

## EX-10 SERIES Ver.2

FIBER SENSORS

LASER SENSORS

PHOTOELECTRIC SENSORS

MICRO PHOTOELECTRIC SENSORS

AREA SENSORS

SAFETY LIGHT CURTAINS/ SAFETY COMPONENTS

PRESSURE/ FLOW SENSORS

INDUCTIVE PROXIMITY SENSORS

PARTICULAR USE SENSORS

SENSOR OPTIONS

SIMPLE WIRE-SAVING UNITS

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STATIC CONTROL DEVICES

LASER MARKERS

PLC

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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

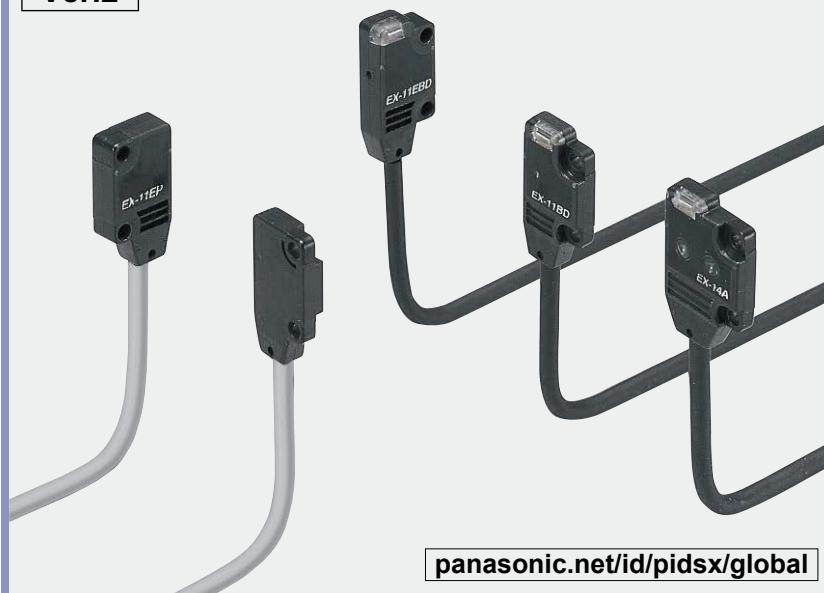
RX

RT-610

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

Ver.2



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 x H14.5 x D3.5 mm  
**W0.394 x H0.571 x D0.138 in**  
 (thru-beam, front sensing type).



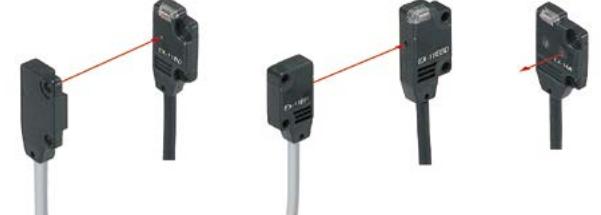
## Flexible mounting

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.

Thru-beam  
 • Front sensing type

• Side sensing type

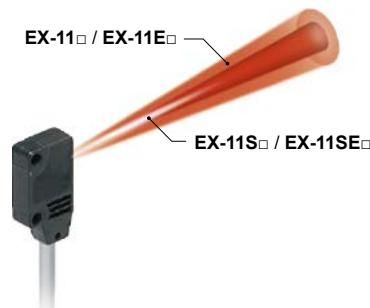
Diffuse reflective  
 • Front sensing type



## 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.

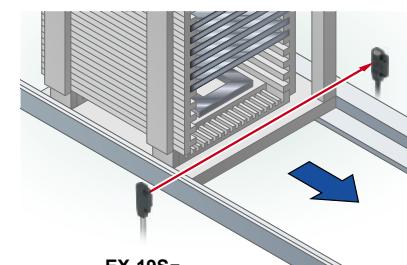


## Possible to sense a minute object less than ø0.5 mm ø0.039 in with no slit.

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

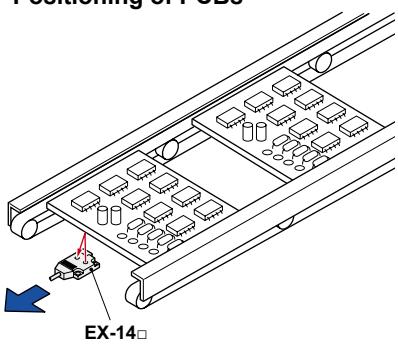
## Long sensing range of 1 m 3.281 ft with narrow beam

