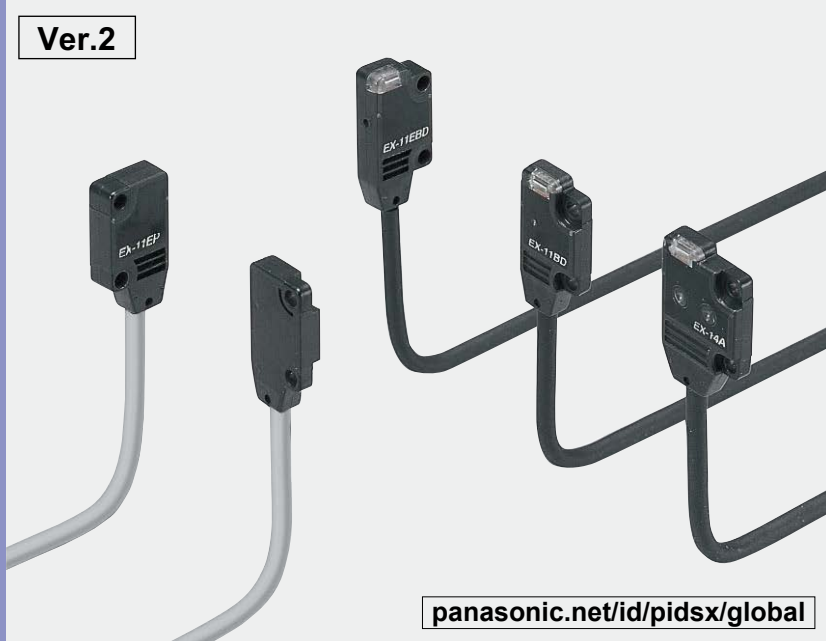


# EX-10 SERIES Ver.2

Related Information ■ General terms and conditions..... F-3 ■ Selection guide ..... P.231~  
 ■ Glossary of terms / General precautions ..... P.1549~ / P.1552~ ■ Korea's S-mark..... P.1602

- FIBER SENSORS
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- UV CURING SYSTEMS



Ver.2

[panasonic.net/id/pidsx/global](http://panasonic.net/id/pidsx/global)



## Amplifier built-in extraordinarily small and slim size

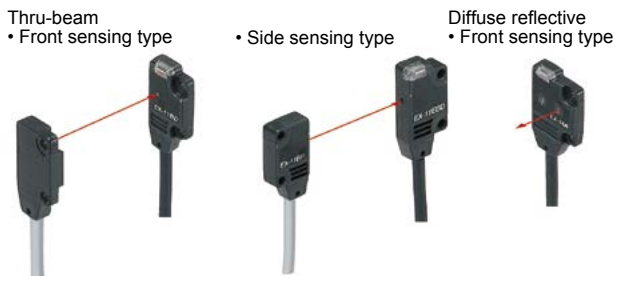
### Smallest body, just 3.5 mm 0.138 in thick

It can be mounted in a very small space as its size is just W10 × H14.5 × D3.5 mm  
 W0.394 × H0.571 × D0.138 in (thru-beam, front sensing type).



### Flexible mounting

The diffuse reflective type sensor is front sensing and is so thin that it gives an impression of being just pasted on the mounting base. The thru-beam type is available as front sensing type, as well as, side sensing type, allowing flexible mounting.



### A wide variety of narrow-beam type! Light diffusion is approx. 1/2 of standard type. EX-□S□

**Less interference with no slit, narrow-pitch can be set.**

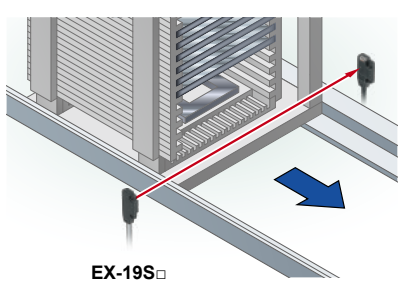
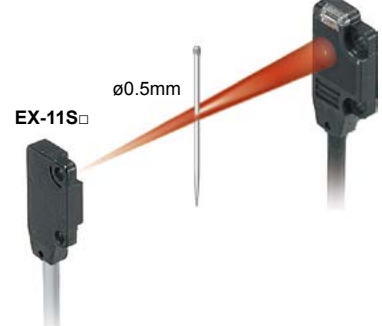
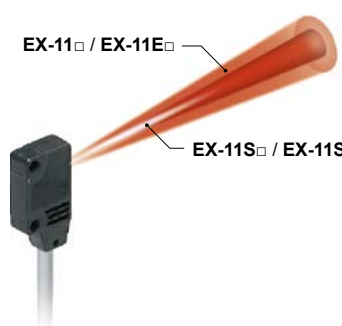
The pitch of installation is 1/2 of conventional models, so that the close-installation is possible. No cost is necessary to purchase or install a slit.

**Possible to sense a minute object less than ø0.5 mm ø0.039 in with no slit.**

The series is applicable to sense a minute object without any cost.

**Long sensing range of 1 m 3.281 ft with narrow beam**

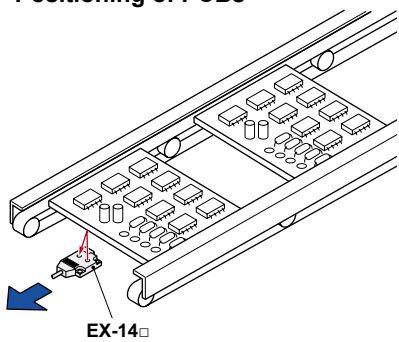
A long 1 m 3.281 ft sensing range is possible with narrow beam.



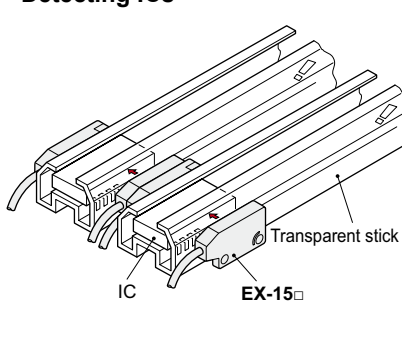
- Selection Guide
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- Power Supply Built-in
- Amplifier-separated
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- CX-400
- CY-100
- EX-10
- EX-20
- EX-30
- EX-40
- CX-440
- EQ-30
- EQ-500
- MQ-W
- RX-LS200
- RX
- RT-610

**APPLICATIONS**

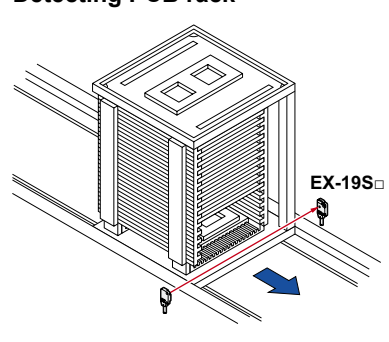
**Positioning of PCBs**



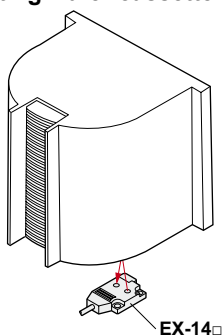
**Detecting ICs**



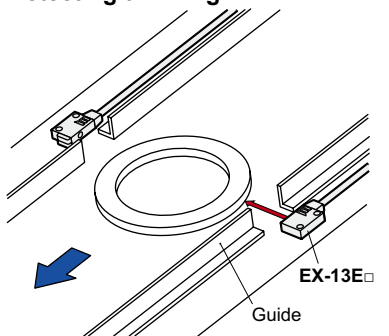
**Detecting PCB rack**



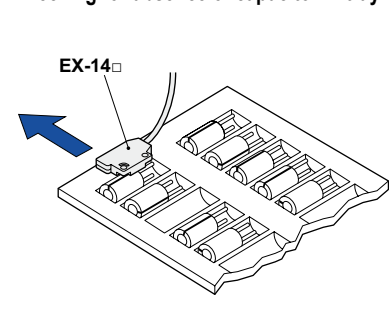
**Detecting wafer cassette**



**Detecting thin ring**



**Checking for absence of capacitor in tray**

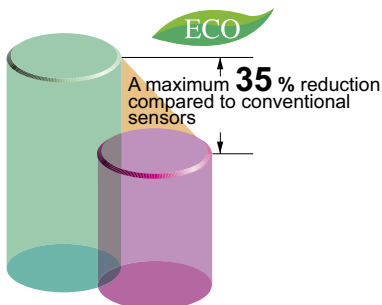


**BASIC PERFORMANCE**

**Electric power saving \***

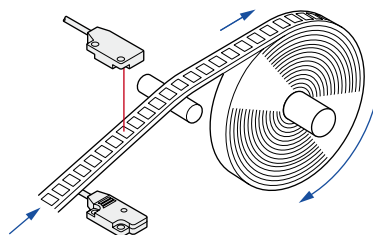
The EX-10 series achieves reductions in power consumption of up to 65%. These sensors contribute to environmental friendliness.

\* Effective from production in October 2010.



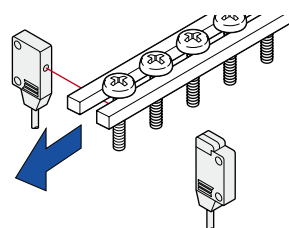
**High-speed response time: 0.5 ms**

The sensor is suitable for detecting small and high-speed traveling objects.



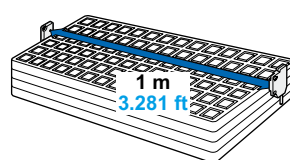
**Minimum sensing object:  $\phi 1$  mm  $\phi 0.039$  in EX-11(E), EX-15(E)**

EX-11, EX-11E, EX-15 and EX-15E are incorporated with  $\phi 1$  mm  $\phi 0.039$  in slit masks so that  $\phi 1$  mm  $\phi 0.039$  in, or more, object can be detected. Hence, they are suitable for precise positioning or small parts detection.



**Long sensing range: 1 m 3.281 ft EX-19(E)**

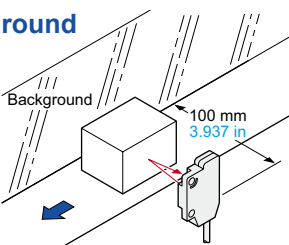
A sensing range of 1 m 3.281 ft has been realized with a slim size of just 3.5 mm 0.138 in. It can be used to detect even wide IC trays.



