX-2×6</td>
<td>CX-411-1</td>
<td>ø6 mm 0.079×0.236 in</td>
<td>2 m 6.562 ft</td>
</tr>
</tbody>
</table>

**Interference prevention filter**
- **For CX-411-1 only**
  - **PF-CX4-V** (Vertical, Silver) 2 pcs. per set
    - Sensing range: 5 m 16.404 ft (Note 1)
    - Min. sensing object: ø12 mm ø0.472 in (Note 1)
  - **PF-CX4-H** (Horizontal, Light brown) 2 pcs. per set

**Rectangular slit mask**
- **For thru-beam type sensor only**
  - **RF-210**
    - CX-491-1: 1 m 3.281 ft (Note 2)
    - CX-493-1: 1.5 m 4.921 ft (Note 2)
    - CX-481-1: 3 m 9.843 ft (Note 2)
    - CX-483-1: 3 m 9.843 ft (Note 2)
  - **RF-220**
    - CX-491-1: 1 m 3.281 ft (Note 2)
    - CX-493-1: 1.5 m 4.921 ft (Note 2)
    - CX-481-1: 3 m 9.843 ft (Note 2)
    - CX-483-1: 3 m 9.843 ft (Note 2)
  - **RF-230 (Note 3)**
    - CX-491-1: 3 m 9.843 ft (Note 2)

**Notes:**
1. Value when attached on both sides.
2. The sensing range “A” may vary depending on the shape of sensing object. Be sure to check the operation with the actual sensing object.
3. Two sets of CX-411-1 can be mounted close together.

### Interference prevention filter
- **For CX-411-1 only**

### Reflectors
- **RF-210**
  - CX-491-1: 3 mm 0.118 in
  - CX-493-1: 3 mm 0.118 in
  - CX-481-1: 3 mm 0.118 in
  - CX-483-1: 3 mm 0.118 in