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

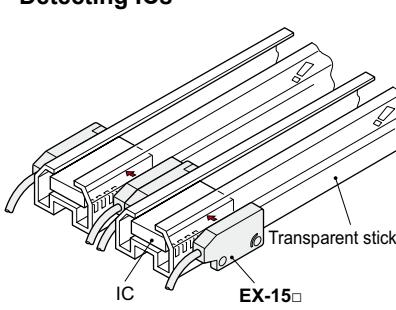


## APPLICATIONS

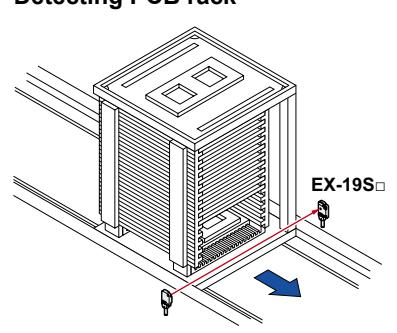
### Positioning of PCBs



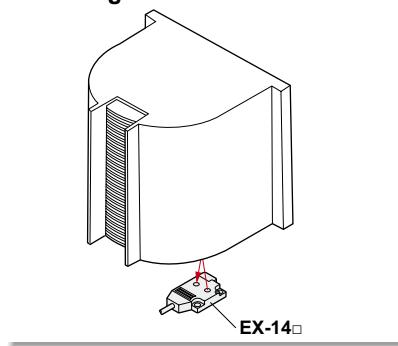
### Detecting ICs



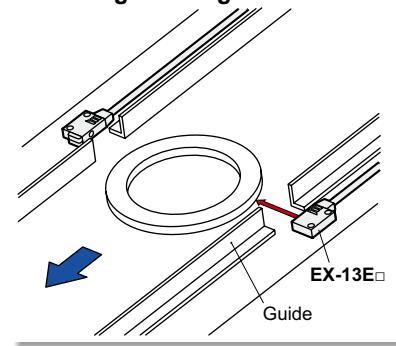
### Detecting PCB rack



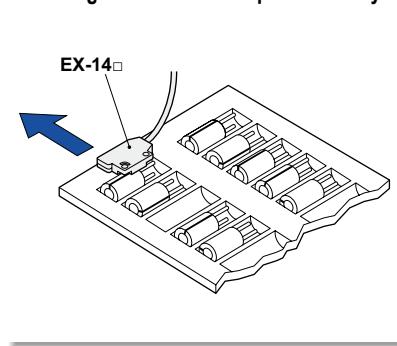
### Detecting wafer cassette



### Detecting thin ring



### Checking for absence of capacitor in tray

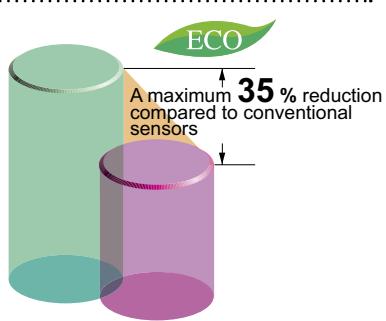


## BASIC PERFORMANCE

### Electric power saving \*

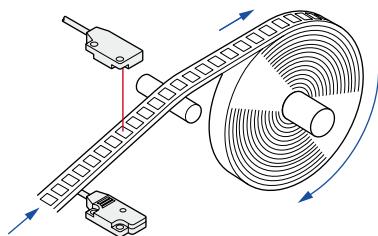
The EX-10 series achieves reductions in power consumption of up to 65 %. These sensors contribute to environmental friendliness.

\* Effective from production in October 2010.