**Background suppression**

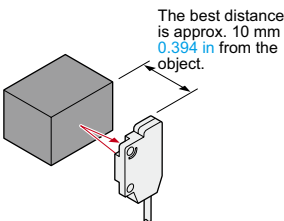
**Hardly affected by background**

Even a specular background separated by 100 mm 3.937 in, or more, is not detected. (However, the background should be directly opposite. A spherical or curved background may be detected.)



**Black object reliably detected**

It can reliably detect dark color objects since it is convergent reflective type.



The best distance is approx. 10 mm 0.394 in from the object.

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Amplifier-separated

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CY-100

EX-10

EX-20

EX-30

EX-40

CX-440

EQ-30

EQ-500

MQ-W

RX-LS200

RX

RT-610

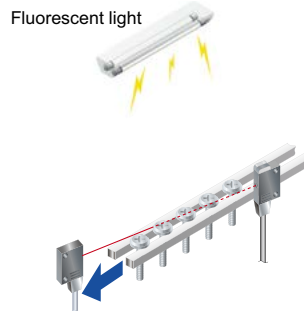
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**ENVIRONMENTAL RESISTANCE**

**Incorporated an inverter countermeasure circuit \***

The **EX-10** series become significantly stronger against inverter light and other extraneous light.

\* Effective from production in October 2010.



**Waterproof IP67**

The sensors features an IP67 rating to allow their use in process lines where water is used or splashed. Rust-resistant stainless steel sensor mounting brackets are available.

Note: If water splashes on the sensor during sensing operation, it may sense water as an object.

**Bending durability**

**EX-□-R**

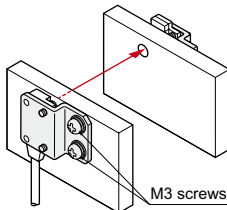
Bending-resistant cable type **EX-□-R** is available. It is most suitable for moving parts, such as robot arm, etc.

**MOUNTING / SIZE**

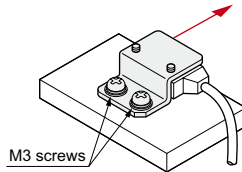
**Mountable with M3 screws**

Non-corrosive stainless steel type sensor mounting bracket is also available.

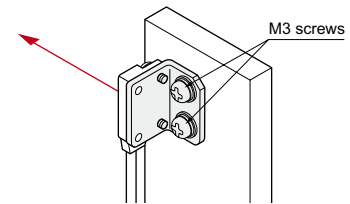
- **MS-EX10-1**  
[Cold rolled carbon steel (SPCC)]
- **MS-EX10-11**  
[Stainless steel (SUS304)]  
(mounting bracket for the front sensing type)



- **MS-EX10-2**  
[Cold rolled carbon steel (SPCC)]
- **MS-EX10-12**  
[Stainless steel (SUS304)]  
(mounting bracket for the side sensing type)



- **MS-EX10-3**  
[Cold rolled carbon steel (SPCC)]
- **MS-EX10-13**  
[Stainless steel (SUS304)]  
(L-shaped mounting bracket)



Note: Sensor mounting brackets can not be used for the narrow beam type (EX-□S□).

**Red beam makes beam alignment easy**

The red LED beam projected from the emitter helps you to align the sensor heads.

**FUNCTIONS**

**Bright 2-color indicator**

A convenient 2-color indicator has been incorporated in the miniature body.

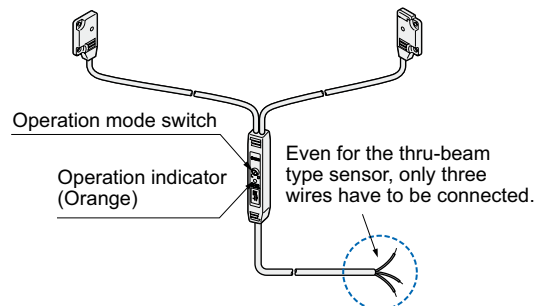


**VARIETIES**

**Operation mode switch**

**EX-15□/17□**

Thru-beam type sensor incorporated with an operation mode switch on the bifurcation is also available. It helps you to test the operability before start-up.



**OTHERS**

**Less resources used \***

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

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

\* Effective from production in October 2010.



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- RX
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**ORDER GUIDE**

| Type             | Appearance  | Sensing range    | Model No.(Note 2)   |             | Output operation                      | Output   |          |
|------------------|---|------------------|---|-------------|---------------------------------------|--|----------|
|                  |   |                  | NPN output  | PNP output  |                                       |  |          |
| Standard type    | Thru-beam<br>Front sensing<br><small>With operation mode switch on the bifurcation.</small> | 150 mm 5.906 in  | EX-11A  | EX-11A-PN   | Light-ON                              | NPN open-collector transistor or PNP open-collector transistor |          |
|                  |   | 500 mm 19.685 in | EX-11B  | EX-11B-PN   | Dark-ON                               |  |          |
|                  |   | 500 mm 19.685 in | EX-13A  | EX-13A-PN   | Light-ON                              |  |          |
|                  |   | 500 mm 19.685 in | EX-13B  | EX-13B-PN   | Dark-ON                               |  |          |
|                  |   | 1 m 3.281 ft     | EX-19A  | EX-19A-PN   | Light-ON                              |  |          |
|                  |   | 1 m 3.281 ft     | EX-19B  | EX-19B-PN   | Dark-ON                               |  |          |
|                  | Thru-beam<br>Side sensing<br><small>With operation mode switch on the bifurcation.</small>  | 150 mm 5.906 in  | EX-15   | EX-15-PN    | Switchable either Light-ON or Dark-ON |  |          |
|                  |   | 500 mm 19.685 in | EX-17   | EX-17-PN    | Switchable either Light-ON or Dark-ON |  |          |
|                  |   | 150 mm 5.906 in  | EX-11EA   | EX-11EA-PN  | Light-ON                              |  |          |
|                  |   | 150 mm 5.906 in  | EX-11EB   | EX-11EB-PN  | Dark-ON                               |  |          |
|                  |   | 500 mm 19.685 in | EX-13EA   | EX-13EA-PN  | Light-ON                              |  |          |
|                  |   | 500 mm 19.685 in | EX-13EB   | EX-13EB-PN  | Dark-ON                               |  |          |
|                  | Convergent reflective (Diffused beam type)<br>Front sensing                                 |                  | 2 to 25 mm 0.079 to 0.984 in (Note 1)<br>(Convergent point: 10 mm 0.394 in) | EX-14A      | EX-14A-PN                             |  | Light-ON |
|                  |   |                  |   | EX-14B      | EX-14B-PN                             |  | Dark-ON  |
| EX-15E           |   |                  |   | —           | Switchable either Light-ON or Dark-ON |  |          |
| EX-17E           |   |                  |   | —           | Switchable either Light-ON or Dark-ON |  |          |
| Narrow beam type | Thru-beam<br>Front sensing  | 150 mm 5.906 in  | EX-11SA   | EX-11SA-PN  | Light-ON                              | NPN open-collector transistor or PNP open-collector transistor |          |
|                  |   | 500 mm 19.685 in | EX-11SB   | EX-11SB-PN  | Dark-ON                               |  |          |
|                  |   | 500 mm 19.685 in | EX-13SA   | EX-13SA-PN  | Light-ON                              |  |          |
|                  |   | 500 mm 19.685 in | EX-13SB   | EX-13SB-PN  | Dark-ON                               |  |          |
|                  |   | 1 m 3.281 ft     | EX-19SA   | EX-19SA-PN  | Light-ON                              |  |          |
|                  | 1 m 3.281 ft  | EX-19SB          | EX-19SB-PN  | Dark-ON     |                                       |  |          |
|                  | Thru-beam<br>Side sensing   | 150 mm 5.906 in  | EX-11SEA  | EX-11SEA-PN | Light-ON                              |  |          |
|                  |   | 150 mm 5.906 in  | EX-11SEB  | EX-11SEB-PN | Dark-ON                               |  |          |
|                  |   | 500 mm 19.685 in | EX-13SEA  | EX-13SEA-PN | Light-ON                              |  |          |
|                  |   | 500 mm 19.685 in | EX-13SEB  | EX-13SEB-PN | Dark-ON                               |  |          |
| 500 mm 19.685 in |   | EX-13SEB         | EX-13SEB-PN   | Dark-ON     |                                       |  |          |

**NOTE:** Mounting bracket is not supplied with the sensor. Please select from the range of optional sensor mounting brackets (**MS-EX10-□**). Sensor mounting brackets (**MS-EX10-□**) can not be used for the narrow beam type (**EX-□S□**).

Notes: 1) The sensor does not detect even a specular background if it is separated by 100 mm 3.937 in or more. (However, the background should be directly opposite. A spherical or curved background may be detected.)

2) The model No. with "P" shown on the label affixed to the thru-beam type sensor is the emitter, "D" shown on the label is the receiver.

**Bending-resistant cable type**

Bending-resistant cable type is also available for NPN output type. (excluding narrow beam type **EX-□S□** and sensor with operation mode switch on the bifurcation **EX-15□/17□**)

When ordering this type, suffix "-R" to the model No.

(e.g.) Bending-resistant cable type of **EX-11A** is "**EX-11A-R**".

**5 m 16.404 ft cable length type**

5 m 16.404 ft cable length type (standard: 2 m 6.562 ft) is also available for NPN output type. (excluding narrow beam type **EX-□S□** and bending-resistant cable type)

When ordering this type, suffix "-C5" to the model No.

(e.g.) 5 m 16.404 ft cable length type of **EX-11A** is "**EX-11A-C5**".