### Reflectors
- **RF-220**
  - CX-491-1: 3 mm 0.118 in
  - CX-493-1: 3 mm 0.118 in

### Reflectors
- **RF-230**
  - CX-491-1: 3 mm 0.118 in

### Interference prevention filter
- **PF-CX4-V** (Vertical, Silver)
  - RF-210
  - RF-220
  - RF-230

### Interference prevention filter
- **PF-CX4-H** (Horizontal, Light brown)

---

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

<table>
<thead>
<tr>
<th>Designation</th>
<th>Model No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reflector mounting bracket</td>
<td>MS-RF21</td>
<td>Protective mounting bracket for RF-210 It protects the reflector from damage and maintains alignment.</td>
</tr>
<tr>
<td></td>
<td>MS-RF22</td>
<td>For RF-220</td>
</tr>
<tr>
<td></td>
<td>MS-RF23</td>
<td>For RF-230</td>
</tr>
<tr>
<td>Reflective tape</td>
<td>RF-11</td>
<td>• Sensing range (Note 4): 0.5 m 1.64 ft [CX-491: 0.8 m 2.625 ft [CX-493: 0.328 to 1.969 ft [CX-492: • Ambient temperature: -25 to +50 °C -13 to +122 °F • Ambient humidity: 35 to 85 % RH Notes: 1) Keep the tape free from stress. If it is pressed too much, its capability may deteriorate. 2) Do not cut the tape. It will deteriorate the sensing performance.</td>
</tr>
<tr>
<td></td>
<td>RF-12</td>
<td>• Sensing range (Note 4): 0.7 m 2.297 ft [CX-491: 1.2 m 3.937 ft [CX-493: 0.1 to 0.6 m 0.328 to 1.969 ft [CX-492: • Ambient temperature: -25 to +55 °C -13 to +131 °F • Ambient humidity: 35 to 85 % RH</td>
</tr>
<tr>
<td></td>
<td>RF-13</td>
<td>• Sensing range (Note 5): 0.5 m 1.640 ft [CX-491: • Ambient temperature: -25 to +55 °C -13 to +131 °F • Ambient humidity: 35 to 85 % RH</td>
</tr>
<tr>
<td>Sensor mounting bracket</td>
<td>MS-CX2-1</td>
<td>Foot angled mounting bracket It can also be used for mounting RF-210. The thru-beam type sensor needs two brackets.</td>
</tr>
<tr>
<td>(Note 1)</td>
<td>MS-CX2-2</td>
<td>Foot biangled mounting bracket It can also be used for mounting RF-210.</td>
</tr>
<tr>
<td></td>
<td>MS-CX2-4</td>
<td>Protective mounting bracket</td>
</tr>
<tr>
<td></td>
<td>MS-CX2-5</td>
<td>Back biangled mounting bracket</td>
</tr>
<tr>
<td></td>
<td>MS-CX-3</td>
<td>Back angled mounting bracket</td>
</tr>
<tr>
<td>Universal sensor stand</td>
<td>MS-AJ1</td>
<td>Horizontal mounting type Basic assembly</td>
</tr>
<tr>
<td>(Note 2)</td>
<td>MS-AJ2</td>
<td>Vertical mounting type</td>
</tr>
<tr>
<td></td>
<td>MS-AJ1-A</td>
<td>Horizontal mounting type Lateral arm assembly</td>
</tr>
<tr>
<td></td>
<td>MS-AJ1-M</td>
<td>Horizontal mounting type Assembly for reflector</td>
</tr>
<tr>
<td></td>
<td>MS-AJ2-A</td>
<td>Vertical mounting type</td>
</tr>
<tr>
<td>Sensor checker</td>
<td>CHX-SC2</td>
<td>It is useful for beam alignment of thru-beam type sensors. The optimum receiver position is given by indicators, as well as an audio signal.</td>
</tr>
</tbody>
</table>

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

## Universal sensor mounting stand

<table>
<thead>
<tr>
<th>Designation</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MS-AJ1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MS-AJ1-A</td>
<td>With the lateral arm, the sensor can sense from above a production line. Forward / back adjustment: 130 m 5.118 in approx.</td>
<td></td>
</tr>
<tr>
<td>MS-AJ1-M</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MS-AJ2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MS-AJ2-A</td>
<td>With the lateral arm, the sensor can sense from above a production line. Forward / back adjustment: 130 m 5.118 in approx.</td>
<td></td>
</tr>
<tr>
<td>MS-AJ2-M</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MS-CX-3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MS-CX-4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MS-CX-5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MS-CX-2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHX-SC2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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## SPECIFICATIONS

