Amplifier Built-in
Ultra-slim Photoelectric Sensor
EX-10 SERIES Ver.2

Ver.2

* The contents of this catalog are as of October 2017. For the latest information, please visit our company website.
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.
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.

EX-10 SERIES Ver.2
Amplifier Built-in
APPLICATIONS

Positioning of PCBs
Detecting ICs
Detecting PCB rack
Detecting wafer cassette
Detecting thin ring
Checking for absence of capacitor in tray

BACKGROUND 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.

Minimum sensing object: Ø1 mm Ø0.039 in

EX-11□, EX-11E□, EX-15 and EX-15E are incorporated with Ø1 mm Ø0.039 in slit masks so that Ø1 mm Ø0.039 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

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.
**ENVIROMENTAL 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 feature 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

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)]
  - [Stainless steel (SUS304)]
  - Mounting bracket for the front sensing type

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

- **MS-EX10-3**
  - [Cold rolled carbon steel (SPCC)]
  - [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.

2-color indicator
- Orange: Operation indicator
- Green: Stability indicator

**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.

**VARIETIES**

Operation mode switch

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.

Even for the thru-beam type sensor, only three wires have to be connected.
## ORDER GUIDE

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<th>Output operation</th>
<th>Output</th>
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<td>Light-ON</td>
<td>NPN open-collector transistor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>500 mm 19.685 in</td>
<td>EX-11B</td>
<td>Dark-ON</td>
<td>or PNP open-collector transistor</td>
</tr>
<tr>
<td></td>
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<td>1 m 3.281 ft</td>
<td>EX-13A</td>
<td>Light-ON</td>
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</tr>
<tr>
<td></td>
<td></td>
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<td>EX-13B</td>
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</tr>
<tr>
<td></td>
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<td>EX-19A</td>
<td>Light-ON</td>
<td>Switchable either</td>
</tr>
<tr>
<td></td>
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<td>EX-19B</td>
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<td>Light-ON or Dark-ON</td>
</tr>
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<td>EX-17</td>
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</tr>
<tr>
<td></td>
<td>Side sensing</td>
<td>150 mm 5.906 in</td>
<td>EX-15E</td>
<td>Switchable either Light-ON or Dark-ON</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>500 mm 19.685 in</td>
<td>EX-17E</td>
<td>Light-ON</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Convergent reflective (Diffused beam type)</td>
<td>2 to 25 mm 0.079 to 0.984 in (Note 1)</td>
<td>EX-14A</td>
<td>Light-ON</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Convergent point: 10 mm 0.394 in)</td>
<td>EX-14B</td>
<td>Dark-ON</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Narrow beam type</td>
<td>150 mm 5.906 in</td>
<td>EX-11SA</td>
<td>Light-ON</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>500 mm 19.685 in</td>
<td>EX-11SB</td>
<td>Dark-ON</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 m 3.281 ft</td>
<td>EX-13SA</td>
<td>Light-ON</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>EX-13SB</td>
<td>Dark-ON</td>
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<td>EX-19SA</td>
<td>Light-ON</td>
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<td>EX-19SB</td>
<td>Dark-ON</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>EX-11SEA</td>
<td>Switchable either Light-ON or Dark-ON</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>EX-11SEB</td>
<td>Light-ON</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>EX-13SEA</td>
<td>Light-ON</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>EX-13SEB</td>
<td>Dark-ON</td>
<td></td>
</tr>
</tbody>
</table>

### NOTES:

1. 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□).

2. 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.)

3. 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".
### OPTIONS

![Sensor checker](image)

**CHX-SC2**

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.

### 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 are attached.

- **MS-EX10-13**
  - Material: Stainless steel (SUS304)
  - Two M2 (length 8 mm 0.315 in) pan head screws [stainless steel (SUS304)] are attached.