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EX-30

EX-40

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EQ-30

EQ-500

MQ-W

RX-LS200

RX

RT-610

**OPTIONS**

NOTE: Sensor mounting brackets can not be used for the narrow beam type (EX-□S□).

| Designation                      | Model No.   | Description   |
|----------------------------------|---|---|
| Sensor mounting bracket (Note 1) | <b>MS-EX10-1</b>  | Mounting bracket for the front sensing type sensor [Cold rolled carbon steel (SPCC)] (The thru-beam type sensor needs two brackets.)  |
|                                  | <b>MS-EX10-2</b>  | Mounting bracket for the side sensing type sensor [Cold rolled carbon steel (SPCC)] (The thru-beam type sensor needs two brackets.)   |
|                                  | <b>MS-EX10-3</b>  | L-shaped mounting bracket sensor [Cold rolled carbon steel (SPCC)] (The thru-beam type sensor needs two brackets.)  |
|                                  | <b>MS-EX10-11</b>   | Mounting bracket for the front sensing type sensor [Stainless steel (SUS304)] (The thru-beam type sensor needs two brackets.)   |
|                                  | <b>MS-EX10-12</b>   | Mounting bracket for the side sensing type sensor [Stainless steel (SUS304)] (The thru-beam type sensor needs two brackets.)  |
|                                  | <b>MS-EX10-13</b>   | L-shaped mounting bracket [Stainless steel (SUS304)] (The thru-beam type sensor needs two brackets.)  |
| Slit mask                        | <b>OS-EX10-12</b><br>(Slit size $\phi 1.2$ mm $\phi 0.047$ in)  | Slit on one side <ul style="list-style-type: none"> <li>Sensing range: 600 mm <b>23.622 in</b> [EX-19□]</li> <li>250 mm <b>9.843 in</b> [EX-13□, EX-17□]</li> <li>Min. sensing object: <math>\phi 2</math> mm <math>\phi 0.079</math> in</li> </ul>             |
|                                  |   | Slit on both sides <ul style="list-style-type: none"> <li>Sensing range: 400 mm <b>15.748 in</b> [EX-19□]</li> <li>200 mm <b>7.874 in</b> [EX-13□, EX-17□]</li> <li>Min. sensing object: <math>\phi 1.2</math> mm <math>\phi 0.047</math> in</li> </ul>         |
|                                  | <b>OS-EX10-15</b><br>(Slit size $\phi 1.5$ mm $\phi 0.059$ in)  | Slit on one side <ul style="list-style-type: none"> <li>Sensing range: 800 mm <b>31.496 in</b> [EX-19□]</li> <li>350 mm <b>13.780 in</b> [EX-13□]</li> <li>Min. sensing object: <math>\phi 2</math> mm <math>\phi 0.079</math> in</li> </ul>                    |
|                                  |   | Slit on both sides <ul style="list-style-type: none"> <li>Sensing range: 500 mm <b>19.685 in</b> [EX-19□]</li> <li>300 mm <b>11.811 in</b> [EX-13□]</li> <li>Min. sensing object: <math>\phi 1.5</math> mm <math>\phi 0.059</math> in</li> </ul>                |
|                                  | <b>OS-EX10E-12</b><br>(Slit size $\phi 1.2$ mm $\phi 0.047$ in) | Slit on one side <ul style="list-style-type: none"> <li>Sensing range: 400 mm <b>15.748 in</b> [EX-19E□] (Note 3)</li> <li>250 mm <b>9.843 in</b> [EX-13E□, EX-17E□]</li> <li>Min. sensing object: <math>\phi 2</math> mm <math>\phi 0.079</math> in</li> </ul> |
|                                  |   | Slit on both sides <ul style="list-style-type: none"> <li>Sensing range: 200 mm <b>7.874 in</b> [EX-13E□, EX-17E□]</li> <li>Min. sensing object: <math>\phi 1.2</math> mm <math>\phi 0.047</math> in</li> </ul>   |
| Sensor checker (Note 2)          | <b>CHX-SC2</b>  | It is useful for beam alignment of thru-beam type sensors. The optimum receiver position is given by indicators, as well as an audio signal.  |
| Mounting screw                   | <b>MS-M2</b>  | Mounting screws with washers (50 pcs. lot). It can mount securely as it is spring washer attached.  |

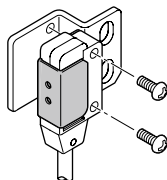
- Notes: 1) Can not be used for the narrow beam type (EX-□S□).  
 2) Refer to p.959~ for the sensor checker **CHX-SC2**.  
 3) Since **EX-19E□** has a built-in  $\phi 1$  mm  $\phi 0.039$  in slit in the emitter, be sure to mount it in the receiver.

**Slit mask**

- OS-EX10-12
- OS-EX10-15
- OS-EX10E-12



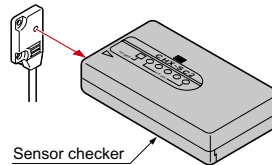
Example of mounting (OS-EX10E-12)



Tighten along with the sensor mounting bracket.

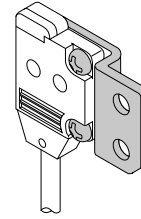
**Sensor checker**

- CHX-SC2



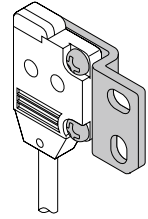
**Sensor mounting bracket**

- MS-EX10-1



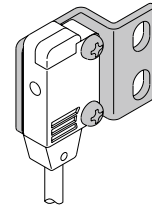
Material: Cold rolled carbon steel (SPCC) (Uni-chrome plated)  
 Two M2 (length 4 mm **0.157 in**) pan head screws are attached.

- MS-EX10-11



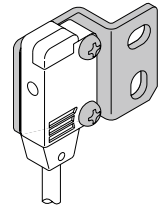
Material: Stainless steel (SUS304)  
 Two M2 (length 4 mm **0.157 in**) pan head screws [stainless steel (SUS304)] are attached.

- MS-EX10-2



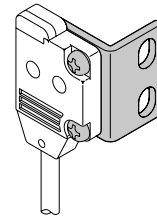
Material: Cold rolled carbon steel (SPCC) (Uni-chrome plated)  
 Two M2 (length 8 mm **0.315 in**) pan head screws are attached.

- MS-EX10-12



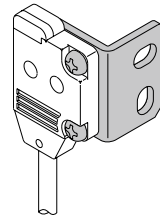
Material: Stainless steel (SUS304)  
 Two M2 (length 8 mm **0.315 in**) pan head screws [stainless steel (SUS304)] are attached.

- MS-EX10-3



Material: Cold rolled carbon steel (SPCC) (Uni-chrome plated)  
 Two M2 (length 4 mm **0.157 in**) pan head screws, and two M2 (length 8 mm **0.315 in**) pan head screws are attached.

- MS-EX10-13



Material: Stainless steel (SUS304)  
 Two M2 (length 4 mm **0.157 in**) pan head screws [stainless steel (SUS304)] and two M2 (length 8 mm **0.315 in**) pan head screws [stainless steel (SUS304)] are attached.

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- LASER SENSORS
- PHOTO-ELECTRIC SENSORS
- MICRO PHOTO-ELECTRIC SENSORS
- AREA SENSORS
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- PRESSURE / FLOW SENSORS
- INDUCTIVE PROXIMITY SENSORS
- PARTICULAR USE SENSORS
- SENSOR OPTIONS
- WIRE-SAVING UNITS
- WIRE-SAVING SYSTEMS
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- LASER MARKERS
- PLC
- HUMAN MACHINE INTERFACES
- ENERGY MANAGEMENT SOLUTIONS
- FA COMPONENTS
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- UV CURING SYSTEMS
- Selection Guide
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- Amplifier-separated
- EX-Z
- CX-400
- CY-100
- EX-10
- EX-20
- EX-30
- EX-40
- CX-440
- EQ-30
- EQ-500
- MQ-W
- RX-LS200
- RX
- RT-610



## SPECIFICATIONS

| Item  | Type                  |          | Thru-beam · standard type   |              |  |  |  |              |  |  |
|---|-----------------------|----------|---|--------------|--|--|--|--------------|--|--|
|   | Model No.<br>(Note 2) | Light-ON | EX-11A(-PN)   | EX-11EA(-PN) | EX-13A(-PN)  | EX-13EA(-PN)   | EX-19A(-PN)  | EX-19EA(-PN) |  |  |
|   |                       | Dark-ON  | EX-11B(-PN)   | EX-11EB(-PN) | EX-13B(-PN)  | EX-13EB(-PN)   | EX-19B(-PN)  | EX-19EB(-PN) |  |  |
| CE marking directive compliance               |                       |          | EMC Directive, RoHS Directive   |              |  |  |  |              |  |  |
| Sensing range                                 |                       |          | 150 mm <b>5.906 in</b>  |              | 500 mm <b>19.685 in</b>  |  | 1 m <b>3.281 ft</b>  |              |  |  |
| Min. sensing object                           |                       |          | $\varnothing 1$ mm <b><math>\varnothing 0.039</math> in</b> opaque object<br>(Completely beam interrupted object)<br>(Setting distance between emitter and receiver: 150 mm <b>5.906 in</b> )   |              | $\varnothing 2$ mm <b><math>\varnothing 0.079</math> in</b> opaque object<br>(Completely beam interrupted object)<br>(Setting distance between emitter and receiver: 500 mm <b>19.685 in</b> ) |  | $\varnothing 2$ mm <b><math>\varnothing 0.079</math> in</b> opaque object<br>(Completely beam interrupted object)<br>(Setting distance between emitter and receiver: 1 m <b>3.281 ft</b> ) |              |  |  |
| Hysteresis                                    |                       |          | —   |              |  |  |  |              |  |  |
| Repeatability (perpendicular to sensing axis) |                       |          | 0.05 mm <b>0.002 in</b> or less   |              |  |  |  |              |  |  |
| Supply voltage                                |                       |          | 12 to 24 V DC $\pm 10\%$ Ripple P-P 10 % or less  |              |  |  |  |              |  |  |
| Current consumption                           |                       |          | Emitter: 10 mA or less, Receiver: 10 mA or less   |              |  |  |  |              |  |  |
| Output  |                       |          | <NPN output type><br>NPN open-collector transistor <ul style="list-style-type: none"> <li>• Maximum sink current: 50 mA</li> <li>• Applied voltage: 30 V DC or less (between output and 0 V)</li> <li>• Residual voltage: 2 V or less (at 50 mA sink current)</li> <li>• 1 V or less (at 16 mA sink current)</li> </ul> |              |  | <PNP output type><br>PNP open-collector transistor <ul style="list-style-type: none"> <li>• Maximum source current: 50 mA</li> <li>• Applied voltage: 30 V DC or less (between output and +V)</li> <li>• Residual voltage: 2 V or less (at 50 mA source current)</li> <li>• 1 V or less (at 16 mA source current)</li> </ul> |  |              |  |  |
| Utilization category                          |                       |          | DC-12 or DC-13  |              |  |  |  |              |  |  |
| Short-circuit protection                      |                       |          | Incorporated  |              |  |  |  |              |  |  |
| Response time                                 |                       |          | 0.5 ms or less  |              |  |  |  |              |  |  |
| Operation indicator                           |                       |          | Orange LED (lights up when the output is ON)  |              |  |  |  |              |  |  |
| Incident beam indicator                       |                       |          | —   |              |  |  |  |              |  |  |
| Stability indicator                           |                       |          | Green LED<br>(lights up under stable light received condition or stable dark condition)   |              |  |  |  |              |  |  |
| Pollution degree                              |                       |          | 3 (Industrial environment)  |              |  |  |  |              |  |  |
| Protection                                    |                       |          | IP67 (IEC)  |              |  |  |  |              |  |  |
| Ambient temperature                           |                       |          | -25 to +55 °C <b>-13 to +131 °F</b> (No dew condensation or icing allowed), Storage: -30 to +70 °C <b>-22 to +158 °F</b>  |              |  |  |  |              |  |  |
| Ambient humidity                              |                       |          | 35 to 85 % RH, Storage: 35 to 85 % RH   |              |  |  |  |              |  |  |
| Ambient illuminance                           |                       |          | Incandescent light: 3,000 lx or less at the light-receiving face  |              |  |  |  |              |  |  |
| Voltage withstandability                      |                       |          | 1,000 V AC for one min. between all supply terminals connected together and enclosure   |              |  |  |  |              |  |  |
| Insulation resistance                         |                       |          | 20 M $\Omega$ , or more, with 250 V DC megger between all supply terminals connected together and enclosure   |              |  |  |  |              |  |  |
| Vibration resistance                          |                       |          | 10 to 500 Hz frequency, 3 mm <b>0.118 in</b> double amplitude in X, Y and Z directions for two hours each   |              |  |  |  |              |  |  |
| Shock resistance                              |                       |          | 500 m/s <sup>2</sup> acceleration (50 G approx.) in X, Y and Z directions three times each  |              |  |  |  |              |  |  |
| Emitting element                              |                       |          | Red LED [Peak emission wavelength: 680 nm <b>0.027 mil</b> (EX-19E□: 624 nm <b>0.025 mil</b> ), modulated]  |              |  |  |  |              |  |  |
| Material                                      |                       |          | Enclosure: Polyethylene terephthalate, Lens: Polyallylate   |              |  |  |  |              |  |  |
| Cable (Note 3)                                |                       |          | 0.1 mm <sup>2</sup> 3-core (thru-beam type emitter: 2-core) cabtyre cable, 2 m <b>6.562 ft</b> long   |              |  |  |  |              |  |  |
| Cable extension                               |                       |          | Extension up to total 50 m <b>164 ft</b> is possible with 0.3 mm <sup>2</sup> , or more, cable (thru-beam type: emitter and receiver).  |              |  |  |  |              |  |  |
| Weight  |                       |          | Net weight (each emitter and receiver): 20 g approx., Gross weight: 50 g approx.  |              |  |  |  |              |  |  |
| Accessories                                   |                       |          | Mounting screws: 1 set  |              |  |  |  |              |  |  |

Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23 °C **+73.4 °F**.

2) Model Nos. having the suffix "**-PN**" are PNP output type.

3) The bending-resistant cable type (model Nos. having suffix "**-R**") has a 0.1 mm<sup>2</sup> 3-core (thru-beam type emitter: 2-core) bending-resistant cabtyre cable, 2 m **6.562 ft** long.

FIBER  
SENSORSLASER  
SENSORSPHOTO-  
ELECTRIC  
SENSORSMICRO  
PHOTO-  
ELECTRIC  
SENSORSAREA  
SENSORSSAFETY LIGHT  
CURTAINS/  
SAFETY  
COMPONENTSPRESSURE /  
FLOW  
SENSORSINDUCTIVE  
PROXIMITY  
SENSORSPARTICULAR  
USE  
SENSORSSENSOR  
OPTIONSSIMPLE  
WIRE-SAVING  
UNITSWIRE-SAVING  
SYSTEMSMEASURE-  
MENT  
SENSORSSTATIC  
CONTROL  
DEVICESLASER  
MARKERS

PLC

HUMAN  
MACHINE  
INTERFACESENERGY  
MANAGEMENT  
SOLUTIONSFA  
COMPONENTSMACHINE  
VISION  
SYSTEMSUV  
CURING  
SYSTEMSSelection  
GuideAmplifier  
Built-inPower Supply  
Built-inAmplifier-  
separated

EX-Z

CX-400

CY-100

EX-10

EX-20

EX-30

EX-40

CX-440

EQ-30

EQ-500

MQ-W

RX-LS200

RX

RT-610

**SPECIFICATIONS**

| Item  | Type  |  | Thru-beam · narrow beam type   |  |                         |  |                     | Convergent reflective (Diffused beam type)   | Thru-beam · with operation mode switch on bifurcation  |  |   |                 |  |
|---|---|--|--|--|-------------------------|--|---------------------|--|--|--|---|-----------------|--|
|   |   |  | Front sensing  | Side sensing   | Front sensing           | Side sensing   | Front sensing       | Front sensing  | Front sensing  | Side sensing   | Front sensing   | Side sensing    |  |
|   | Model No. (Note 2)  | Light-ON   | EX-11SA(-PN)   | EX-11SEA(-PN)  | EX-13SA(-PN)            | EX-13SEA(-PN)  | EX-19SA(-PN)        | EX-14A(-PN)  | EX-15 (Note 3)   | EX-15E (Note 3)  | EX-17 (Note 3)  | EX-17E (Note 3) |  |
|   |   | Dark-ON  | EX-11SB(-PN)   | EX-11SEB(-PN)  | EX-13SB(-PN)            | EX-13SEB(-PN)  | EX-19SB(-PN)        | EX-14B(-PN)  |  |  |   |                 |  |
| CE marking directive compliance               | EMC Directive, RoHS Directive   |  |  |  |                         |  |                     |  |  |  |   |                 |  |
| Sensing range                                 |   |  | 150 mm <b>5.906 in</b>   |  | 500 mm <b>19.685 in</b> |  | 1 m <b>3.281 ft</b> | 2 to 25 mm <b>0.079 to 0.984 in</b> (Note 4) (Conv. point: 10 mm <b>0.394 in</b> )   | 150 mm <b>5.906 in</b>   |  | 500 mm <b>19.685 in</b>   |                 |  |
| Min. sensing object                           |   |  | ø0.5 mm <b>ø0.002 in</b> opaque object (Completely beam interrupted object) (Note 5)                                     | ø1 mm <b>ø0.039 in</b> opaque object (Completely beam interrupted object) (Note 5) |                         | ø2 mm <b>ø0.079 in</b> opaque object (Completely beam interrupted object) (Note 5) |                     | ø0.1 mm <b>ø0.004 in</b> copper wire (Setting distance: 10 mm <b>0.394 in</b> )  | ø1 mm <b>ø0.039 in</b> opaque object (Completely beam interrupted object) (Setting distance between emitter and receiver: 150 mm <b>5.906 in</b> ) |  | ø2 mm <b>ø0.079 in</b> opaque object (Completely beam interrupted object) (Setting distance between emitter and receiver: 500 mm <b>19.685 in</b> ) |                 |  |
| Hysteresis                                    |   |  |  |  |                         |  |                     | 15 % or less of operation distance (Note 4)  |  |  |   |                 |  |
| Repeatability (perpendicular to sensing axis) | 0.05 mm <b>0.002 in</b> or less   |  |  |  |                         |  |                     | 0.1 mm <b>0.004 in</b> or less   | 0.05 mm <b>0.002 in</b> or less  |  |   |                 |  |
| Supply voltage                                | 12 to 24 V DC ±10 %   |  |  |  |                         |  |                     | Ripple P-P 10 % or less  |  |  |   |                 |  |
| Current consumption                           | Emitter: 10 mA or less, Receiver: 10 mA or less   |  |  |  |                         |  |                     | 13 mA or less  | 25 mA or less  |  |   |                 |  |
| Output  | <NPN output type><br>NPN open-collector transistor<br>• Maximum sink current: 50 mA<br>• Applied voltage: 30 V DC or less (between output and 0 V)<br>• Residual voltage: 2 V or less (at 50 mA sink current) 1 V or less (at 16 mA sink current) |  |  |  |                         |  |                     | <PNP output type><br>PNP open-collector transistor<br>• Maximum source current: 50 mA<br>• Applied voltage: 30 V DC or less (between output and +V)<br>• Residual voltage: 2 V or less (at 50 mA source current) 1 V or less (at 16 mA source current) |  | NPN open-collector transistor<br>• Maximum sink current: 100 mA<br>• Applied voltage: 30 V DC or less (between output and 0 V)<br>• Residual voltage: 2 V or less (at 100 mA sink current) 1 V or less (at 16 mA sink current) |   |                 |  |
| Utilization category                          | DC-12 or DC-13  |  |  |  |                         |  |                     |  |  |  |   |                 |  |
| Short-circuit protection                      | Incorporated  |  |  |  |                         |  |                     |  |  |  |   |                 |  |
| Response time                                 | 0.5 ms or less  |  |  |  |                         |  |                     |  |  |  |   |                 |  |
| Operation indicator                           | Orange LED (lights up when the output is ON)  |  |  |  |                         |  |                     | Orange LED (lights up when the output is ON), located on the bifurcation   |  |  |   |                 |  |
| Incident beam indicator                       |   |  |  |  |                         |  |                     | Orange LED (lights up under light received condition), located on the receiver   |  |  |   |                 |  |
| Stability indicator                           | Green LED (lights up under stable light received condition or stable dark condition)  |  |  |  |                         |  |                     | Green LED (lights up under stable light received condition or stable dark condition), located on the receiver  |  |  |   |                 |  |
| Environmental resistance                      | Pollution degree  |  | 3 (Industrial environment)   |  |                         |  |                     |  |  |  |   |                 |  |
|   | Protection  |  | IP67 (IEC)   |  |                         |  |                     |  |  |  |   |                 |  |
|   | Ambient temperature   |  | -25 to +55 °C <b>-13 to +131 °F</b> (No dew condensation or icing allowed), Storage: -30 to +70 °C <b>-22 to +158 °F</b> |  |                         |  |                     |  |  |  |   |                 |  |
|   | Ambient humidity  |  | 35 to 85 % RH, Storage: 35 to 85 % RH  |  |                         |  |                     |  |  |  |   |                 |  |
|   | Ambient illuminance   |  | Incandescent light: 3,000 lx or less at the light-receiving face   |  |                         |  |                     |  |  |  |   |                 |  |
|   | Voltage withstandability  |  | 1,000 V AC for one min. between all supply terminals connected together and enclosure                                    |  |                         |  |                     |  |  |  |   |                 |  |
|   | Insulation resistance   |  | 20 MΩ, or more, with 250 V DC megger between all supply terminals connected together and enclosure                       |  |                         |  |                     |  |  |  |   |                 |  |
|   | Vibration resistance  |  | 10 to 500 Hz frequency, 3 mm <b>0.118 in</b> double amplitude in X, Y and Z directions for two hours each                |  |                         |  |                     |  |  |  |   |                 |  |
| Shock resistance                              |   | 500 m/s <sup>2</sup> acceleration (50 G approx.) in X, Y and Z directions three times each |  |  |                         |  |                     |  |  |  |   |                 |  |
| Emitting element                              | Red LED (Peak emission wavelength: 650 nm <b>0.026 mil</b> , modulated)   |  |  |  |                         |  |                     | Red LED (Peak emission wavelength: 680 nm <b>0.027 mil</b> , modulated)  |  |  |   |                 |  |
| Material                                      | Enclosure: Polyethylene terephthalate<br>Lens: Polyallylate   |  |  |  |                         |  |                     | Enclosure: Polyethylene terephthalate<br>Lens: Polyallylate, Bifurcation: Polyallylate   |  |  |   |                 |  |
| Cable (Note 6)                                | 0.1 mm <sup>2</sup> 3-core (thru-beam type emitter: 2-core) cabtyre cable, 2 m <b>6.562 ft</b> long   |  |  |  |                         |  |                     | 0.2 mm <sup>2</sup> 3-core cabtyre cable, 2 m <b>6.562 ft</b> long (beyond bifurcation; from emitter / receiver to bifurcation: 0.5 m <b>1.640 ft</b> long)  |  |  |   |                 |  |
| Cable extension                               | Extension up to total 50 m <b>164 ft</b> is possible with 0.3 mm <sup>2</sup> , or more, cable (thru-beam type: emitter and receiver).  |  |  |  |                         |  |                     | Extension up to total 100 m <b>328 ft</b> is possible with 0.3 mm <sup>2</sup> , or more, cable.   |  |  |   |                 |  |
| Weight  | Net weight (each emitter and receiver): 20 g approx., Gross weight: 50 g approx.  |  |  |  |                         |  |                     | Net weight: 20 g approx. Gross weight: 40 g approx.  | Net weight: 55 g approx., Gross weight: 80 g approx.   |  |   |                 |  |
| Accessories                                   | Mounting screws: 1 set  |  |  |  |                         |  |                     | Mounting screws: 1 set   | Mounting screws: 1 set, Adjusting screwdriver: 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) Model Nos. having the suffix “-PN” are PNP output type.  
 3) Either Light-ON or Dark-ON can be selected by the operation mode switch.  
 4) The sensing range and the hysteresis of convergent reflective type sensor are specified for white non-glossy paper (50 × 50 mm **1.969 × 1.969 in**) as the object.  
 5) The min. sensing objects are specified in case the emitter / receiver sensing range is to set the maximum.  
 6) The bending-resistant cable type (model Nos. having suffix “-R”) has a 0.1 mm<sup>2</sup> 3-core (thru-beam type emitter: 2-core) bending-resistant cabtyre cable, 2 m **6.562 ft** long.