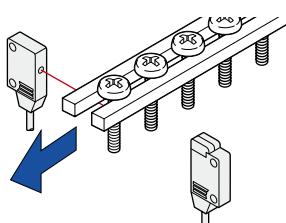
### High-speed response time: 0.5 ms

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



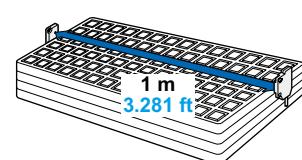
### Minimum sensing object: ø1 mm 0.039 in EX-11(E)□, EX-15(E)□

EX-11□, EX-11E□, EX-15 and EX-15E are incorporated with ø1 mm 0.039 in slit masks so that ø1 mm 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)□

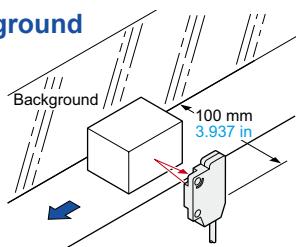
A sensing range of 1 m 3.281 ft has been realized with a slim size of just 3.5 mm 0.138 in. It can be used to detect even wide IC trays.



### Background suppression

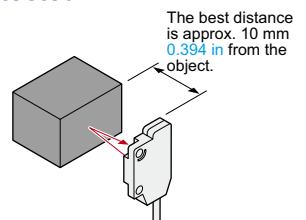
#### Hardly affected by background

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.



**EX-14□**

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**

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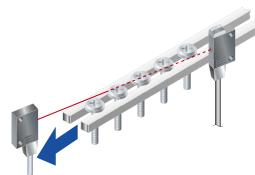
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## ENVIRONMENTAL RESISTANCE

### 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.

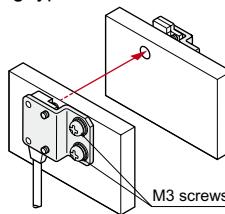
## MOUNTING / SIZE

### Mountable with M3 screws

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

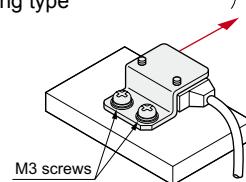
- **MS-EX10-1**  
[Cold rolled carbon steel (SPCC)]

**MS-EX10-11**  
[Stainless steel (SUS304)]  
(mounting bracket for the front)  
(sensing type)



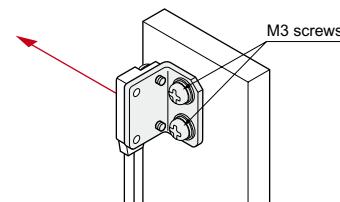
- **MS-EX10-2**  
[Cold rolled carbon steel (SPCC)]