### Slit mask

- **OS-EX10-12**
  - Slit size ø1.2 mm ø0.047 in
  - Slit on one side: Sensing range 600 mm 23.622 in, Min. sensing object ø2 mm ø0.079 in
  - Slit on both sides: Sensing range 250 mm 9.843 in [EX-13□, EX-17□], Min. sensing object ø1.2 mm ø0.047 in

- **OS-EX10-15**
  - Slit size ø1.5 mm ø0.059 in
  - Slit on one side: Sensing range 800 mm 31.496 in [EX-19□], Min. sensing object ø2 mm ø0.079 in
  - Slit on both sides: Sensing range 350 mm 13.780 in [EX-13□], Min. sensing object ø1.5 mm ø0.059 in

- **OS-EX10E-12**
  - Slit size ø1.2 mm ø0.047 in
  - Slit on one side: Sensing range 400 mm 15.748 in [EX-19□] (Note 2), Min. sensing object ø2 mm ø0.079 in
  - Slit on both sides: Sensing range 200 mm 7.874 in [EX-13□, EX-17□], Min. sensing object ø1.2 mm ø0.047 in

Notes:
1. Can not be used for the narrow beam type (EX-□S□).
2. Since EX-19□ has a built-in ø1 mm ø 0.039 in slit in the emitter, be sure to mount it in the receiver.

### Mounting screw

**MS-M2**

Mounting screws with washers (50 pcs. lot). It can mount securely as it is spring washer attached.

### Slit mask

- **OS-EX10-12**
- **OS-EX10-15**

Example of mounting (OS-EX10E-12)

Tighten along with the sensor mounting bracket.
### SPECIFICATIONS

<table>
<thead>
<tr>
<th>Item</th>
<th>Thru-beam - standard type</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Front sensing</td>
</tr>
<tr>
<td><strong>Model No.</strong></td>
<td>EX-11A(-PN)</td>
</tr>
<tr>
<td>Light-ON</td>
<td></td>
</tr>
<tr>
<td>Dark-ON</td>
<td>EX-11B(-PN)</td>
</tr>
</tbody>
</table>

#### CE marking directive compliance
- EMC Directive, RoHS Directive

#### Sensing range
- 150 mm 5.906 in
- 500 mm 19.685 in
- 1 m 3.281 ft

#### Min. sensing object
- ø1 mm ø0.039 in opaque object (Completely beam interrupted object)
- Setting distance between emitter and receiver: 150 mm 5.906 in
- ø2 mm ø0.079 in opaque object (Completely beam interrupted object)
- Setting distance between emitter and receiver: 500 mm 19.685 in
- ø2 mm ø0.079 in opaque object (Completely beam interrupted object)
- Setting distance between emitter and receiver: 1 m 3.281 ft

#### Hysteresis
- 0.05 mm 0.002 in 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

#### Output
- **<NPN output type>**
  - NPN open-collector transistor
  - Maximum sink current: 50 mA
  - Applied voltage: 30 V DC or less (between output and 0 V)
  - Residual voltage: 1 V or less (at 16 mA sink current)
- **<PNP output type>**
  - PNP open-collector transistor
  - Maximum source current: 50 mA
  - Applied voltage: 30 V DC or less (between output and +V)
  - Residual voltage: 1 V or less (at 16 mA source 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)

#### Incident beam indicator
- Green LED (lights up under stable light received condition or stable dark condition)

#### Stability indicator
- Pollution degree: 3 (Industrial environment)
- Protection: IP67 (IEC)

#### Pollution degree
- 3 (Industrial environment)
- 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 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 MO, 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 (50 G approx.) in X, Y and Z directions three times each

#### Emitting element
- Red LED [Peak emission wavelength: 680 nm 0.027 mil (EX-19E□): 624 nm 0.025 mil], modulated

#### Material
- Enclosure: Polyethylene terephthalate, Lens: Polyalylate

#### Cable (Note 3)
- 0.1 mm² 3-core (thru-beam type emitter: 2-core) cable, 2 m 6.562 ft long

#### Cable extension
- Extension up to total 50 m 164 ft is possible with 0.3 mm², 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 mm² 3-core (thru-beam type emitter: 2-core) bending-resistant cable, 2 m 6.562 ft long.
# SPECIFICATIONS