### Standard type

<table>
<thead>
<tr>
<th>Item</th>
<th>Type</th>
<th>Thru-beam</th>
<th>Retroreflective</th>
<th>Diffuse reflective</th>
<th>Narrow-view</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>NPN output</td>
<td>CX-411</td>
<td>CX-412</td>
<td>CX-413</td>
<td>CX-491</td>
</tr>
<tr>
<td></td>
<td>PNP output</td>
<td>CX-411-P</td>
<td>CX-412-P</td>
<td>CX-413-P</td>
<td>CX-491-P</td>
</tr>
<tr>
<td>Sensing range</td>
<td></td>
<td>10 m</td>
<td>15 m 32.608 ft</td>
<td>30 m 98.425 ft</td>
<td>5 m 16.404 ft</td>
</tr>
<tr>
<td>Sensing object</td>
<td></td>
<td>ø12 mm</td>
<td>ø12 mm 9.383 in</td>
<td>ø12 mm 9.383 in</td>
<td>ø0.39 in</td>
</tr>
<tr>
<td>Hysteresis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15 % or less of operation distance (Note 3)</td>
</tr>
<tr>
<td>Supply voltage</td>
<td></td>
<td>12 to 24 V DC ±10 %</td>
<td>Ripple P-P 10 % or less</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current consumption</td>
<td></td>
<td>13 mA or less</td>
<td>10 mA or less</td>
<td>13 mA or less</td>
<td>15 mA or less</td>
</tr>
<tr>
<td>Output</td>
<td></td>
<td>Switchable either Light-ON or Dark-ON</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operation indicator</td>
<td></td>
<td>1 ms or less</td>
<td>2 ms or less</td>
<td>1 ms or less</td>
<td></td>
</tr>
<tr>
<td>Stability indicator</td>
<td></td>
<td>Green LED (lights up under stable light received condition or stable dark condition)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power indicator</td>
<td></td>
<td>Green LED (lights up when the power is ON) (incorporated on the emitter)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity adjuster</td>
<td></td>
<td>Continuously variable adjuster (incorporated on the receiver for thru-beam type)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automatic interference prevention function</td>
<td></td>
<td>Incorporate (Two units of sensors can be mounted close together.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protection</td>
<td></td>
<td>IP67 (IEC)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient temperature</td>
<td></td>
<td>-25 to +55 °C -13 to +131 °F (No dew condensation or icing allowed), Storage: -30 to +70 °C -22 to +158 °F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient humidity</td>
<td></td>
<td>35 to 85 % RH, Storage: 35 to 85 % RH</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient illumination</td>
<td></td>
<td>Incandescent light: 3,000 ft at the light-receiving face</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voltage withstandability</td>
<td></td>
<td>1,000 V AC for one min. between all supply terminals connected together and enclosure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insulation resistance</td>
<td></td>
<td>20 MΩ, or more, with 250 V DC megger between all supply terminals connected together and enclosure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vibration resistance</td>
<td></td>
<td>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</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shock resistance</td>
<td></td>
<td>500 m/s² acceleration (50 G approx.) in X, Y and Z directions for three times each</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emitting element (modulated)</td>
<td></td>
<td>Red LED 870 nm 0.327 mW</td>
<td>Infrared LED 870 nm 0.034 mW</td>
<td>Infrared LED 870 nm 0.034 mW</td>
<td>Red LED 860 nm 0.033 mW</td>
</tr>
<tr>
<td>Material</td>
<td></td>
<td>PBT (Polybutylene terephthalate), Lens: Acrylic (CX-48:: Polycarbonate), Indicator cover: Acrylic (CX-48:: Polycarbonate)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable</td>
<td></td>
<td>0.2 mm² -3 (thru-beam type emitter: 2-core) cabling cable, 2 m 6.562 ft long</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable extension</td>
<td></td>
<td>Extension up to total 100 m 328.084 ft is possible with 0.3 mm², or more, cable (thru-beam type: both emitter and receiver)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td></td>
<td>Net: 45 g approx., Receiver: 50 g approx.</td>
<td>50 g approx.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gross: 100 g approx.</td>
<td>80 g approx.</td>
<td>60 g approx.</td>
<td></td>
</tr>
</tbody>
</table>

### Notes:
1. Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23 °C ±7.3 °F.
2. The sensing range and the sensing object of the retroreflective type sensor are specified for the RF-230 reflector. The sensing range represents the actual sensing range of the sensor. The sensing 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.
3. The sensing range and hysteresis of the diffuse reflector type sensor are specified for white non-glossy paper (200 × 200 mm 7.874 × 7.874 in) as the object.
4. If slit masks (optional) are fitted, an object of ø0.5 mm ø0.020 in (using non-slip slit mask) can be detected.
5. Make sure to confirm detection with an actual sensor before use.