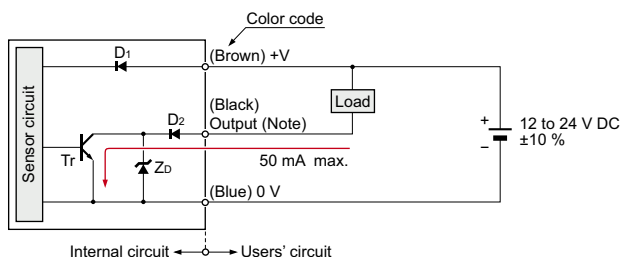
FIBER SENSORS  
 LASER SENSORS  
 PHOTO-ELECTRIC SENSORS  
 MICRO PHOTO-ELECTRIC SENSORS  
 AREA SENSORS  
 SAFETY LIGHT CURTAINS / SAFETY COMPONENTS  
 PRESSURE / FLOW SENSORS  
 INDUCTIVE PROXIMITY SENSORS  
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**EX-Z**  
**CX-400**  
**CY-100**  
**EX-10**  
**EX-20**  
**EX-30**  
**EX-40**  
**CX-440**  
**EQ-30**  
**EQ-500**  
**MQ-W**  
**RX-LS200**  
**RX**  
**RT-610**

## I/O CIRCUIT AND WIRING DIAGRAMS

EX-11□ EX-11S□ EX-13□ EX-13S□ EX-19□ EX-19S□ EX-14□

NPN output type

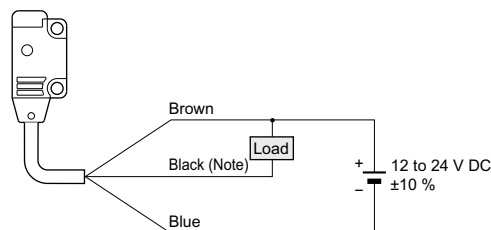
### I/O circuit diagram



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

Symbols ... D1: Reverse supply polarity protection diode  
D2: Reverse output polarity protection diode  
ZD: Surge absorption zener diode  
Tr: NPN output transistor

### Wiring diagram

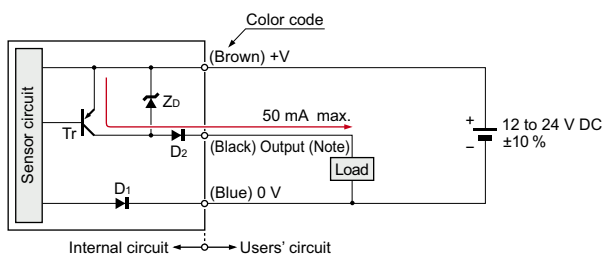


Note: The emitter of the thru-beam type sensor does not incorporate the black wire.

EX-11□-PN EX-11S□-PN EX-13□-PN EX-13S□-PN EX-19□-PN EX-19S□-PN EX-14□-PN

PNP output type

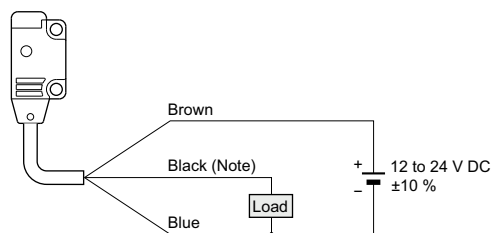
### I/O circuit diagram



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

Symbols ... D1: Reverse supply polarity protection diode  
D2: Reverse output polarity protection diode  
ZD: Surge absorption zener diode  
Tr: PNP output transistor

### Wiring diagram

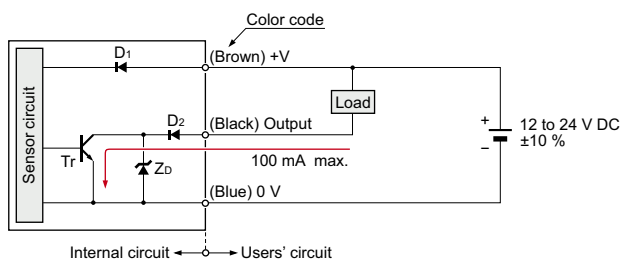


Note: The emitter of the thru-beam type sensor does not incorporate the black wire.

EX-15□ EX-15E□ EX-17□ EX-17E□

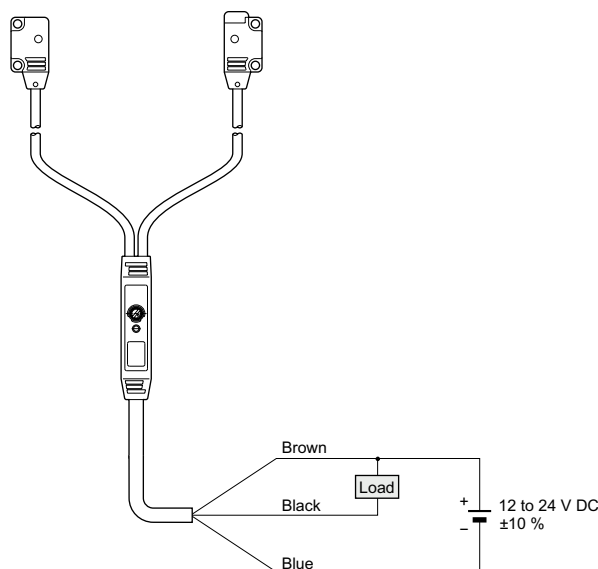
NPN output type

### I/O circuit diagram



Symbols ... D1: Reverse supply polarity protection diode  
D2: Reverse output polarity protection diode  
ZD: Surge absorption zener diode  
Tr: NPN output transistor

### EX-15□, EX-15E□, EX-17□, EX-17E□ wiring diagram



FIBER SENSORS

LASER SENSORS

PHOTO-ELECTRIC SENSORS

MICRO PHOTO-ELECTRIC SENSORS

AREA SENSORS

SAFETY LIGHT CURTAINS / SAFETY COMPONENTS

PRESSURE / FLOW SENSORS

INDUCTIVE PROXIMITY SENSORS

PARTICULAR USE SENSORS

SENSOR OPTIONS

SIMPLE WIRE-SAVING UNITS

WIRE-SAVING SYSTEMS

MEASUREMENT SENSORS

STATIC CONTROL DEVICES

LASER MARKERS

PLC

HUMAN MACHINE INTERFACES

ENERGY MANAGEMENT SOLUTIONS

FA COMPONENTS

MACHINE VISION SYSTEMS

UV CURING SYSTEMS

Selection Guide

Amplifier Built-in

Power Supply Built-in

Amplifier-separated

EX-Z

CX-400

CY-100

EX-10

EX-20

EX-30

EX-40

CX-440

EQ-30

EQ-500

MQ-W

RX-LS200

RX

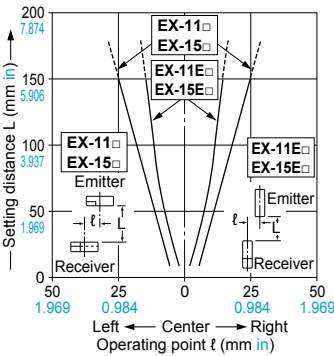
RT-610



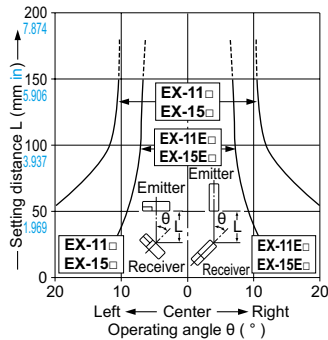
**SENSING CHARACTERISTICS (TYPICAL)**

**EX-11□ EX-11E□ EX-15□ EX-15E□ Thru-beam type**

**Parallel deviation**

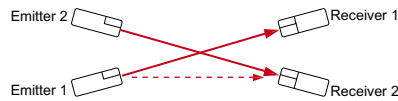


**Angular deviation**

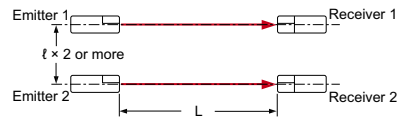


\*Optical properties of side sensing types (**EX-□E□**)

Due to the optical properties of side sensing types, note that sensing may be affected if multiple sensors are positioned in such a way that optical axes intersect as shown in the diagram below.