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Type</th>
<th>Thru-beam - narrow beam type</th>
<th>Convergent reflective (Shade beam type)</th>
<th>Ex-beam - with operation mode switch on bifurcation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light-ON</td>
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<td>EX-11SE (PN)</td>
<td>EX-11SEB (PN)</td>
<td>EX-11SEA (PN)</td>
</tr>
<tr>
<td>Dark-ON</td>
<td>EX-11SB (PN)</td>
<td>EX-11SEB (PN)</td>
<td>EX-11SEB (PN)</td>
<td>EX-11SEA (PN)</td>
</tr>
</tbody>
</table>

## CE marking directive compliance
- EMC Directive, RoHS Directive –

## Sensing range
- 150 mm 5.906 in
- 500 mm 19.685 in
- 1 m 3.281 ft

## Output
- **Sensing range:**
  - 0.05 mm 0.002 in or less
  - 0.1 mm 0.004 in or less
- **Repeatability (perpendicular to sensing axis):**
  - 0.05 mm 0.002 in or less
- **Response time:**
  - 0.5 ms or less

## Power supply
- **Supply voltage:**
  - 12 to 24 V DC ±10 %
  - Ripple P-P 10 % or less

## Current consumption
- **Output:**
  - Emitter: 10 mA or less, Receiver: 10 mA or less
  - 13 mA or less
  - 25 mA or less

## 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
- Green LED
- 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)

## Pollution degree
- 3 (Industrial environment)

## 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 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 0.118 in in double amplitude in X, Y, and Z directions for two hours each

## Shock resistance
- 500 m/s² acceleration (50 G approx.) in X, Y, and Z directions three times each

## Emission element
- Red LED (Peak emission wavelength: 650 nm 0.026 μm, modulated)
- Red LED (Peak emission wavelength: 680 nm 0.027 μm, modulated)

## Material
- Enclosure: Polyethylene terephthalate
- Lens: Polyalylate

## Cable (Note 6)
- 0.1 mm² 3-core (thru-beam type emitter: 2-core) cable
  - 2 m 6.562 ft long
- 0.2 mm² 3-core cable
  - 2 m 6.562 ft long (beyond bifurcation; from emitter / receiver to bifurcation: 0.5 m 1.640 ft long)

## Cable extension
- Extension up to total 50 m 164 ft is possible with 0.3 mm² or more, cable (thru-beam type: emitter and receiver)
- Extension up to total 100 m 328 ft is possible with 0.3 mm² or more, cable.

## Weight
- Net weight: 20 g approx.
- Gross weight: 50 g approx.
- Net weight: 55 g approx.
- Gross weight: 80 g approx.

## Accessories
- 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 ±3 °C.
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 sensitivity range and the hysteresis of convergent reflective type sensor are specified for white non-glossy paper (50 x 50 mm 1.969 x 1.969 in) as the object.
5. The bending-resistant cable type (model Nos. having suffix “-R”) has a 0.1 mm² 3-core (thru-beam type emitter: 2-core) bending-resistant cable, 2 m 6.562 ft long.
**I/O CIRCUIT AND WIRING DIAGRAMS**


**NPN output type**

**I/O circuit diagram**

```
Sensor circuit

<table>
<thead>
<tr>
<th>Color code</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Brown) +V</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Internal circuit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Users' circuit</td>
</tr>
</tbody>
</table>

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

**Wiring diagram**

```
Brown

Black (Note)

Blue

Load

12 to 24 V DC ±10 %

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

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


**PNP output type**

**I/O circuit diagram**

```
Sensor circuit

<table>
<thead>
<tr>
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<td>Users' circuit</td>
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</table>

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

**Wiring diagram**

```
Brown

Black (Note)

Blue

Load

12 to 24 V DC ±10 %

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

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

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

**NPN output type**

**I/O circuit diagram**

```
Sensor circuit

<table>
<thead>
<tr>
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<tr>
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<th>Internal circuit</th>
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<tbody>
<tr>
<td>Users' circuit</td>
</tr>
</tbody>
</table>

**EX-15**, **EX-15E**, **EX-17**, **EX-17E** wiring diagram