**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.



## 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.

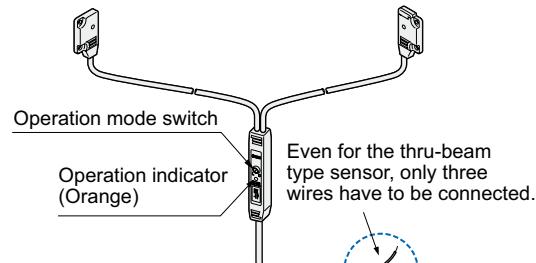


## VARIETIES

### Operation mode switch

**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.



## ■ ORDER GUIDE

Type	Appearance	Sensing range	Model No.(Note 2)		Output operation	Output
			NPN output	PNP output		
Standard type	Thru-beam Front sensing With operation mode switch on the bifurcation	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	
		1 m 3.281 ft	EX-13A	EX-13A-PN	Light-ON	
		150 mm 5.906 in	EX-13B	EX-13B-PN	Dark-ON	
		500 mm 19.685 in	EX-19A	EX-19A-PN	Light-ON	
	Thru-beam Side sensing With operation mode switch on the bifurcation	150 mm 5.906 in	EX-19B	EX-19B-PN	Dark-ON	
		500 mm 19.685 in	EX-15	EX-15 -PN	Switchable either Light-ON or Dark-ON	
		150 mm 5.906 in	EX-17	EX-17-PN	Switchable either Light-ON or Dark-ON	
		500 mm 19.685 in	EX-11EA	EX-11EA-PN	Light-ON	
		1 m 3.281 ft	EX-11EB	EX-11EB-PN	Dark-ON	
Convergent reflective (diffused beam type)	Front sensing With operation mode switch on the bifurcation	150 mm 5.906 in	EX-13EA	EX-13EA-PN	Light-ON	NPN open-collector transistor or PNP open-collector transistor
		500 mm 19.685 in	EX-13EB	EX-13EB-PN	Dark-ON	
		1 m 3.281 ft	EX-19EA	EX-19EA-PN	Light-ON	
		150 mm 5.906 in	EX-19EB	EX-19EB-PN	Dark-ON	
		500 mm 19.685 in	EX-15E	—	Switchable either Light-ON or Dark-ON	
	Front sensing	2 to 25 mm 0.079 to 0.984 in (Note 1) (Convergent point: 10 mm 0.394 in)	EX-17E	—	Switchable either Light-ON or Dark-ON	
		150 mm 5.906 in	EX-14A	EX-14A-PN	Light-ON	
		500 mm 19.685 in	EX-14B	EX-14B-PN	Dark-ON	
Narrow beam type	Thru-beam 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	
		1 m 3.281 ft	EX-13SA	EX-13SA-PN	Light-ON	
		150 mm 5.906 in	EX-13SB	EX-13SB-PN	Dark-ON	
		500 mm 19.685 in	EX-19SA	EX-19SA-PN	Light-ON	
	Thru-beam Side sensing	150 mm 5.906 in	EX-19SB	EX-19SB-PN	Dark-ON	
		500 mm 19.685 in	EX-11SEA	EX-11SEA-PN	Light-ON	
		1 m 3.281 ft	EX-11SEB	EX-11SEB-PN	Dark-ON	
		150 mm 5.906 in	EX-13SEA	EX-13SEA-PN	Light-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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## 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> (Slit size ø1.2 mm ø0.047 in)	<p>Slit on one side</p> <ul style="list-style-type: none"> <li>Sensing range: 600 mm <b>23.622 in</b> [EX-19□] 250 mm <b>9.843 in</b> [EX-13□, EX-17□]</li> <li>Min. sensing object: ø2 mm <b>ø0.079 in</b></li> </ul> <p>Slit on both sides</p> <ul style="list-style-type: none"> <li>Sensing range: 400 mm <b>15.748 in</b> [EX-19□] 200 mm <b>7.874 in</b> [EX-13□, EX-17□]</li> <li>Min. sensing object: ø1.2 mm <b>ø0.047 in</b></li> </ul>
		<p>Slit on one side</p> <ul style="list-style-type: none"> <li>Sensing range: 800 mm <b>31.496 in</b> [EX-19□] 350 mm <b>13.780 in</b> [EX-13□]</li> <li>Min. sensing object: ø2 mm <b>ø0.079 in</b></li> </ul> <p>Slit on both sides</p> <ul style="list-style-type: none"> <li>Sensing range: 500 mm <b>19.685 in</b> [EX-19□] 300 mm <b>11.811 in</b> [EX-13□]</li> <li>Min. sensing object: ø1.5 mm <b>ø0.059 in</b></li> </ul>
	<b>OS-EX10-15</b> (Slit size ø1.5 mm ø0.059 in)	<p>Slit on one side</p> <ul style="list-style-type: none"> <li>Sensing range: 400 mm <b>15.748 in</b> [EX-19E□] (Note 3) 250 mm <b>9.843 in</b> [EX-13E□, EX-17E□]</li> <li>Min. sensing object: ø2 mm <b>ø0.079 in</b></li> </ul> <p>Slit on both sides</p> <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: ø1.2 mm <b>ø0.047 in</b></li> </ul>
		<p>Slit on one side</p> <ul style="list-style-type: none"> <li>Sensing range: 400 mm <b>15.748 in</b> [EX-19E□] (Note 3) 250 mm <b>9.843 in</b> [EX-13E□, EX-17E□]</li> <li>Min. sensing object: ø2 mm <b>ø0.079 in</b></li> </ul> <p>Slit on both sides</p> <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: ø1.2 mm <b>ø0.047 in</b></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.

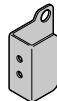
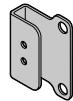
Notes: 1) Can not be used for the narrow beam type (EX-□S□).

2) Refer to p.959~ for the sensor checker **CHX-SC2**.

3) Since EX-19E□ has a built-in ø1 mm ø 0.039 in slit in the emitter, be sure to mount it in the receiver.

