Sensors that are environmentally and user friendly.

Reducing environmental burdens further
Up to 60% less power consumption

The total lineup of 148 models covers through the inclusion of a newly developed custom integrated circuit. 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.

Strong against oil and coolant liquids

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

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).

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:

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

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

**Detecting out of position tape feeder cassette**

![Detecting out of position tape feeder cassette](image)

**Detecting objects in places that have a lot of dust or clouds of particles**

![Detecting objects in places that have a lot of dust or clouds of particles](image)

**Passage confirmation of object on a conveyor belt**

![Passage confirmation of object on a conveyor belt](image)

**Detecting transparent glass bottles**

![Detecting transparent glass bottles](image)

**Small tablet sensing**

![Small tablet sensing](image)

**Biscuit sensing**

![Biscuit sensing](image)

---

**BASIC PERFORMANCE**

**Strong infrared beam**

![Strong infrared beam](image)

Remarkable penetrating power enables applications such as package content detection.

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

![Can sense differences as small as 0.4 mm 0.016 in, with hysteresis of 2 % or less](image)

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

**Hardly affected by colors**

![Hardly affected by colors](image)

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.

**Retroreflective type with polarizing filters**

![Retroreflective type with polarizing filters](image)

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

---

**Note:** When sensing utilizing penetrating power, make sure to verify using the actual sensor.
Introducing the transparent object sensing type sensor

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)

<table>
<thead>
<tr>
<th>Sensing object</th>
<th>Sensing object size (mm in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass sheet</td>
<td>50 × 50 1.969 × 1.969</td>
</tr>
<tr>
<td>Cylindrical glass</td>
<td>ø50 × 1.969 t = 0.7 0.028</td>
</tr>
<tr>
<td>Acrylic board</td>
<td>50 × 50 1.969 × 1.969</td>
</tr>
<tr>
<td>Styro (Flap case)</td>
<td>50 × 50 1.969 × 1.969 t = 0.9 0.035</td>
</tr>
<tr>
<td>Food wrapping film</td>
<td>50 × 50 1.969 × 1.969 t = 10 0.394 mil</td>
</tr>
<tr>
<td>Cigarette case film</td>
<td>50 × 50 1.969 × 1.969 t = 20 0.767 mil</td>
</tr>
<tr>
<td>Vinyl sack</td>
<td>50 × 50 1.969 × 1.969 t = 30 1.181 mil</td>
</tr>
<tr>
<td>PET bottle (500ml)</td>
<td>ø66 ø2.598 t = 20 µm 0.787 mil</td>
</tr>
<tr>
<td>Transparent objects</td>
<td></td>
</tr>
</tbody>
</table>

Twice the sensing range!

Long sensing range of 5 m 16.4 ft

A long 5 m 16.4 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.

Ultra-long sensing range of 30 m 98.4 ft

The CX-413 achieves the ultra-long sensing range of 30 m 98.4 ft. It can be used for a stacker crane or a multilevel parking structure.

Stronger noise resistance

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

Strong on dust and dirt

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

Strong even in cold environments

Stable performance can be maintained even in environments of –25 °C –13 °F.

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 gases.
Compact Photoelectric Sensor CX-400 SERIES Ver.2

MOUNTING

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.

The bright spot makes beam axis alignment easy CX-443

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 the smallest spot in its class ø2 mm ø0.079 in approx., even the minutest object can be accurately detected.

OPERABILITY

Reduction of volume adjustment labor CX-423

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

CX-422: 800 mm 31.496 in
CX-421: 300 mm 11.811 in
CX-424: 100 mm 3.937 in

CX-423: 70 to 300 mm 2.756 to 11.811 in

CX-423 □

Narrow-view type

Can be used for sensing minute differences CX-443

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

VARIETIES

Basic type new release

Omit the sensitivity adjuster and operation mode switch and release a basic type cable 0.5 m 1.641 ft in length. If the usage is clear, quick construction can be performed onsite without detailed adjustments and the cost can be controlled.

CX-422: 800 mm 31.496 in
CX-421: 300 mm 11.811 in
CX-424: 100 mm 3.937 in

CX-423: 70 to 300 mm 2.756 to 11.811 in

CX-423 □

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.

Select from 2 spot diameters as per the application CX-441/443

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

CX-441

Spot diameter: ø2 mm ø0.079 in approx.

[Positioning]
Detects minute holes.

CX-443

Spot diameter: ø6.5 mm ø0.256 in approx.

Detection of presence / absence of objects
Ignored minute holes and accurately detects objects.

Great maintainability

No unnecessary cables or terminal blocks

Selection Guide
Amplifier Built-in
Power Supply Built-in
Amplifier-separate

CX-400
EX-10
EX-20
EX-30
EX-40
CX-440
EQ-30
EQ-500
MG-W
RX-LS200
RX
RT-610

Operational Guide
 FUNCTIONS

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

For details on the operation of the BGS / FGS functions, refer to “BGS / FGS functions” of “PRECAUTIONS FOR PROPER USE”.

The BGS function is best suited for the following case

**Background not present**
When object and background are separated

<table>
<thead>
<tr>
<th>BGS</th>
<th>FGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not affected if the background color changes or someone passes behind the conveyor.</td>
<td>Unaffected by gloss, color or uneven surfaces when sensing objects present on a conveyor belt.</td>
</tr>
</tbody>
</table>