![Sensing Range Diagram](image-url)
<table>
<thead>
<tr>
<th><strong>SPECIFICATIONS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standard type</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Small spot</td>
</tr>
<tr>
<td></td>
<td>Adjustable range reflective</td>
</tr>
<tr>
<td>Item</td>
<td>NPN output</td>
</tr>
<tr>
<td></td>
<td>CX-441</td>
</tr>
<tr>
<td></td>
<td>CX-443</td>
</tr>
<tr>
<td>Adjustable range (Note 2)</td>
<td>20 to 50 mm 0.787 to 1.969 in</td>
</tr>
<tr>
<td>Sensing range (with white non-glossy paper)</td>
<td>20 to 100 mm 0.787 to 3.937 in</td>
</tr>
<tr>
<td>Hysteresis (with white non-glossy paper)</td>
<td>2 % or less of operation distance</td>
</tr>
<tr>
<td>Repeatability (with white non-glossy paper)</td>
<td>5 % or less of operation distance</td>
</tr>
<tr>
<td>Output voltage</td>
<td>12 to 24 V DC ±10 % Ripple P-P 10 % or less</td>
</tr>
<tr>
<td>Current consumption</td>
<td>25 mA or less</td>
</tr>
<tr>
<td>Output operation</td>
<td>Switchable either Detection-ON or Detection-OFF</td>
</tr>
<tr>
<td>Distance adjuster</td>
<td>5-turn mechanical adjuster</td>
</tr>
<tr>
<td>Sensing mode</td>
<td>BGS / FGS functions Switchable with wiring of sensing mode selection input</td>
</tr>
<tr>
<td>Azimuthal interference rejection function (Note 4)</td>
<td>Incorporated</td>
</tr>
<tr>
<td>Protection</td>
<td>IP67 (IEC)</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-25 to +55 °C -13 to +131 °F (No dew condensation or icing allowed), Storage: -30 to +70 °C -22 to +158 °F</td>
</tr>
<tr>
<td>Ambient humidity</td>
<td>35 to 85 % RH, Storage: 35 to 85 % RH</td>
</tr>
<tr>
<td>Ambient illuminance</td>
<td>Incandescent light: 3,000 lx at the light-receiving face</td>
</tr>
<tr>
<td>Voltage withstandability</td>
<td>1,000 V AC for one min. between all supply terminals connected together and enclosure</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>20 MΩ, or more, with 250 V DC megger between all supply terminals connected together and enclosure</td>
</tr>
<tr>
<td>Vibration resistance</td>
<td>10 to 500 Hz frequency, 3 mm 0.118 in in double amplitude in X, Y and Z directions for two hours each</td>
</tr>
<tr>
<td>Shock resistance</td>
<td>500 m/s² acceleration (50 G approx.) in X, Y and Z directions for three times each</td>
</tr>
<tr>
<td>Emitting element</td>
<td>Red LED (Peak emission wavelength: 650 nm 25.591 μm, modulated)</td>
</tr>
<tr>
<td>Spot diameter</td>
<td>ø2 mm 0.079 in approx. (at 50 mm 1.969 in distance)</td>
</tr>
<tr>
<td></td>
<td>ø6.5 mm 0.256 in approx. (at 50 mm 1.969 in distance)</td>
</tr>
<tr>
<td></td>
<td>ø9 mm 0.354 in approx. (at 100 mm 3.937 in distance)</td>
</tr>
<tr>
<td></td>
<td>ø15 mm 0.591 in approx. (at 300 mm 11.811 in distance)</td>
</tr>
<tr>
<td>Material</td>
<td>Enclosure: PBT (Polybutylene terephthalate), Lens: Polycarbonate, Indicator cover: Polycarbonate</td>
</tr>
<tr>
<td>Cable</td>
<td>0.2 mm² 4-core cabtyre cable, 2 m 6.562 ft long</td>
</tr>
<tr>
<td>Cable extension</td>
<td>Extension up to total 100 m 328.064 ft is possible with 0.3 mm², or more, cable.</td>
</tr>
<tr>
<td>Weight</td>
<td>Net weight: 55 g approx., Gross weight: 65 g approx.</td>
</tr>
</tbody>
</table>

Notes:
1. Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23 °C +73.4 °F.
2. The adjustable range stands for the maximum sensing range which can be set with the distance adjuster. The sensor can detect an object 2 mm 0.079 in [CX-444(P)-CX-444(P)]; 15 mm 0.591 in, [CX-444(P)-CX-444(P)]; 20 mm 0.787 in), or more, away.
3. Refer to the manual or the general catalog for operation of the stability indicator.
4. Note that detection may be unstable depending on the mounting conditions or the sensing object. In the state that this product is mounted, be sure to check the operation with the actual sensing object.