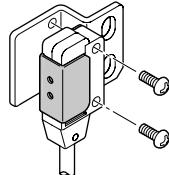
### Slit mask

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



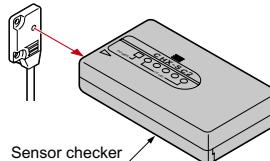
- OS-EX10E-12**

Example of mounting  
(OS-EX10E-12)



### Sensor checker

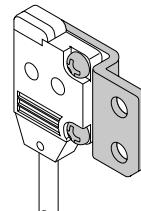
- CHX-SC2**



Tighten along with the sensor mounting bracket.

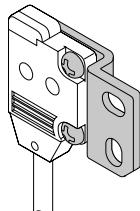
### Sensor mounting bracket

- MS-EX10-1**



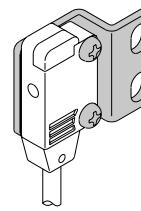
Material: Cold rolled carbon steel (SPCC)  
(Uni-chrome plated)  
Two M2 (length 4 mm  
**0.157 in**) pan head screws are attached.

- MS-EX10-11**



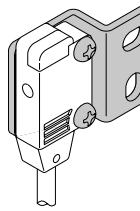
Material: Stainless steel (SUS304)  
Two M2 (length 4 mm  
**0.157 in**) pan head screws [stainless steel (SUS304)] are attached.

- MS-EX10-2**



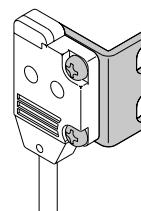
Material: Cold rolled carbon steel (SPCC)  
(Uni-chrome plated)  
Two M2 (length 8 mm  
**0.315 in**) pan head screws are attached.

- MS-EX10-12**



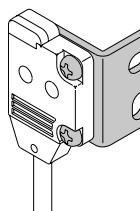
Material: Stainless steel (SUS304)  
Two M2 (length 8 mm  
**0.315 in**) pan head screws [stainless steel (SUS304)] are attached.

- 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.

## SPECIFICATIONS

Type		Thru-beam · standard type								
		Front sensing	Side sensing	Front sensing	Side sensing	Front sensing	Side sensing			
Model No. (Note 2)	Light-ON	<b>EX-11A(-PN)</b>	<b>EX-11EA(-PN)</b>	<b>EX-13A(-PN)</b>	<b>EX-13EA(-PN)</b>	<b>EX-19A(-PN)</b>	<b>EX-19EA(-PN)</b>			
Item	Dark-ON	<b>EX-11B(-PN)</b>	<b>EX-11EB(-PN)</b>	<b>EX-13B(-PN)</b>	<b>EX-13EB(-PN)</b>	<b>EX-19B(-PN)</b>	<b>EX-19EB(-PN)</b>			
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		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>	ø2 mm <b>ø0.079 in</b> opaque object (Completely beam interrupted object) 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 ±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: 2 V or less (at 50 mA sink current) 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: 2 V or less (at 50 mA source current) 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		—								
Stability indicator		Green LED (lights up under stable light received condition or stable dark condition)								
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: 680 nm <b>0.027 mil</b> (EX-19E: 624 nm <b>0.025 mil</b> ), modulated]								
Material		Enclosure: Polyethylene terephthalate, Lens: Polyalylate								
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

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	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)			
Item	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>0.384 in</b> )	150 mm <b>5.906 in</b>		500 mm <b>19.685 in</b>					
Min. sensing object	<b>Ø0.5 mm Ø0.002 in</b> opaque object (Completely beam interrupted object) (Note 5)	<b>Ø1 mm Ø0.039 in</b> opaque object (Completely beam interrupted object) (Note 5)	<b>Ø2 mm Ø0.079 in</b> opaque object (Completely beam interrupted object) (Note 5)	<b>Ø0.1 mm Ø0.004 in</b> copper wire (Setting distance: 10 mm <b>0.394 in</b> )	<b>Ø1 mm Ø0.039 in</b> opaque object (Completely beam interrupted object) (Setting distance: 150 mm <b>5.906 in</b> )	<b>Ø2 mm Ø0.079 in</b> opaque object (Completely beam interrupted object) (Setting distance: 500 mm <b>19.685 in</b> )								
Hysteresis							15% or less of operation distance (Note 4)							
Repeatability (perpendicular to sensing axis)	<b>0.05 mm 0.002 in</b> or less					<b>0.1 mm 0.004 in</b> or less	<b>0.05 mm 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	<b>25 mA</b> 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: 2 V or less (at 50 mA sink current) 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: 2 V or less (at 50 mA source current) 1 V or less (at 16 mA source current)	NPN open-collector transistor • Maximum sink current: 100 mA • Applied voltage: 30 V DC or less (between output and 0 V) • Residual voltage: 2 V or less (at 100 mA sink current) 1 V or less (at 16 mA sink current)							
Utilization category	<b>DC-12 or DC-13</b>													
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 Lens: Polyalylate					Enclosure: Polyethylene terephthalate Lens: Polyalylate, Bifurcation: Polyalylate								
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.