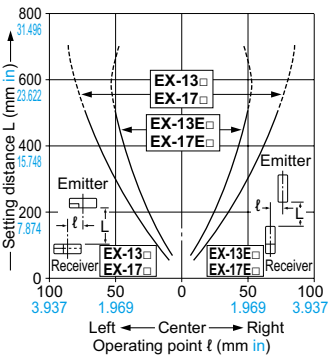
Beam from Emitter 1 may be caught by Receiver 2.



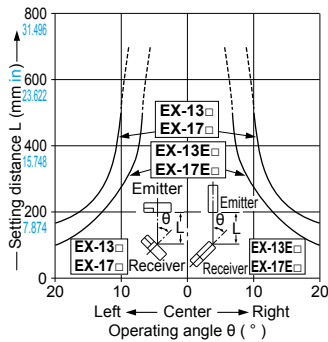
There is no problem when sensors are installed in parallel (although the distance between sensors should be  $l \times 2$  or more).

**EX-13□ EX-13E□ EX-17□ EX-17E□ Thru-beam type**

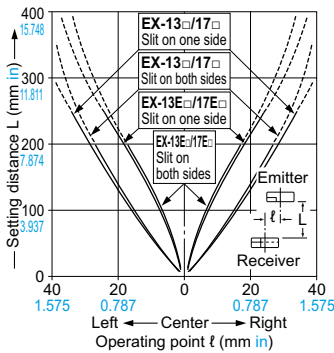
**Parallel deviation**



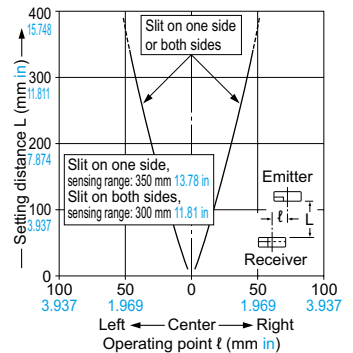
**Angular deviation**



**Parallel deviation with slit masks (ø1.2 mm ø0.047 in)**

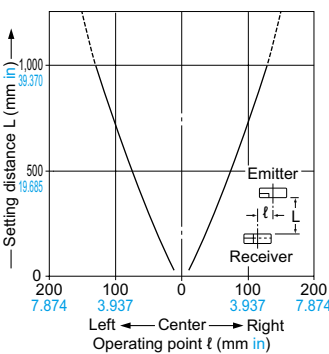


**Parallel deviation with slit masks (ø1.5 mm ø0.059 in)**

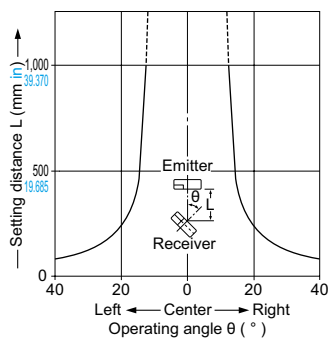


**EX-19□ Thru-beam type**

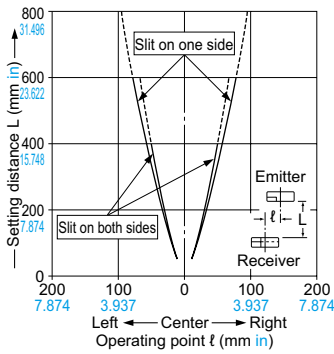
**Parallel deviation**



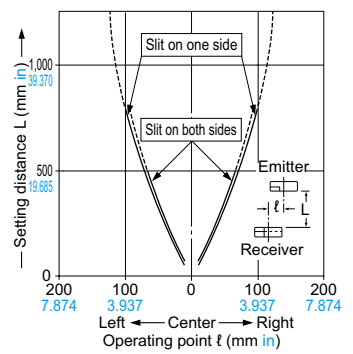
**Angular deviation**



**Parallel deviation with slit masks (ø1.2 mm ø0.047 in)**

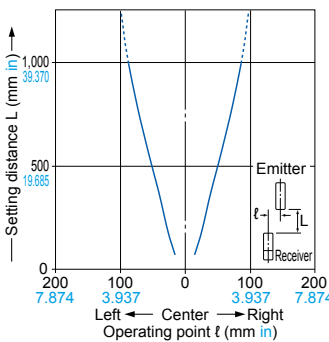


**Parallel deviation with slit masks (ø1.5 mm ø0.059 in)**



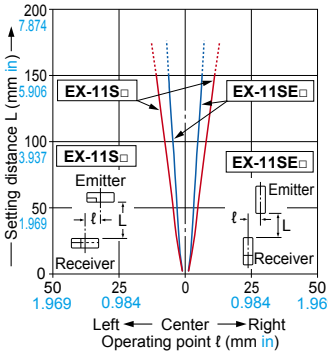
**EX-19E□ Thru-beam type**

**Parallel deviation**



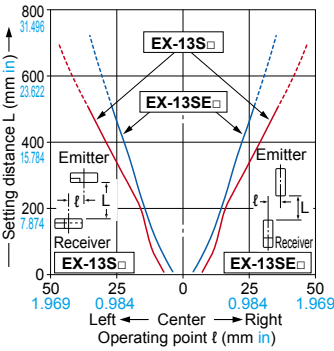
**EX-11S□/EX-11SE□ Thru-beam type**

**Parallel deviation**



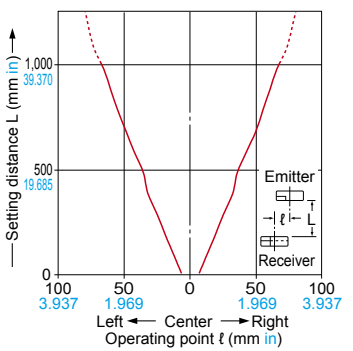
**EX-13S□/EX-13SE□ Thru-beam type**

**Parallel deviation**



**EX-19S□ Thru-beam type**

**Parallel deviation**



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- EX-30
- EX-40
- CX-440
- EQ-30
- EQ-500
- MQ-W
- RX-LS200
- RX
- RT-610

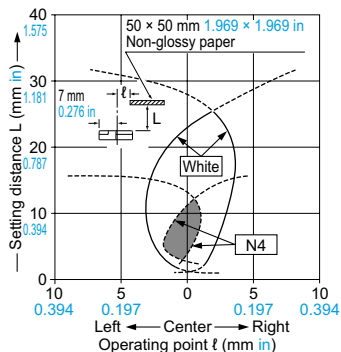
## SENSING CHARACTERISTICS (TYPICAL)

EX-14□

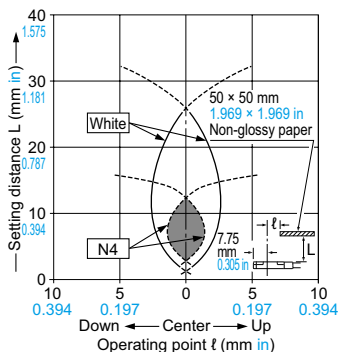
Convergent reflective type

### Sensing fields

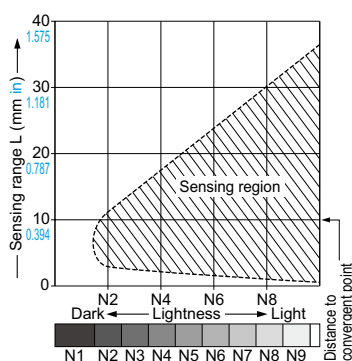
• Horizontal (left and right) direction



• Vertical (up and down) direction



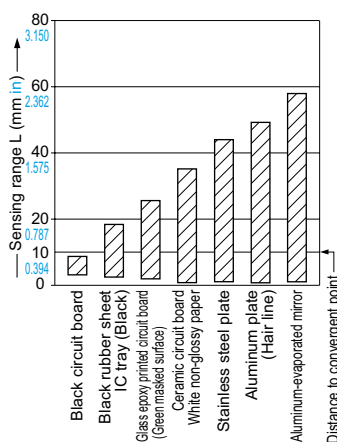
### Correlation between lightness and sensing range



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

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

### Correlation between material (50 × 50 mm 1.969 × 1.969 in) and sensing range



The bars in the graph indicate the sensing range (typical) for the respective material. However, there is a slight variation in the sensing range depending on the product. Further, if there is a reflective object (conveyor, etc.) in the background of the sensing object, since it affects the sensing, separate it by more than twice the sensing range shown in the left graph.

## PRECAUTIONS FOR PROPER USE

Refer to p.1552~ for general precautions.

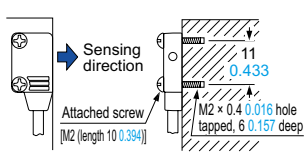


- Never use this product as a sensing device for personnel protection.
- In case of using sensing devices for personnel protection, use products which meet laws and standards, such as OSHA, ANSI or IEC etc., for personnel protection applicable in each region or country.

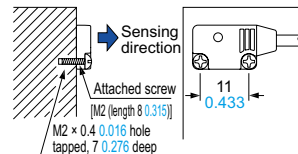
### Mounting

• In case of mounting on tapped holes (Unit: mm in)

#### Side sensing



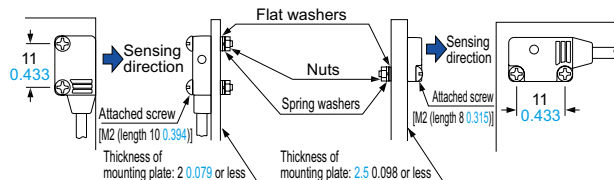
#### Front sensing



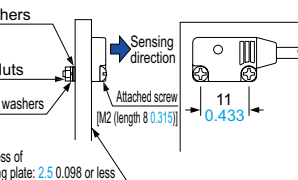
The tightening torque should be 0.2 N·m or less.