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

**BGS (Background suppression) function**

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

**FGS (Foreground suppression) function**

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

Strong against interference

The interference prevention function lets two sensors be mounted close together precisely.
## 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><strong>Thru-beam</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long sensing range</td>
<td></td>
<td>10 m 32.808 ft</td>
<td>CX-411</td>
<td>NPN output</td>
<td>Red LED</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15 m 49.213 ft</td>
<td>CX-412</td>
<td>PNP output</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>30 m 98.425 ft</td>
<td><strong>NEW</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Retroreflective</strong></td>
<td></td>
<td>3 m 9.843 ft (Note 2)</td>
<td>CX-491</td>
<td>PNP output</td>
<td>Infrared LED</td>
</tr>
<tr>
<td>For transparent object sensing</td>
<td></td>
<td>5 m 16.404 ft (Note 2)</td>
<td>CX-493</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>50 to 500 mm 1.969 to 19.685 in (Note 2)</td>
<td>CX-481</td>
<td>PNP output</td>
<td>Infrared LED</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50 to 1,000 mm 1.969 to 39.37 in (Note 2)</td>
<td><strong>NEW</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.1 to 2 m 0.328 to 6.562 ft (Note 2)</td>
<td>CX-482</td>
<td>PNP output</td>
<td>Infrared LED</td>
</tr>
<tr>
<td><strong>Diffuse reflective</strong></td>
<td></td>
<td>100 mm 3.937 in</td>
<td>CX-424</td>
<td>PNP output</td>
<td>Red LED</td>
</tr>
<tr>
<td>Narrow-view</td>
<td></td>
<td>300 mm 11.811 in</td>
<td>CX-421</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>800 mm 31.496 in</td>
<td>CX-422</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Adjustable range reflective</strong></td>
<td></td>
<td>70 to 300 mm 2.756 to 11.811 in</td>
<td>CX-423</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. (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.

![Sensing range diagram](image)

<table>
<thead>
<tr>
<th>CX-491</th>
<th>CX-493</th>
<th>CX-481</th>
<th>CX-482</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 0 to 3 m 0 to 9.843 ft</td>
<td>0 to 5 m 0 to 16.404 ft</td>
<td>50 to 500 mm 1.969 to 19.685 in</td>
<td>50 to 1,000 mm 1.969 to 39.37 in</td>
</tr>
<tr>
<td>B 0.1 to 3 m 0.328 to 9.843 ft</td>
<td>0.1 to 5 m 0.328 to 16.404 ft</td>
<td>0.1 to 2 m 0.328 to 6.562 ft</td>
<td>0.8 to 2 m 2.625 to 6.562 ft</td>
</tr>
<tr>
<td>Type</td>
<td>Appearance</td>
<td>Sensing range</td>
<td>Model No.(Note 1)</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------------</td>
<td>----------------</td>
<td>-------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NPN output</td>
</tr>
<tr>
<td>Thru-beam</td>
<td></td>
<td>10 m 32.808 ft</td>
<td>CX-411A-C05</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CX-411B-C05</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15 m 49.213 ft</td>
<td>CX-412A-C05</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CX-412B-C05</td>
</tr>
<tr>
<td>Retroreflective</td>
<td>Optional</td>
<td>3 m 9.843 ft</td>
<td>CX-491A-C05-Y</td>
</tr>
<tr>
<td></td>
<td>With polarizing filters</td>
<td></td>
<td>CX-491B-C05-Y</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-411A-C05: CX-411E, Receiver of CX-411A-C05: CX-411AD
2) The reflector is sold separately.
3) The sensing range of the retroreflective type sensor is specified for the RF-230 (optional) reflector. The sensing range represents the actual sensing range of the sensor. The sensing 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.

![Diagram of sensor and reflector](image)

### Setting range of the reflector: B

<table>
<thead>
<tr>
<th>CX-491:</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 0 to 3 m</td>
</tr>
<tr>
<td>0 to 9.843 ft</td>
</tr>
<tr>
<td>B 0.1 to 3 m</td>
</tr>
<tr>
<td>0.328 to 9.843 ft</td>
</tr>
</tbody>
</table>
ORDER GUIDE

0.5 m 1.640 ft / 5 m 16.404 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 ft) 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-4□: 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-4□: 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 cable (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

#### Round slit mask

<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>OS-CX-05</td>
<td>RX-411</td>
<td>ø0.5 mm</td>
<td>20 mm 0.787 in</td>
<td>ø0.5 mm ø0.020 in</td>
</tr>
<tr>
<td></td>
<td>RX-412</td>
<td>ø0.020 in</td>
<td>30 mm 1.181 in</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RX-413</td>
<td></td>
<td>60 mm 2.362 in</td>
<td></td>
</tr>
<tr>
<td>OS-CX-1</td>
<td>RX-411</td>
<td>ø1 mm</td>
<td>100 mm 3.937 in</td>
<td>ø0.5 mm ø0.020 in</td>
</tr>
<tr>
<td></td>
<td>RX-412</td>
<td>ø0.039 in</td>
<td>150 mm 5.906 in</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RX-413</td>
<td></td>
<td>300 mm 11.811 in</td>
<td></td>
</tr>
<tr>
<td>OS-CX-2</td>
<td>RX-411</td>
<td>ø2 mm</td>
<td>400 mm 15.748 in</td>
<td>ø0.5 mm ø0.020 in</td>
</tr>
<tr>
<td></td>
<td>RX-412</td>
<td>ø0.079 in</td>
<td>600 mm 23.622 in</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RX-413</td>
<td></td>
<td>1,200 mm 47.242 in</td>
<td></td>
</tr>
</tbody>
</table>

#### Rectangular slit mask

<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>OS-CX-05×6</td>
<td>CX-411</td>
<td>0.5×6 mm</td>
<td>400 mm 15.748 in</td>
<td>ø0.5 mm ø0.020 in</td>
</tr>
<tr>
<td></td>
<td>CX-412</td>
<td>0.020×0.236 in</td>
<td>30 mm 1.181 in</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CX-413</td>
<td></td>
<td>60 mm 2.362 in</td>
<td></td>
</tr>
<tr>
<td>OS-CX-1×6</td>
<td>CX-411</td>
<td>1×6 mm</td>
<td>1 m 3.281 ft</td>
<td>ø0.5 mm ø0.020 in</td>
</tr>
<tr>
<td></td>
<td>CX-412</td>
<td>0.039×0.236 in</td>
<td>1.5 m 4.921 ft</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CX-413</td>
<td></td>
<td>2 m 6.562 ft</td>
<td></td>
</tr>
<tr>
<td>OS-CX-2×6</td>
<td>CX-411</td>
<td>2×6 mm</td>
<td>5 m 16.404 ft</td>
<td>ø0.5 mm ø0.020 in</td>
</tr>
<tr>
<td></td>
<td>CX-412</td>
<td>0.079×0.236 in</td>
<td>3 m 9.843 ft</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CX-413</td>
<td></td>
<td>6 m 19.685 ft</td>
<td></td>
</tr>
</tbody>
</table>