```
Brown

Black

Blue

Load

12 to 24 V DC ±10 %
```

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**

**NPN output type**
**SENSING CHARACTERISTICS (TYPICAL)**

**EX-10 SERIES Ver.2**

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

<table>
<thead>
<tr>
<th>Setting distance L (mm)</th>
<th>Parallel deviation</th>
<th>Angular deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.748</td>
<td>21.072</td>
<td>0.000</td>
</tr>
<tr>
<td>23.622</td>
<td>24.344</td>
<td>0.000</td>
</tr>
<tr>
<td>31.496</td>
<td>25.016</td>
<td>0.000</td>
</tr>
</tbody>
</table>

*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 \( t \times 2 \) or more).

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

<table>
<thead>
<tr>
<th>Setting distance L (mm)</th>
<th>Parallel deviation with slit masks (( \varnothing 1.2 \text{ mm} \ \varnothing 0.047 \text{ in} ))</th>
<th>Parallel deviation with slit masks (( \varnothing 1.5 \text{ mm} \ \varnothing 0.059 \text{ in} ))</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.969</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>3.937</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>7.874</td>
<td>0.000</td>
<td>0.000</td>
</tr>
</tbody>
</table>

**EX-19**

**EX-19E** Thru-beam type

**EX-11S/EX-11SE** Thru-beam type

**EX-13S/EX-13SE** Thru-beam type

**EX-19S** Thru-beam type

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 \( t \times 2 \) or more).
**SENSING CHARACTERISTICS (TYPICAL)**

**EX-14**

**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.

**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.

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

**PRECAUTIONS FOR PROPER USE**

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

**Mounting**

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

  **Side sensing**

  ![Side sensing](image)

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

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

  **Side sensing**

  ![Side sensing](image)

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

**Operation mode switch**

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

<table>
<thead>
<tr>
<th>Switch position</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Light-ON" /></td>
<td>Light-ON mode is set when the switch is turned fully clockwise (L side).</td>
</tr>
<tr>
<td><img src="image" alt="Dark-ON" /></td>
<td>Dark-ON mode is set when the switch is turned fully counterclockwise (D side).</td>
</tr>
</tbody>
</table>

**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.
DIMENSIONS (Unit: mm in)

The CAD data can be downloaded from our website.
Ultra-slim Photoelectric Sensor EX-10 SERIES Ver.2

**DIMENSIONS (Unit: mm in)**

**EX-14**

![Sensor diagram]

- Stability indicator (Green)
- Operation indicator (Orange)
- Beam-receiving part
- Beam-emitting part

<table>
<thead>
<tr>
<th>Beam-receiving</th>
<th>2 ø2.2 ø0.087 mounting holes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beam-emitting</td>
<td>2 ø0.091 cable, 2 m 6.562 ft long</td>
</tr>
</tbody>
</table>

**MS-EX10-1**

![Sensor mounting bracket diagram]

- 4-M2 x 0.4 0.016 thru-hole threads
- 2 ø3.4 ø0.134 mounting holes
- 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 diagram]

- 2-M2 x 0.4 0.016 thru-hole threads
- Material: Cold rolled carbon steel (SPCC) (Uni-chrome plated)
- Two M2 (length 8 mm 0.315 in) pan head screws are attached.

Assembly dimensions

Mounting drawing with EX-14

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

The CAD data can be downloaded from our website.
DIMENSIONS (Unit: mm in)

The CAD data can be downloaded from our website.

MS-EX10-3

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

MS-EX10-11

Assembly dimensions
Mounting drawing with EX-14:

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

MS-EX10-12

Assembly dimensions
Mounting drawing with EX-11E0 and EX-13E0

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

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.

Assembly dimensions

Mounting drawing with EX-14□

Beam-emitting part

Beam-receiving part

The CAD data can be downloaded from our website.
Disclaimer

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