• In case of using attached screws and nuts (Unit: mm in)

#### Side sensing



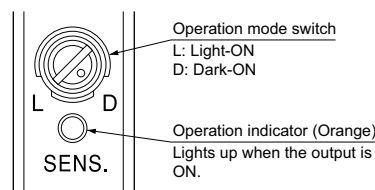
#### Front sensing



The tightening torque should be 0.2 N·m or less.

### Operation mode switch

(EX-15□, EX-15E□, EX-17□ and EX-17E□ only)



| Switch position | Description  |
|-----------------|--|
|                 | Light-ON mode is set when the switch is turned fully clockwise (L side).       |
|                 | Dark-ON mode is set when the switch is turned fully counterclockwise (D side). |

### Others

- Do not use during the initial transient time (50 ms) after the power supply is switched on.
- Excess bending of the cable or stress applied to the cable may disconnect the internal lead wire.

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CY-100

EX-10

EX-20

EX-30

EX-40

CX-440

EQ-30

EQ-500

MQ-W

RX-LS200

RX

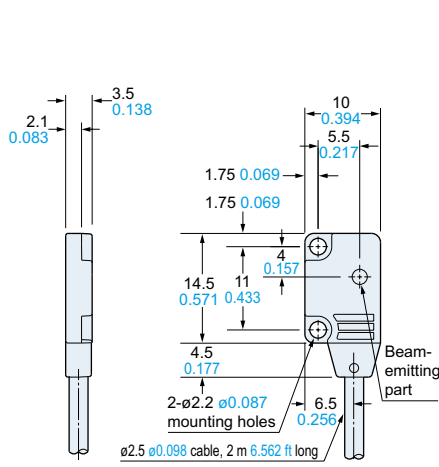
RT-610

**DIMENSIONS (Unit: mm in)**

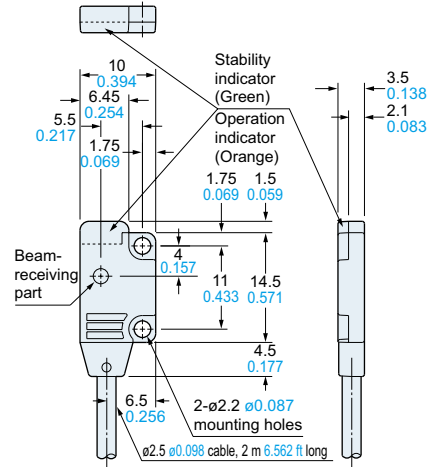
The CAD data can be downloaded from our website.

**EX-11 □ EX-11S □ EX-13 □ EX-13S □ EX-19 □ EX-19S □**

Sensor



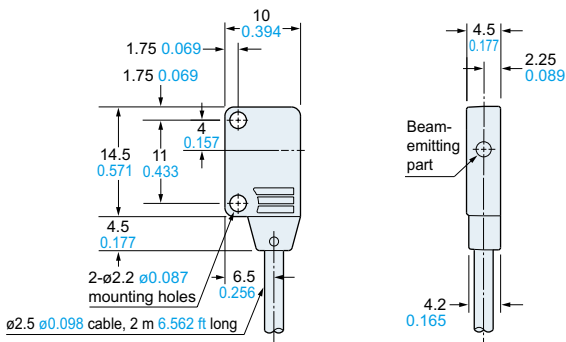
**Emitter**



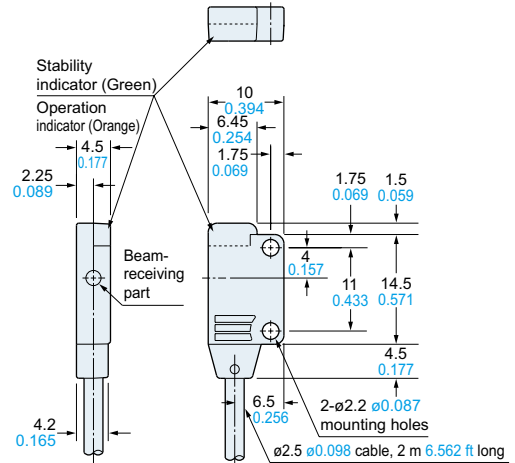
**Receiver**

**EX-11E □ EX-11SE □ EX-13E □ EX-13SE □ EX-19E □**

Sensor



**Emitter**



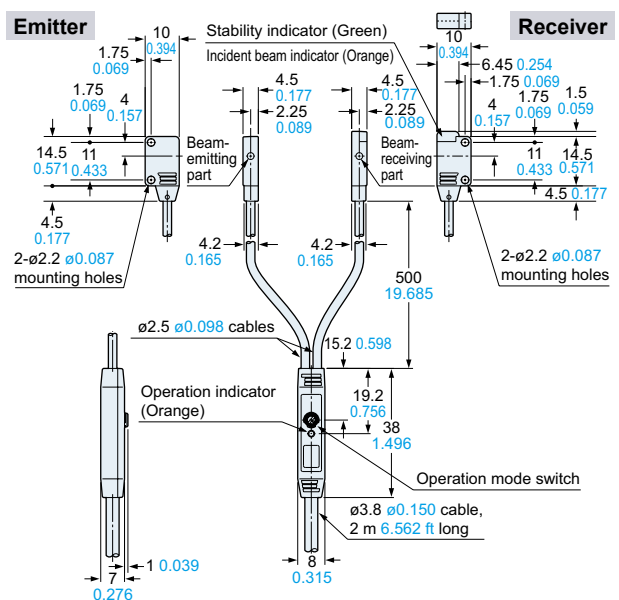
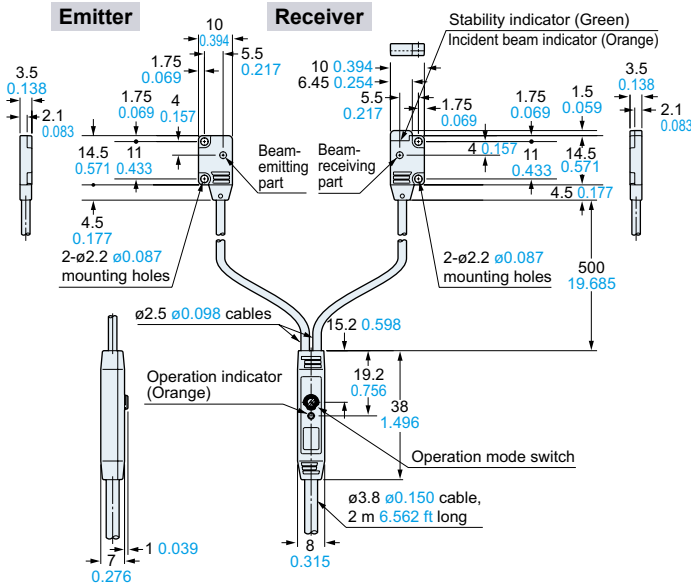
**Receiver**

**EX-15 EX-17**

Sensor

**EX-15E EX-17E**

Sensor



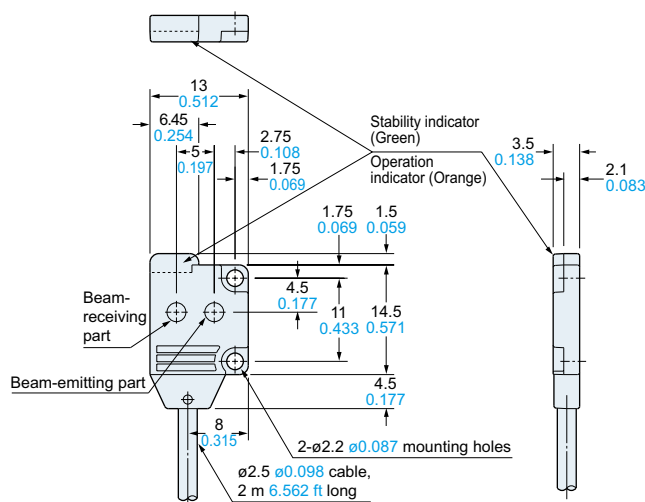
- FIBER SENSORS
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- MICRO PHOTO-ELECTRIC SENSORS
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- EX-30
- EX-40
- CX-440
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- EQ-500
- MQ-W
- RX-LS200
- RX
- RT-610

**DIMENSIONS (Unit: mm in)**

The CAD data can be downloaded from our website.

**EX-14□**

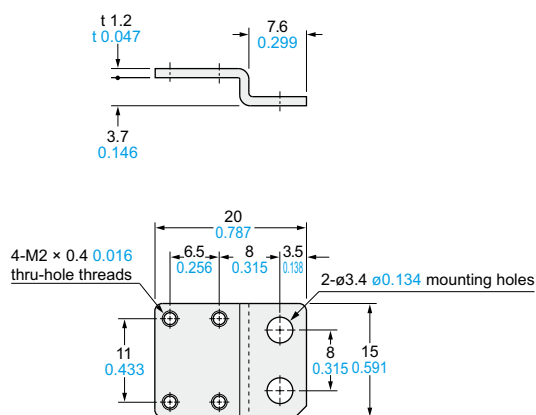
Sensor

**MS-EX10-1**

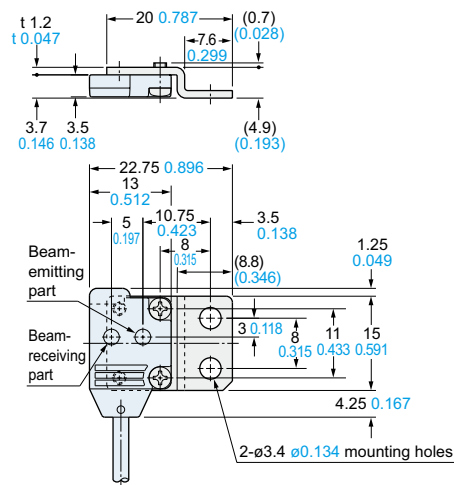
Sensor mounting bracket (Optional)

**Assembly dimensions**

Mounting drawing with EX-14□

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

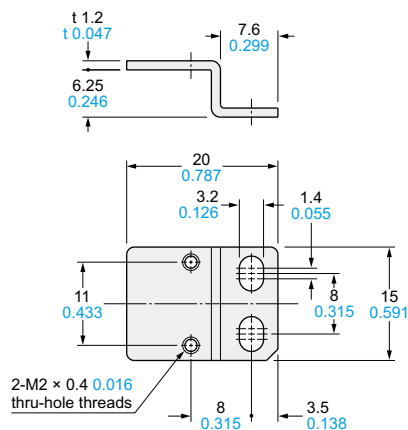
Two M2 (length 4 mm 0.157 in) pan head screws are attached.