#### Reflector

<table>
<thead>
<tr>
<th>Designation</th>
<th>Model No.</th>
<th>Sensing range</th>
<th>Min. sensing object</th>
</tr>
</thead>
<tbody>
<tr>
<td>PF-CX-4-V</td>
<td>RX-411</td>
<td>1 m 3.281 ft</td>
<td>ø0.5 mm ø0.020 in</td>
</tr>
<tr>
<td></td>
<td>RX-493</td>
<td>1.5 m 4.921 ft</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RX-481</td>
<td>3 m 9.843 ft</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RX-482</td>
<td>0.5×6 mm 0.020×0.236 in</td>
<td>1.5 m 4.921 ft</td>
</tr>
<tr>
<td>RF-220</td>
<td>CX-411</td>
<td>1.5 m 4.921 ft</td>
<td>ø0.5 mm ø0.020 in</td>
</tr>
<tr>
<td></td>
<td>CX-493</td>
<td>3 m 9.843 ft</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CX-481</td>
<td>50 m 1.969 ft</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CX-482</td>
<td>0.1×1.3 m 0.039×0.236 in</td>
<td>2×6 mm 0.079×0.236 in</td>
</tr>
</tbody>
</table>

### Notes:

1. Value when attached on both sides.
2. Set the distance between the CX-491~493~ and the reflector to 0.1 m 0.328 ft or more.
### OPTIONS

<table>
<thead>
<tr>
<th>Designation</th>
<th>Model No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reflective tape</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MS-RF21-1</td>
<td>Reflective tape mounting bracket for RF-210</td>
<td>Protects the sensor from damage and maintains alignment.</td>
</tr>
<tr>
<td>MS-RF22</td>
<td>Reflective tape mounting bracket for RF-220</td>
<td>For RF-220</td>
</tr>
<tr>
<td>MS-RF23</td>
<td>Reflective tape mounting bracket for RF-230</td>
<td>For RF-230</td>
</tr>
<tr>
<td>RF-11</td>
<td>Reflective tape</td>
<td>Sensing range (Note 4): 0.5 m 1.64 ft [CX-491:] 0.8 m 2.625 ft [CX-492:]</td>
</tr>
<tr>
<td>RF-12</td>
<td>Reflective tape</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-482:]</td>
</tr>
<tr>
<td>RF-13</td>
<td>Reflective tape</td>
<td>Sensing range (Note 5): 0.5 m 1.64 ft [CX-491:]</td>
</tr>
</tbody>
</table>

### Sensor mounting bracket (Note 1)

<table>
<thead>
<tr>
<th>Designation</th>
<th>Model No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS-CX2-1</td>
<td>Foot angled mounting bracket</td>
<td>It can also be used for mounting RF-210.</td>
</tr>
<tr>
<td>MS-CX2-2</td>
<td>Foot angled mounting bracket</td>
<td>For RF-220</td>
</tr>
<tr>
<td>MS-CX2-5</td>
<td>Foot angled mounting bracket</td>
<td>For RF-230</td>
</tr>
<tr>
<td>MS-CX-3</td>
<td>Back angled mounting bracket</td>
<td>Vertical mounting type</td>
</tr>
<tr>
<td>MS-AJ1</td>
<td>Horizontal mounting type</td>
<td>Basic assembly</td>
</tr>
<tr>
<td>MS-AJ2</td>
<td>Vertical mounting type</td>
<td>Lateral arm assembly</td>
</tr>
<tr>
<td>MS-AJ1-A</td>
<td>Horizontal mounting type</td>
<td>Assembly for reflector</td>
</tr>
<tr>
<td>MS-AJ2-A</td>
<td>Vertical mounting type</td>
<td></td>
</tr>
<tr>
<td>MS-AJ1-M</td>
<td>Horizontal mounting type</td>
<td></td>
</tr>
<tr>
<td>MS-AJ2-M</td>
<td>Vertical mounting type</td>
<td></td>
</tr>
</tbody>
</table>

### Sensor mounting bracket (Note 2)

<table>
<thead>
<tr>
<th>Designation</th>
<th>Model No.</th>
<th>Description</th>
</tr>
</thead>
</table>
| CHX-SC2 | Sensor checker | It is useful for beam alignment of thru-beam type sensors. The optimum receiver position is given by indicators, as well as an audio signal.

Notes:
1. The plug-in connector type sensor does not allow the use of some sensor mounting brackets because of the protrusion of the connector.
2. Refer to the universal sensor mounting stand MS-AJ1 series pages.
3. Refer to the sensor checker CHX-SC2 pages.
4. Set the distance between the sensor and the reflective tape to 0.1 m 0.328 ft (CX-482::: 0.4 m 1.312 ft) or more.
5. Set the distance between the sensor and the reflective tape to 0.2 m 0.656 ft or more.

### Universal sensor mounting stand

- **MS-AJ1**
  - Swivel: 360° rotation
  - Height adjustment: 150 mm 5.906 in approx.
  - 45° Elevation angle: ±45°
  - With the lateral arm, the sensor can sense from above a production line.

- **MS-AJ1-A**
  - Swivel: 360° rotation
  - Height adjustment: 150 mm 5.906 in approx.
  - 45° Elevation angle: ±45°
  - With the lateral arm, the sensor can sense from above a production line.

- **MS-AJ2**
  - Swivel: 360° rotation
  - Height adjustment: 150 mm 5.906 in approx.
  - 45° Elevation angle: ±45°
  - With the lateral arm, the sensor can sense from above a production line.

- **MS-AJ2-A**
  - Swivel: 360° rotation
  - Height adjustment: 150 mm 5.906 in approx.
  - 45° Elevation angle: ±45°
  - With the lateral arm, the sensor can sense from above a production line.