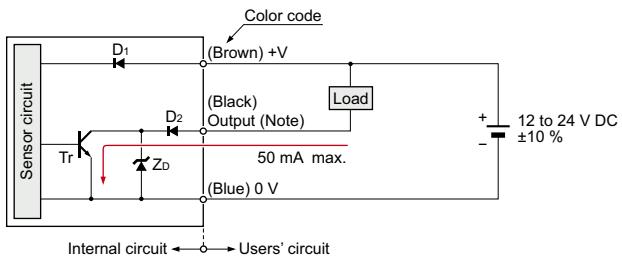
6) The bending-resistant cable type (model Nos. having suffix **-R**) has a 0.1 mm<sup>2</sup> 3-core (thru-beam type emitter: 2-core) bending-resistant cabtyre cable, 2 m **6.562 ft** long.

## I/O CIRCUIT AND WIRING DIAGRAMS

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

NPN output type

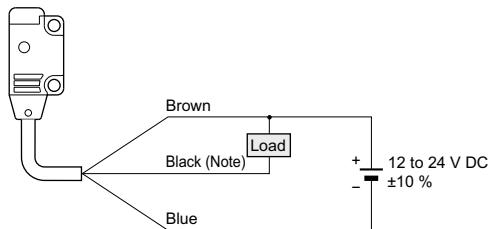
### I/O circuit diagram



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

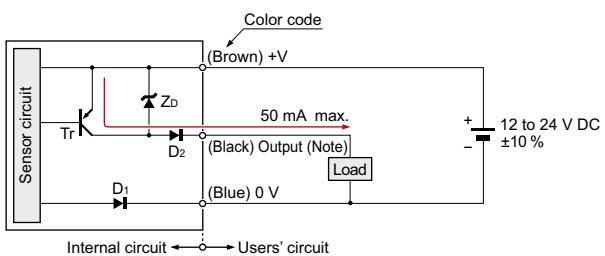


Note: The emitter of the thru-beam type sensor does not incorporate the black wire.

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

PNP output type

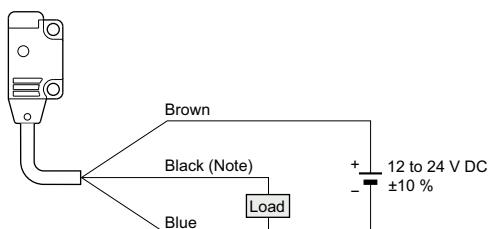
### I/O circuit diagram



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

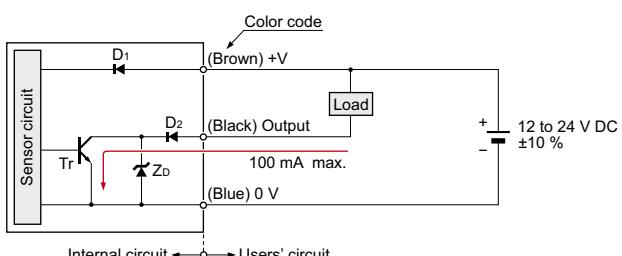


Note: The emitter of the thru-beam type sensor does not incorporate the black wire.