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## SPECIFICATIONS

### Basic type

<table>
<thead>
<tr>
<th>Item</th>
<th>NPN output</th>
<th>PNP output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model No.</td>
<td>CX-411A-C05</td>
<td>CX-411A-P-C05</td>
</tr>
<tr>
<td></td>
<td>CX-411B-C05</td>
<td>CX-411B-P-C05</td>
</tr>
<tr>
<td></td>
<td>CX-412A-C05</td>
<td>CX-412A-P-C05</td>
</tr>
<tr>
<td></td>
<td>CX-412B-C05</td>
<td>CX-412B-P-C05</td>
</tr>
<tr>
<td></td>
<td>CX-491A-C05-Y</td>
<td>CX-491A-P-C05-Y</td>
</tr>
<tr>
<td></td>
<td>CX-491B-C05-Y</td>
<td>CX-491B-P-C05-Y</td>
</tr>
</tbody>
</table>

#### Sensing range
- Light-ON: 10 m, 32.808 ft
- Dark-ON: 15 m, 49.213 ft
- Light-ON: 3 m, 9.843 ft (Note 2)

#### Sensing object
- ø12 mm ø0.472 in or more opaque object (Note 3)
- ø50 mm ø1.969 in or more transparent, translucent or opaque object (Note 2, 4)

#### Hysteresis
- 0.5 mm 0.020 in or less

#### Supply voltage
- 12 to 24 V DC ±10 %

#### Current consumption
- Emitter: 15 mA or less
- Receiver: 10 mA or less
- 13 mA or less

#### Output
- NPN open-collector transistor
  - Maximum sink current: 100 mA
  - Applied voltage: 30 V DC or less (between output and 0 V)
  - Residual voltage: 2 V or less (at 100 mA sink current)
  - 1 V or less (at 16 mA sink current)
- PNP open-collector transistor
  - Maximum source current: 100 mA
  - Applied voltage: 30 V DC or less (between output and +V)
  - Residual voltage: 2 V or less (at 100 mA source current)
  - 1 V or less (at 16 mA source current)

#### Power indicator
- Green LED (lights up when the power is ON) (incorporated on the emitter)

#### Sensitivity adjuster
- Automatic interference prevention function: Incorporated (Two units of sensors can be mounted close together.)
- Two units of sensors can be mounted together with interference prevention filters. (Sensing range: 5 m 16.404 ft)

#### 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
- Insulation resistance: 3,000 kΩ at the light-receiving face
- Insulation resistance: 20 MΩ, or more, with 250 V DC megger between all supply terminals connected together and enclosure
- Shock resistance: 500 m/s² acceleration (50 G approx.) in X, Y and Z directions for three times each

#### Emitter element (modulated)
- Red LED
- Infrared LED
- Peak emission wavelength
  - Red LED: 680 nm 0.027 mil
  - Infrared LED: 870 nm 0.034 mil
  - Red LED: 680 nm 0.027 mil
- Material
  - Enclosure: PBT (Polybutylene terephthalate), Lens: Acrylic, Indicator cover: Acrylic
- Cable
  - 0.2 mm² 3-core (thru-beam type emitter: 2-core) cable, 0.5 m 1.640 ft long
  - Extension up to total 100 m 328.084 ft is possible with 0.3 mm², or more, cable (thru-beam type: both emitter and receiver)

#### Weight
- Net: Emitter: 20 g approx., Receiver: 20 g approx.
- Gross: 50 g approx.

### Notes:
1. Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23 °C +73.4 °F.
2. The sensing range and the sensing object of the retroreflective type sensor are specified for the RF-230 reflector (optional). The sensing range represents the actual sensing range of the sensor. The sensing ranges itemized in “A” of the table below may vary depending on the shape of the sensing object. Be sure to check the operation with the actual sensing object.
3. If slit masks (optional) are fitted, an object of ø0.5 mm ø0.020 in (using round slit mask) can be detected.
4. Make sure to confirm detection with an actual sensor before use.
### I/O CIRCUIT AND WIRING DIAGRAMS