- **MS-AJ1-M**
  - Swivel: 360° rotation
  - Height adjustment: 150 mm 5.906 in approx.
  - 45° Elevation angle: ±45°

- **MS-AJ2-M**
  - Swivel: 360° rotation
  - Height adjustment: 150 mm 5.906 in approx.
  - 45° Elevation angle: ±45°

- **MS-CX1**
  - Swivel: 360° rotation
  - Height adjustment: 360° rotation
  - 45° Elevation angle: ±45°

- **MS-CX2**
  - Swivel: 360° rotation
  - Height adjustment: 360° rotation
  - 45° Elevation angle: ±45°

- **RS-22**
  - Swivel: 360° rotation
  - Height adjustment: 360° rotation
  - 45° Elevation angle: ±45°

### Sensor mounting bracket (Note 3)

- **MS-CX2-1**
  - Sensor mounting bracket
  - Basic assembly

- **MS-CX2-2**
  - Sensor mounting bracket
  - Vertical mounting type

- **MS-CX2-5**
  - Sensor mounting bracket
  - Vertical mounting type

- **MS-CX3**
  - Sensor mounting bracket
  - Vertical mounting type

- **MS-CX4**
  - Sensor mounting bracket
  - Vertical mounting type

- **MS-CX5**
  - Sensor mounting bracket
  - Vertical mounting type

- **CHX-SC2**
  - Sensor checker
  - 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.
### SPECIFICATIONS

#### Standard type

<table>
<thead>
<tr>
<th>Item</th>
<th>Type</th>
<th>Thru-beam</th>
<th>Retroreflective</th>
<th>Diffuse reflective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensing range</td>
<td>NPN output</td>
<td>CX-411</td>
<td>CX-412</td>
<td>CX-413</td>
</tr>
<tr>
<td>Sensing</td>
<td>PNP output</td>
<td>CX-411-P</td>
<td>CX-412-P</td>
<td>CX-413-P</td>
</tr>
<tr>
<td>Sensing object</td>
<td>ø12 mm ø0.472 in or more opaque object (Note 4)</td>
<td>ø40 mm ø1.575 in or more opaque, translucent or specular object (Note 2, 5)</td>
<td>ø50 mm ø1.969 in or more transparent, translucent or opaque object (Note 2, 5)</td>
<td></td>
</tr>
<tr>
<td>Repeatability perpendicular to sensing axis</td>
<td>1 mm 0.039 in or less</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supply voltage</td>
<td>12 to 24 V DC ±10 % Ripple P-P 10 % or less</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current consumption</td>
<td>13 mA or less</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output</td>
<td>NPN open-collector transistor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum sink current</td>
<td>100 mA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applied voltage</td>
<td>30 V DC or less (between output and 0 V)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residual voltage</td>
<td>2 V or less (at 100 mA sink current)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hysteresis</td>
<td>15 % or less of operation distance (Note 3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity adjuster</td>
<td>Continuously variable adjuster (incorporated on the receiver for thru-beam type)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Protection

- IP67 (IEC)
- Ambient temperature: -25 to +55 °C -13 to +131 °F (No dew condensation or icing allowed), Storage: -30 to +70 °C -22 to +158 °F
- Ambient humidity: 35 to 85 % RH, Storage: 35 to 85 % RH
- Ambient illuminance: Incandescent light: 3,000 lx at the light-receiving face
- Voltage withstandability: 1,000 V AC for one min. between all supply terminals connected together and enclosure
- Insulation resistance: 20 MΩ, or more, 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 ms² acceleration (50 G approx.) in X, Y and Z directions for three times each

#### Emitting element (modulated)

<table>
<thead>
<tr>
<th>Emitting</th>
<th>Red LED</th>
<th>Infrared LED</th>
<th>Red LED</th>
<th>Infrared LED</th>
<th>Red LED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emitter</td>
<td>660 nm 0.272 μm</td>
<td>870 nm 0.234 μm</td>
<td>660 nm 0.272 μm</td>
<td>870 nm 0.234 μm</td>
<td>660 nm 0.234 μm</td>
</tr>
<tr>
<td>Peak emission wavelength</td>
<td>870 nm 0.034 mil</td>
<td>860 nm 0.033 mil</td>
<td>465 nm 0.115 mil</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Material

- Enclosure: PBT (Polybutylene terephthalate), Lens: Acrylic (CX-48:: Polycarbonate), Indicator cover: Acrylic (CX-48:: Polycarbonate)

#### Cable

- Width: 0.2 mm² 3-core (thru-beam type emitter: 2-core) cable, 2 m 6.562 ft long
- Cable extension: 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

<table>
<thead>
<tr>
<th>Item</th>
<th>Net</th>
<th>Gross</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emitter</td>
<td>45 g approx.</td>
<td>50 g approx.</td>
</tr>
<tr>
<td>Receiver</td>
<td>50 g approx.</td>
<td>60 g approx.</td>
</tr>
</tbody>
</table>

#### Accessories

- RF-230 (Reflector): 1 pc.

### Notes

1. Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23 °C +73.4 °F.
2. The sensing range and the sensing object of the retroreflective type sensor are specified for the RF-230 reflector. The sensing range represents the actual sensing range of the sensor. The sensing 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

<table>
<thead>
<tr>
<th>Sensing range: A</th>
<th>Sensing range: B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor</td>
<td>Reflector</td>
</tr>
<tr>
<td>Setting range of the reflector: B</td>
<td></td>
</tr>
<tr>
<td>A 0 to 3 m</td>
<td>0.0 to 0.843 ft</td>
</tr>
<tr>
<td>0.0 to 5 m</td>
<td>0.0 to 16.404 ft</td>
</tr>
<tr>
<td>0.0 to 10 m</td>
<td>50 to 500 mm</td>
</tr>
<tr>
<td>0.0 to 15 m</td>
<td>1,869 to 19.695 in</td>
</tr>
<tr>
<td>0.0 to 20 m</td>
<td>1,989 to 39.37 mil</td>
</tr>
<tr>
<td>B 0.1 to 3 m</td>
<td>0.3 to 3.943 ft</td>
</tr>
<tr>
<td>0.1 to 5 m</td>
<td>0.3 to 16.404 ft</td>
</tr>
<tr>
<td>0.1 to 10 m</td>
<td>500 to 1,000 mm</td>
</tr>
<tr>
<td>0.1 to 15 m</td>
<td>1,989 to 39.37 mil</td>
</tr>
</tbody>
</table>