**MS-EX10-2**

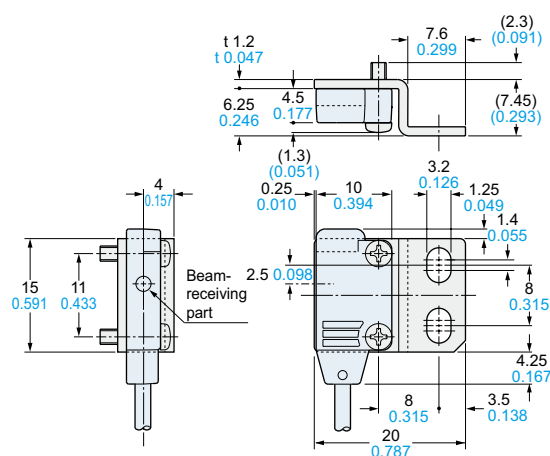
Sensor mounting bracket (Optional)

**Assembly dimensions**

Mounting drawing with EX-11E□ and EX-13E□

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

Two M2 (length 8 mm 0.315 in) pan head screws are attached.

FIBER  
SENSORSLASER  
SENSORSPHOTO-  
ELECTRIC  
SENSORSMICRO  
PHOTO-  
ELECTRIC  
SENSORSAREA  
SENSORSSAFETY LIGHT  
CURTAINS/  
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FLOW  
SENSORSINDUCTIVE  
PROXIMITY  
SENSORSPARTICULAR  
USE  
SENSORSSENSOR  
OPTIONSSIMPLE  
WIRE-SAVING  
UNITSWIRE-SAVING  
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SENSORSSTATIC  
CONTROL  
DEVICESLASER  
MARKERS

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MACHINE  
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MANAGEMENT  
SOLUTIONSFA  
COMPONENTSMACHINE  
VISION  
SYSTEMSUV  
CURING  
SYSTEMSSelection  
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Built-inAmplifier-  
separated**EX-Z****CX-400****CY-100****EX-10****EX-20****EX-30****EX-40****CX-440****EQ-30****EQ-500****MQ-W****RX-LS200****RX****RT-610**

**DIMENSIONS (Unit: mm in)**

The CAD data can be downloaded from our website.

FIBER SENSORS

LASER SENSORS

PHOTO-ELECTRIC SENSORS

MICRO PHOTO-ELECTRIC SENSORS

AREA SENSORS

SAFETY LIGHT CURTAINS / SAFETY COMPONENTS

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**CY-100**

**EX-10**

**EX-20**

**EX-30**

**EX-40**

**CX-440**

**EQ-30**

**EQ-500**

**MQ-W**

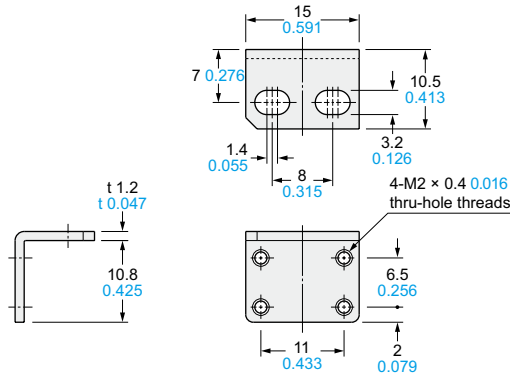
**RX-LS200**

**RX**

**RT-610**

**MS-EX10-3**

Sensor mounting bracket (Optional)

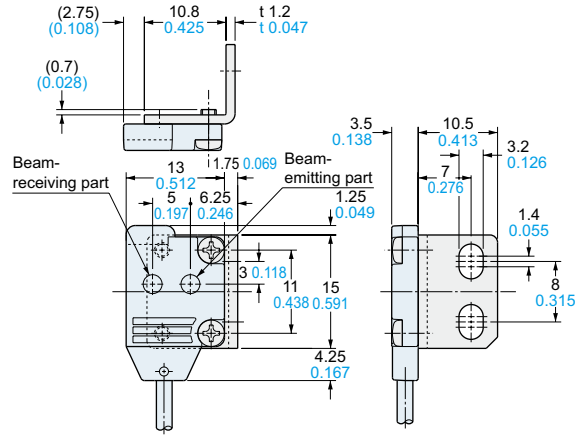


Material: Cold rolled carbon steel (SPCC)  
(Uni-chrome plated)

Two M2 (length 4 mm 0.157 in) pan head screws and two M2 (length 8 mm 0.315 in) pan head screws are attached.

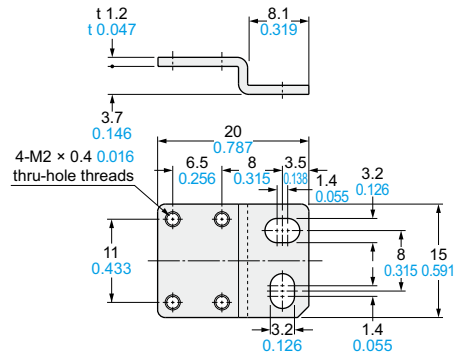
**Assembly dimensions**

Mounting drawing with EX-14□



**MS-EX10-11**

Sensor mounting bracket (Optional)

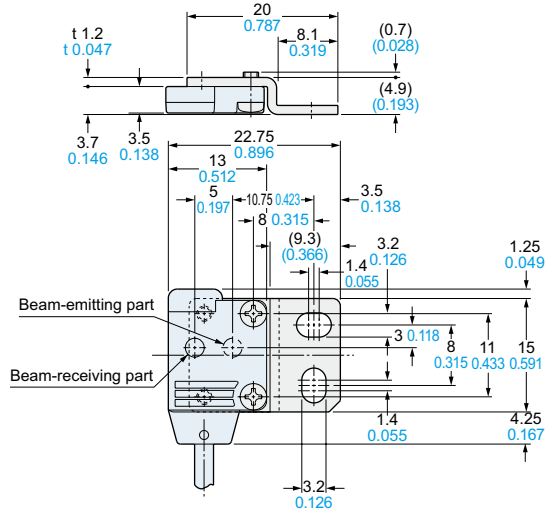


Material: Stainless steel (SUS304)

Two M2 (length 4 mm 0.157 in) pan head screws [stainless steel (SUS304)] are attached.

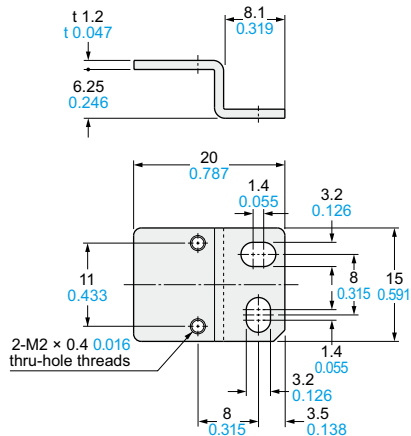
**Assembly dimensions**

Mounting drawing with EX-14□



**MS-EX10-12**

Sensor mounting bracket (Optional)

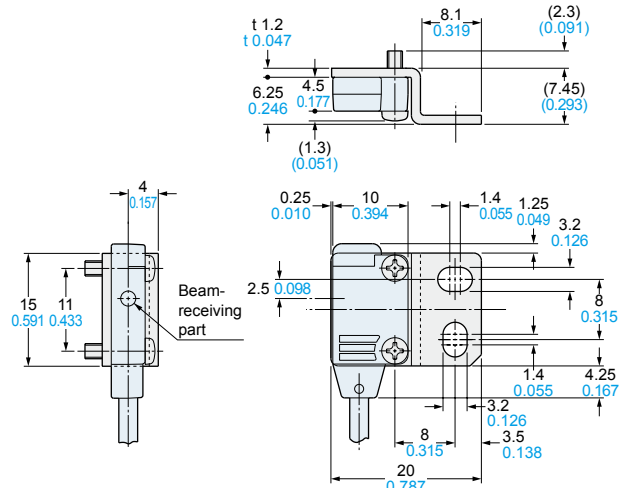


Material: Stainless steel (SUS304)

Two M2 (length 8 mm 0.315 in) pan head screws [stainless steel (SUS304)] are attached.

**Assembly dimensions**

Mounting drawing with EX-11E□ and EX-13E□



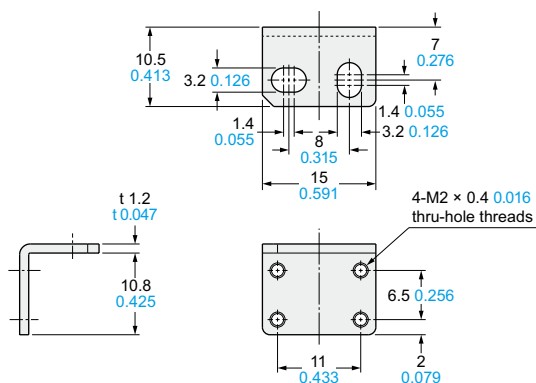


**DIMENSIONS (Unit: mm in)**

The CAD data can be downloaded from our website.

**MS-EX10-13**

Sensor mounting bracket (Optional)

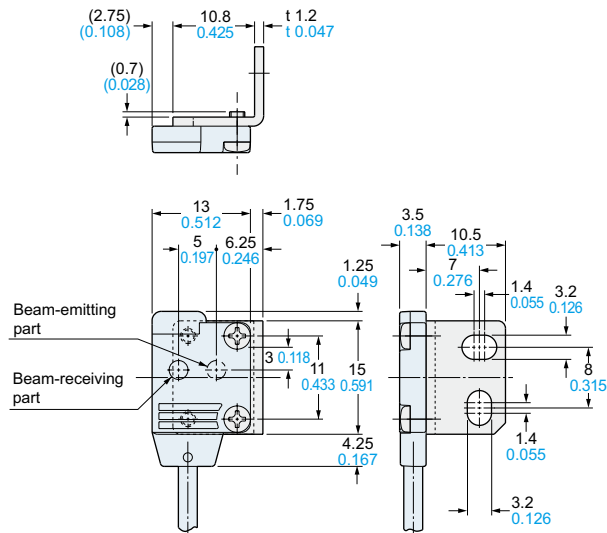


Material: Stainless steel (SUS304)

Two M2 (length 4 mm 0.157 in) pan head screws [stainless steel (SUS304)] and two M2 (length 8 mm 0.315 in) pan head screws [stainless steel (SUS304)] are attached.

**Assembly dimensions**

Mounting drawing with EX-14□



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EX-40

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EQ-30

EQ-500

MQ-W

RX-LS200

RX

RT-610