#### NPN output type

**I/O circuit diagram**

- **Color code / Connector pin No. of the connector type**
  - (Brown / 1) +V
  - (Black / 4) Output (Note 1)
  - (Blue / 3) 0 V
  - (Pink / 2) Sensing mode selection input (Note 2, 3)

- **Symbols**
  - D : Reverse supply polarity protection diode
  - ZD : Surge absorption zener diode
  - Tr : NPN output transistor

**Internal circuit**

- User’s circuit

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

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

#### Wiring diagram

- **Brown**
- **Black (Note 1)**
- **Blue**
- **Pink (Note 2, 3)**
- **Load**

- **Color code / Connector pin No. of the connector type**
  - 12 to 24 V DC ±10 %

- **Symbols**
  - D : Reverse supply polarity protection diode
  - ZD : Surge absorption zener diode
  - Tr : NPN output transistor

**Internal circuit**

- User’s circuit

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

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

#### Connector pin position

**M8 plug-in connector type**

- **1**
  - Sensing mode selection input
  - Output (Note 1)

**M12 pigtailed type**

- **2**
  - Not connected
- **1**
  - Output (Note 1)

#### PNP output type

**I/O circuit diagram**

- **Color code / Connector pin No. of the connector type**
  - (Brown / 1) +V
  - (Black / 4) Output (Note 1)
  - (Blue / 3) 0 V
  - (Pink / 2) Sensing mode selection input (Note 2, 3)

- **Symbols**
  - D : Reverse supply polarity protection diode
  - ZD : Surge absorption zener diode
  - Tr : PNP output transistor

**Internal circuit**

- User’s circuit

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

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

**Connector pin position**

**M8 plug-in connector type**

- **1**
  - Sensing mode selection input
  - Output (Note 1)

**M12 pigtailed type**

- **2**
  - Not connected
- **1**
  - Output (Note 1)

18/07/2011
PRECAUTIONS FOR PROPER USE

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

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

Wiring
- Make sure that the power supply is off while wiring.
- Take care that wrong wiring will damage the sensor.
- Verify that the supply voltage variation is within the rating.
- If power is supplied from a commercial switching regulator, ensure that the frame ground (F.G.) terminal of the power supply is connected to an actual ground.
- In case noise generating equipment (switching regulator, inverter motor, etc.) is used in the vicinity of this product, connect the frame ground (F.G.) terminal of the equipment to an actual ground.

Others
- This product has been developed / produced for industrial use only.
- Do not use during the initial transient time (50 ms) after the power supply is switched on.
- Take care that the sensor is not directly exposed to fluorescent light from a rapid-starter lamp or a high frequency lighting device, as it may affect the sensing performance.
- This sensor is suitable for indoor use only.
- Do not use this sensor in places having excessive vapor, dust, etc., or where it may come in direct contact with water or corrosive gas.
- Take care that the sensor does not come in direct contact with water, oil, grease or organic solvents, such as, thinner, etc.
- This sensor cannot be used in an environment containing inflammable or explosive gases.
- Never disassemble or modify the sensor.

DIMENSIONS (Unit: mm in)

The CAD data in the dimensions can be downloaded from the website: panasonic-electric-works.net/sunx

Notes: 1) Not incorporated on the emitter.
2) It is the power indicator (green) on the emitter.
3) Not incorporated on the emitter.
4) Basic type: 0.5 m 1.640 ft long.
The CAD data in the dimensions can be downloaded from the website: panasonic-electric-works.net/sunx
**DIMENSIONS (Unit: mm in)**

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

Material: Acrylic (Reflector)  
ABS (Base)

2-ø4.6 ø0.181 mounting holes

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>50.3</td>
<td>1.980</td>
</tr>
<tr>
<td>50.3</td>
<td>1.941</td>
</tr>
<tr>
<td>49.3</td>
<td>1.941</td>
</tr>
<tr>
<td>2.335</td>
<td>0.092</td>
</tr>
<tr>
<td>3.3</td>
<td>0.126</td>
</tr>
<tr>
<td>10.1</td>
<td>0.394</td>
</tr>
</tbody>
</table>