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

**Compact Photoelectric Sensor**

### Standard type

<table>
<thead>
<tr>
<th>Type</th>
<th>Adjustable range reflective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item</td>
<td>NPN output</td>
</tr>
<tr>
<td>CNP output</td>
<td>CX-441</td>
</tr>
<tr>
<td>PNP output</td>
<td>CX-443</td>
</tr>
<tr>
<td></td>
<td>CX-444</td>
</tr>
<tr>
<td></td>
<td>CX-442</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Adjustable range (Note 2)</th>
<th>20 to 50 mm</th>
<th>20 to 100 mm</th>
<th>40 to 300 mm</th>
<th>20 to 100 mm</th>
<th>40 to 300 mm</th>
<th>20 to 300 mm</th>
<th>20 to 100 mm</th>
<th>40 to 300 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensing range (with white non-glossy paper)</td>
<td>2.0 mm</td>
<td>2.0 to 50 mm</td>
<td>15 to 100 mm</td>
<td>0.591 to 3.937 in</td>
<td>2.0 to 50 mm</td>
<td>15 to 100 mm</td>
<td>0.591 to 3.937 in</td>
<td>2.0 to 50 mm</td>
</tr>
<tr>
<td>Hysteresis (with white non-glossy paper)</td>
<td>2% or less of operation distance</td>
<td>5% or less of operation distance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| 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) |

<table>
<thead>
<tr>
<th>Supply voltage</th>
<th>12 to 24 V DC ±10 % Ripple P-P 10 % or less</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current consumption</td>
<td>20 mA or less</td>
</tr>
</tbody>
</table>

#### Output

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

- **Output operation**: Switchable either Detection-ON or Detection-OFF
- **Short-circuit protection**: Incorporated
- **Response time**: 1 ms or less
- **Operation indicator**: Orange LED (lights up when the output is ON)
- **Stability indicator**: Green LED (lights up under stable operating condition) (Note 3)
- **Distance adjuster**: 5-turn mechanical adjuster
- **Sensing mode**: BGS / FGS functions Switchable with wiring of sensing mode selection input
- **Automatic interference prevent/aids (Note 4)**: 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**: Incandescent light: 3,000 ℓx at the light-receiving face
- **Ambient luminance**: 35 to 85 % RH
- **Voltage withstandability**: 1,000 V AC for one min. between all supply terminals connected together and enclosure
- **Insulation resistance**: 20 MΩ, or more, with 250 V DC megger between all supply terminals connected together and enclosure
- **Vibration resistance**: 10 to 500 Hz frequency, 3 mm 0.118 in double amplitude in X, Y and Z directions for two hours each
- **Shock resistance**: 500 m/s² acceleration (20 G approx.) in X, Y and Z directions for three times each

#### Emitter element

- **Emitting element**: Red LED (Peak emission wavelength: 650 nm 25.591 μm, modulated)
- **Spot diameter**:
  - ø2 mm ø0.079 in approx. (at 50 mm 1.969 in distance)
  - ø6.5 mm ø0.256 in approx. (at 50 mm 1.969 in distance)
  - ø9 mm ø0.354 in approx. (at 100 mm 3.937 in distance)
  - ø15 mm ø0.591 in approx. (at 300 mm 11.811 in distance)
- **Material**: Enclosure: PBT (Polybutylene terephthalate), Lens: Polycarbonate, Indicator cover: Polycarbonate
- **Cable**: 0.2 mm² 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 mm², or more, cable.
- **Weight**: Net weight: 55 g approx., Gross weight: 65 g approx.

#### Notes:

1. Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23 °C ±7.34 °F.
2. The adjustable range stands for the maximum sensing range which can be set with the distance adjuster. The sensor can detect an object 2 mm 0.079 in [CX-444(P): 15 mm 0.591 in, CX-442(P): 20 mm 0.787 in], or more, away.

### Diagram

- Actual sensing range of the sensor: A
- Adjustable range: B
- Sensing object

### Table

<table>
<thead>
<tr>
<th>Sensing range</th>
<th>Adjustable range</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2 to 50 mm</td>
</tr>
<tr>
<td>B</td>
<td>20 to 50 mm</td>
</tr>
<tr>
<td></td>
<td>0.079 to 1.969 in</td>
</tr>
<tr>
<td></td>
<td>20 to 100 mm</td>
</tr>
<tr>
<td></td>
<td>0.591 to 3.937 in</td>
</tr>
<tr>
<td></td>
<td>40 to 300 mm</td>
</tr>
<tr>
<td></td>
<td>1.575 to 11.811 in</td>
</tr>
</tbody>
</table>
## SPECIFICATIONS