**RF-220** Reflector (Optional)

Material: Acrylic (Reflector)  
ABS (Base)

2-ø3.6 ø0.142 mounting holes

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>35.3</td>
<td>1.390</td>
</tr>
<tr>
<td>21</td>
<td>0.827</td>
</tr>
<tr>
<td>12.8</td>
<td>0.504</td>
</tr>
</tbody>
</table>

**RF-210** Reflector (Optional)

Material: Acrylic (Reflector)  
ABS (Base)

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

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>33.3</td>
<td>1.311</td>
</tr>
<tr>
<td>11.1</td>
<td>0.435</td>
</tr>
<tr>
<td>25</td>
<td>0.984</td>
</tr>
<tr>
<td>10</td>
<td>0.394</td>
</tr>
</tbody>
</table>

**RF-11** Reflective tape (Optional)

Material: Acrylic

Effective reflecting surface

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>1.181</td>
</tr>
<tr>
<td>28</td>
<td>1.102</td>
</tr>
<tr>
<td>8</td>
<td>0.315</td>
</tr>
</tbody>
</table>

**RF-12** Reflective tape (Optional)

Material: Acrylic

Effective reflecting surface

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>1.181</td>
</tr>
<tr>
<td>28</td>
<td>1.102</td>
</tr>
<tr>
<td>25</td>
<td>0.984</td>
</tr>
<tr>
<td>23</td>
<td>0.906</td>
</tr>
</tbody>
</table>

**RF-13** Reflective tape (Optional)

Material: Acrylic

Reflective surface (Acrylic)

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>30</td>
<td>1.181</td>
</tr>
<tr>
<td>0.5</td>
<td>0.020</td>
</tr>
</tbody>
</table>

**MS-CX2-1** Sensor mounting bracket (Optional)

Material: Stainless steel (SUS304)

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

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.2</td>
<td>0.472</td>
</tr>
</tbody>
</table>

Assembly dimensions

Mounting drawing with the receiver of CX-41

Material: Stainless steel (SUS304)

Two M3 (length 12 mm 0.472 in) screws with washers are attached.
The CAD data in the dimensions can be downloaded from the website: panasonic-electric-works.net/sunx

MS-CX2-2

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

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□

MS-CX2-5

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□
**DIMENSIONS (Unit: mm in)**

**MS-CX-3**

**Sensor mounting bracket (Optional)**

Mounting drawing with the receiver of CX-41.

Material: Stainless steel (SUS304)

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

**MS-RF21-1**

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

Material: Stainless steel (SUS304)

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

**MS-RF22**

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

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

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

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The CAD data in the dimensions can be downloaded from the website: [panasonic-electric-works.net/sunx](panasonic-electric-works.net/sunx)
Material: Cold rolled carbon steel (SPCC)
(Uniformchrome plated)

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

MS-AJ1 Universal sensor mounting stand (Optional)

MS-AJ2 Universal sensor mounting stand (Optional)

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

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

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

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

The CAD data in the dimensions can be downloaded from the website:
panasonic-electric-works.net/sunx
**DIMENSIONS (Unit: mm in)**

The CAD data in the dimensions can be downloaded from the website: panasonic-electric-works.net/sunx

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

![Diagram of MS-AJ1-A](image)

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

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

![Diagram of MS-AJ2-A](image)

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

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

![Diagram of MS-AJ1-M](image)

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

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

![Diagram of MS-AJ2-M](image)

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

**Assembly dimensions with RF-220 (Reflector)**

(Mounting part only)

![Assembly diagram](image)

**Assembly dimensions with RF-230 (Reflector)**

(Mounting part only)

![Assembly diagram](image)
Protecting the environment is one of our guiding business principles.

Promoting a totally lead-free working environment
We are now working to eliminate the use of lead in all our in-house manufacturing processes such as in reflow ovens, hand soldering and parts and substrates procurement.

Using simple packaging
Simple, environmentally friendly packaging material reduces waste.

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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.

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Please contact ..........