### Basic type

<table>
<thead>
<tr>
<th>Item</th>
<th>Thru-beam</th>
<th>Retrospective</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Long sensing range</td>
<td>With polarizing filters</td>
</tr>
<tr>
<td></td>
<td>Light-ON</td>
<td>Dark-ON</td>
</tr>
<tr>
<td>NPN output</td>
<td>CX-411A-C05</td>
<td>CX-411B-C05</td>
</tr>
<tr>
<td>PNP output</td>
<td>CX-411A-P-C05</td>
<td>CX-411B-P-C05</td>
</tr>
<tr>
<td>Sensing range</td>
<td>10 m 32.808 ft</td>
<td>15 m 49.213 ft</td>
</tr>
<tr>
<td>Sensing object</td>
<td>Ø12 mm ø0.472 in or more opaque object (Note 3)</td>
<td>Ø50 mm ø1.969 in or more transparent, translucent or opaque object (Note 2, 4)</td>
</tr>
<tr>
<td>Hysteresis</td>
<td>————</td>
<td>————</td>
</tr>
<tr>
<td>Repeatability</td>
<td>0.5 mm 0.020 in or less</td>
<td>————</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>12 to 24 V DC ±10 %</td>
<td>Ripple P-P 10 % or less</td>
</tr>
<tr>
<td>Current consumption</td>
<td>Emitter: 15 mA or less</td>
<td>Receiver: 10 mA or less</td>
</tr>
<tr>
<td>Output</td>
<td>&lt;NPN output type&gt;</td>
<td>&lt;PNP output type&gt;</td>
</tr>
<tr>
<td></td>
<td>NPN open-collector transistor</td>
<td>PNP open-collector transistor</td>
</tr>
<tr>
<td></td>
<td>• Maximum sink current: 100 mA</td>
<td>• Maximum source current: 100 mA</td>
</tr>
<tr>
<td></td>
<td>• Applied voltage: 30 V DC or less (between output and 0 V)</td>
<td>• Applied voltage: 30 V DC or less (between output and +V)</td>
</tr>
<tr>
<td></td>
<td>• Residual voltage: 2 V or less (at 100 mA sink current)</td>
<td>• Residual voltage: 2 V or less (at 100 mA source current)</td>
</tr>
<tr>
<td></td>
<td>1 V or less (at 16 mA sink current)</td>
<td>1 V or less (at 16 mA source current)</td>
</tr>
<tr>
<td>Power indicator</td>
<td>Green LED (lights up when the power is ON)(incorporated on the emitter)</td>
<td>————</td>
</tr>
<tr>
<td>Sensitivity adjuster</td>
<td>————</td>
<td>————</td>
</tr>
<tr>
<td>Automatic interference prevention function</td>
<td>Two units of sensors can be mounted close together with interference prevention filters. (Sensing range: 5 m 16.404 ft)</td>
<td>————</td>
</tr>
<tr>
<td>Short-circuit protection</td>
<td>————</td>
<td>————</td>
</tr>
<tr>
<td>Response time</td>
<td>1 ms or less</td>
<td>————</td>
</tr>
<tr>
<td>Operation indicator</td>
<td>Orange LED (lights up when the output is ON)(incorporated on the receiver for thru-beam type)</td>
<td>————</td>
</tr>
<tr>
<td>Stability indicator</td>
<td>Green LED (lights up under stable light received condition or stable dark condition)(incorporated on the receiver for thru-beam type)</td>
<td>————</td>
</tr>
<tr>
<td>Operation indicator</td>
<td>Green LED (lights up when the power is ON)(incorporated on the emitter)</td>
<td>————</td>
</tr>
</tbody>
</table>

### Environmental resistance

<table>
<thead>
<tr>
<th>Item</th>
<th>Thru-beam</th>
<th>Retrospective</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Light-ON</td>
<td>Dark-ON</td>
</tr>
<tr>
<td>Protection</td>
<td>IP67 (IEC)</td>
<td>————</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>
<td>————</td>
</tr>
<tr>
<td>Ambient humidity</td>
<td>35 to 85 % RH, Storage: 35 to 85 % RH</td>
<td>————</td>
</tr>
<tr>
<td>Ambient illuminance</td>
<td>Incondescent light: 3,000 lx at the light-receiving face</td>
<td>————</td>
</tr>
<tr>
<td>Voltage withstandability</td>
<td>2000 V AC for one min. between all supply terminals connected together and enclosure</td>
<td>————</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>20 MG, or more, with 250 V DC megger between all supply terminals connected together and enclosure</td>
<td>————</td>
</tr>
<tr>
<td>Vibration resistance</td>
<td>10 to 500 Hz frequency, 1.5 mm 0.059 in in double amplitude (10 G max.) in X, Y and Z directions for two hours each</td>
<td>————</td>
</tr>
<tr>
<td>Shock resistance</td>
<td>500 m/s² or more (50 G approx.) in X, Y and Z directions for three times each</td>
<td>————</td>
</tr>
<tr>
<td>Emitting element</td>
<td>Red LED</td>
<td>Infrared LED</td>
</tr>
<tr>
<td>Peak emission wavelength</td>
<td>680 nm 0.027 mil</td>
<td>870 nm 0.034 mil</td>
</tr>
<tr>
<td>Material</td>
<td>Enclosure: PBT (Polybutylene terephthalate), Lens: Acrylic, Indicator cover: Acrylic</td>
<td>————</td>
</tr>
<tr>
<td>Cable</td>
<td>0.2 mm² 3-core (thru-beam type emitter: 2-core) cable, 0.5 mm 1.640 ft long</td>
<td>————</td>
</tr>
<tr>
<td>Cable extension</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>
</tr>
<tr>
<td>Weight</td>
<td>Net</td>
<td>Emitter: 20 g approx., Receiver: 20 g approx.</td>
</tr>
<tr>
<td></td>
<td>Gross</td>
<td>50 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 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 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 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

Wiring 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-44c-P adjustable range reflective type. When using the CX-44c-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-44c-P, its color is white.

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

Connecter pin position

M8 plug-in connector type

M12 pigtailed type

PNP output type

I/O circuit diagram

Wiring 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-44c-P adjustable range reflective type. When using the CX-44c-P, be sure to wire the sensing mode selection input (pink / 2). Unstable operation may occur.
3) When the mating cable is connected to the plug-in connector type of CX-44c-P, its color is white.

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

Connecter pin position

M8 plug-in connector type

M12 pigtailed type

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

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-44c-P adjustable range reflective type. When using the CX-44c-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-44c-P, its color is white.

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

Connecter pin position

M8 plug-in connector type

M12 pigtailed type

Symbols:
D: Reverse supply polarity protection diode
ZD: Surge absorption zener diode
Tr: PNP output transistor
**SENSING CHARACTERISTICS (TYPICAL)**

Please contact our office for the sensing characteristics of CX-413 and CX-483.

### CX-411B

#### Thru-beam type

- **Parallel deviation**
- **Angular deviation**
- **Parallel deviation with round slit masks (ø0.5 mm ø0.020 in)**
- **Parallel deviation with round slit masks (ø1 mm ø0.039 in)**

#### Setting distance L (mm ft)

- 0.787 1.575 0.787 1.575
- 3.937 3.937 7.874 7.874
- 15.748 15.748 31.496 31.496

### CX-412B

#### Thru-beam type

- **Parallel deviation**
- **Angular deviation**
- **Parallel deviation with round slit masks (ø0.5 mm ø0.020 in)**
- **Parallel deviation with round slit masks (ø1 mm ø0.039 in)**

#### Setting distance L (mm ft)

- 0.787 1.575 0.787 1.575
- 3.937 3.937 7.874 7.874
- 15.748 15.748 31.496 31.496

---

**CX-400 SERIES Ver.2**

- **Thru-beam type**
- **Parallel deviation**
- **Angular deviation**
- **Parallel deviation with round slit masks (ø0.5 mm ø0.020 in)**
- **Parallel deviation with round slit masks (ø1 mm ø0.039 in)**

#### Setting distance L (mm ft)

- 15.748 15.748 15.748 15.748
- 3.937 3.937 3.937 3.937
- 7.874 7.874 7.874 7.874
- 15.748 15.748 15.748 15.748
SENSING CHARACTERISTICS (TYPICAL)

Please contact our office for the sensing characteristics of CX-413 and CX-483.

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.
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.

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.)

Emitting beam

Visible range

ø5 mm ø0.197 in
ø2.2 mm ø0.087 in
ø4 mm ø0.157 in
### Sensing Characteristics (Typical)

**CX-441**

<table>
<thead>
<tr>
<th>Sensing fields</th>
<th>Adjustable range reflective type</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Setting distance: 25 mm 0.984 in</td>
<td></td>
</tr>
<tr>
<td>• Setting distance: 50 mm 1.969 in</td>
<td></td>
</tr>
</tbody>
</table>

**Emitted beam**

- α2 mm | 0.079 in
- α3 mm | 0.118 in

**Correlation between color**

(50 × 50 mm 1.969 × 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, respectively, with white color.
- The sensing range also varies depending on material.

**CX-443**

<table>
<thead>
<tr>
<th>Sensing fields</th>
<th>Adjustable range reflective type</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Setting distance: 25 mm 0.984 in</td>
<td></td>
</tr>
<tr>
<td>• Setting distance: 50 mm 1.969 in</td>
<td></td>
</tr>
</tbody>
</table>

**Emitted beam**

- α6.5 mm | 0.260 in
- α6.2 mm | 0.254 in
- α5.9 mm | 0.232 in
- α5.3 mm | 0.209 in

**Correlation between material**

(50 × 50 mm 1.969 × 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, respectively, with white non-glossy paper.
**SENSING CHARACTERISTICS (TYPICAL)**

### CX-444

**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**

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 and 50 mm 1.969 in long, respectively, with white color. The sensing range also varies depending on material.

**Correlation between material**

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 and 50 mm 1.969 in long, respectively, with white non-glossy paper.

### CX-442

**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**

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**

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.
PRECAUTIONS FOR PROPER USE

All models

- 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.

Others

- Do not use during the initial transient time (50 ms) after the power supply is switched on.

CX-41 □  CX-42 □  CX-49 □  CX-48 □

Part description and functions

Stability indicator (Green) (Note 1)
Lights up under the stable light condition or the stable dark condition
Sensitivity adjuster (Note 1)
Sensing range becomes longer when turned.

Notes: 1) Not incorporated on the emitter.
2) It is the power indicator (green, lights up when the power is ON.) on the emitter.

Operation mode switch

<table>
<thead>
<tr>
<th>Operation mode switch</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Light-ON mode is obtained when the operation mode switch (thru-beam type incorporate it in the receiver) is turned fully clockwise (L side).</td>
</tr>
<tr>
<td></td>
<td>Dark-ON mode is obtained when the operation mode switch (thru-beam type incorporate it in the receiver) is turned fully counter-clockwise (D side).</td>
</tr>
</tbody>
</table>

Beam alignment

Thru-beam type

1. Set the operation mode switch to the Light-ON mode position (L side).
2. Place 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.
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

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

Sensitivity Adjustment

<table>
<thead>
<tr>
<th>Step</th>
<th>Sensitivity adjuster</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>①</td>
<td></td>
<td>Turn the sensitivity adjuster fully counterclockwise to the minimum sensitivity position, MIN.</td>
</tr>
<tr>
<td>②</td>
<td></td>
<td>In the light received condition, turn the sensitivity adjuster slowly clockwise and confirm the position Q where the sensor enters the “Light” state operation.</td>
</tr>
<tr>
<td>③</td>
<td></td>
<td>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 R where the sensor just returns to the “Dark” state operation.</td>
</tr>
<tr>
<td>④</td>
<td></td>
<td>The position at the middle of points Q and R is the optimum sensing position.</td>
</tr>
</tbody>
</table>

Note: Use the flathead screwdriver (purchase separately) to turn the adjuster slowly. Turning with excessive strength will cause damage to the adjuster.

<table>
<thead>
<tr>
<th>Light condition</th>
<th>Dark condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thru-beam type</td>
<td></td>
</tr>
<tr>
<td>Emitter</td>
<td>Receiver</td>
</tr>
<tr>
<td>Receiver</td>
<td>Emitter</td>
</tr>
<tr>
<td>Sensing object</td>
<td>Sensing object</td>
</tr>
</tbody>
</table>

Retreriorreflective type sensor (excluding CX-491-□)

- Please take care of the following points when detecting materials having a gloss.

① Make L, shown in the diagram, sufficiently long.
② Install at an angle of 10 to 30 degrees to the sensing object.

Retrteriorreflective 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 retractorreflective 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.

Retrteriorreflective 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.

Relation between output and indicators

<table>
<thead>
<tr>
<th>In case of Light-ON</th>
<th>Sensing condition</th>
<th>Output</th>
<th>Operation indicator</th>
<th>Stability indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stability indicator</td>
<td>Operation indicator</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ON</td>
<td>Stable light receiving</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unstable light receiving</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OFF</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>In case of Dark-ON</th>
<th>Output</th>
<th>Operation indicator</th>
<th>Stability indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stable dark receiving</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stable dark receiving</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Correct

Incorrect
### 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**
1. Insert the fixing hook into the fixing groove.
2. Then, pressing the slit mask against the main unit, insert the fixing tab into the fixing groove.

**How to remove**
1. Insert a screwdriver into the removing tab.
2. Pull forward while lifting the removing tab.

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

**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.

**Operation mode switch**

<table>
<thead>
<tr>
<th>Operation mode switch</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>L-ON</td>
<td>Detecting-ON mode is obtained when the operation mode switch is turned fully clockwise (L side).</td>
</tr>
<tr>
<td>D-ON</td>
<td>Not detecting-ON is obtained when the operation mode switch is turned fully counterclockwise (D side).</td>
</tr>
</tbody>
</table>

**Note:** Use the flathead screwdriver (purchase separately) to turn the operation mode switch 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.

**BGS**

<table>
<thead>
<tr>
<th>Setting distance</th>
<th>Non-detectable area</th>
</tr>
</thead>
<tbody>
<tr>
<td>L-ON</td>
<td>ON</td>
</tr>
<tr>
<td>D-ON</td>
<td>OFF</td>
</tr>
</tbody>
</table>

**FGS**

<table>
<thead>
<tr>
<th>Setting distance</th>
<th>Non-detectable area</th>
</tr>
</thead>
<tbody>
<tr>
<td>L-ON</td>
<td>OFF</td>
</tr>
<tr>
<td>D-ON</td>
<td>ON</td>
</tr>
</tbody>
</table>
### PRECAUTIONS FOR PROPER USE

#### CX-44□

**Stability indicator**
- Since the CX-44□ use 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.
- Further, the stability indicator (green) shows the margin to 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.
- Please use the FGS function together with a conveyor or other background unit.

#### 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 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 (purchase 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.

#### When using the BGS function

**<When a sensing object is moving right or left to the sensor>**

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
<th>Distance adjuster</th>
</tr>
</thead>
<tbody>
<tr>
<td>①</td>
<td>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.)</td>
<td>≈Far</td>
</tr>
<tr>
<td>②</td>
<td>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.</td>
<td>A</td>
</tr>
<tr>
<td>③</td>
<td>Remove the object, turn the adjuster clockwise further until the sensor goes into the 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 C. 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 D.</td>
<td>←Far</td>
</tr>
<tr>
<td>④</td>
<td>The optimum position to stably detect objects is the center point between A and B.</td>
<td>D</td>
</tr>
</tbody>
</table>

**<When a sensing object is approaching / moving away from the sensor>**
- Follow only steps ① and ④. Since the sensing point may change depending on the sensing object, be sure to check the operation with the actual sensing object.

#### When using the FGS function

**<When a sensing object is approaching / moving away from the sensor>**

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
<th>Distance adjuster</th>
</tr>
</thead>
<tbody>
<tr>
<td>①</td>
<td>Turn the distance adjuster fully clockwise to the maximum sensing range position. (CX-441□:443□:444□: 50 mm 1.969 in approx., CX-444□: 100 mm 3.937 in approx., CX-442□: 300 mm 11.811 in approx.)</td>
<td>≈Near</td>
</tr>
<tr>
<td>②</td>
<td>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.</td>
<td>A</td>
</tr>
<tr>
<td>③</td>
<td>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 C.</td>
<td>←Near</td>
</tr>
<tr>
<td>④</td>
<td>The optimum position to stably detect objects is the center point between A and B.</td>
<td>B</td>
</tr>
</tbody>
</table>

**Others**
- Its distance adjuster is mechanically operated. Do not drop; avoid other shocks.
The CAD data in the dimensions can be downloaded from our website.

Notes:
1) Not incorporated on the emitter and the basic type sensor.
2) It is the power indicator (green) on the emitter.
3) Not incorporated on the emitter.
4) Basic type: 0.5 m 1.64 ft long

Notes:
1) Not incorporated on the emitter.
2) It is the power indicator (green) on the emitter.
### DIMENSIONS (Unit: mm in)

**CX-44A**

**Sensor**

- Operation indicator (Orange)
- Distance adjuster (5-turn)
- Stability indicator (Green)
- Operation mode switch
- Beam-receiving part
- Beam-emitting part
- Center of sensing
- Material: Acrylic (Reflector) ABS (Base)
- Two M3 (length 8 mm 0.315 in) screws with washers and two nuts are attached.

**CX-44A-Z**

**Sensor**

- Operation indicator (Orange)
- Distance adjuster (5-turn)
- Stability indicator (Green)
- Operation mode switch
- Beam-receiving part
- Beam-emitting part
- Center of sensing
- Material: Acrylic (Reflector) ABS (Base)
- Two M3 (length 8 mm 0.315 in) screws with washers and two nuts are attached.

Note: It is not attached with the basic type sensor.

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

**RF-220** Reflecter (Optional)

**RF-210** Reflecter (Optional)

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

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

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

Material: Acrylic

Rear surface pressure-sensitive adhesive

Material: Acrylic

Effective reflecting surface

Adhesive tape

Material: Acrylic

Effective reflecting surface

Adhesive tape

Material: Acrylic

Note: It is not attached with the basic type sensor.
### DIMENSIONS (Unit: mm in)

The CAD data in the dimensions can be downloaded from our website.

#### MS-CX2-5

**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.

#### MS-CX-3

**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.

#### MS-RF21-1

**Assembly dimensions**

Material: Stainless steel (SUS304)

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

**MS-RF22**

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**

Assembly dimensions

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

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

The CAD data in the dimensions can be downloaded from our website.