EX-15□ EX-15E□ EX-17□ EX-17E□

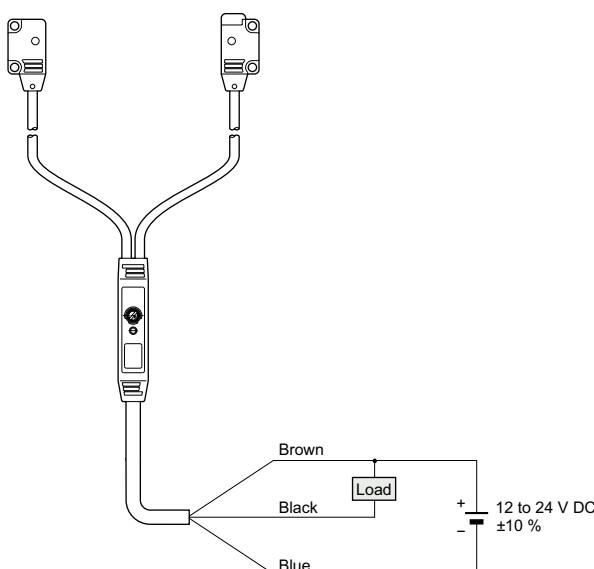
NPN output type

### 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



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

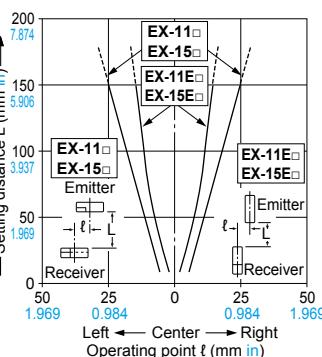
RX

RT-610

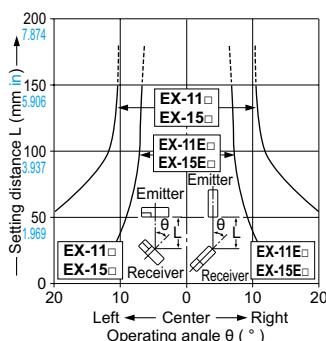
## SENSING CHARACTERISTICS (TYPICAL)

### 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.



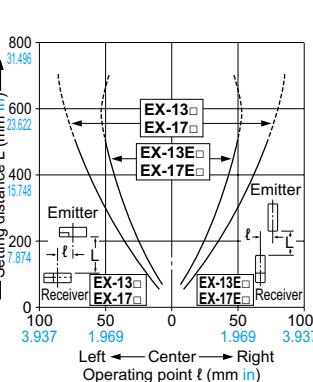
Beam from Emitter 1  
may be caught by Receiver 2.



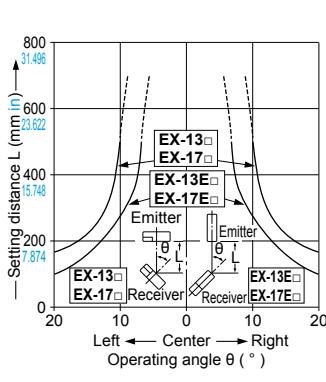
There is no problem when  
sensors are installed in  
parallel  
(although the distance  
between sensors should be  
 $l \times 2$  or more).

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

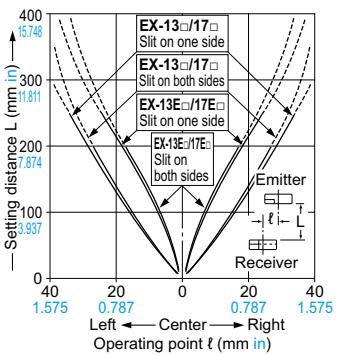
#### Parallel deviation



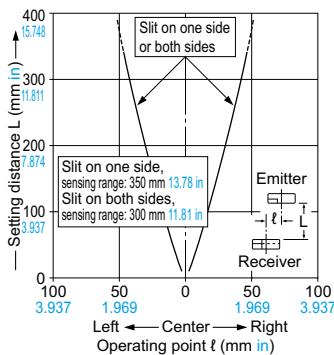
#### Angular deviation



#### Parallel deviation with slit masks ( $\varnothing 1.2$ mm $\varnothing 0.047$ in)

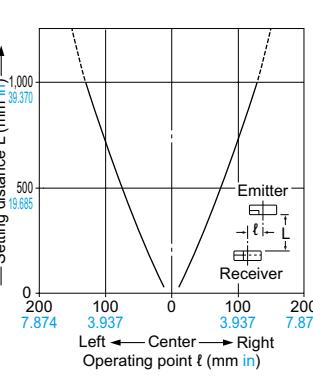


#### Parallel deviation with slit masks ( $\varnothing 1.5$ mm $\varnothing 0.059$ in)

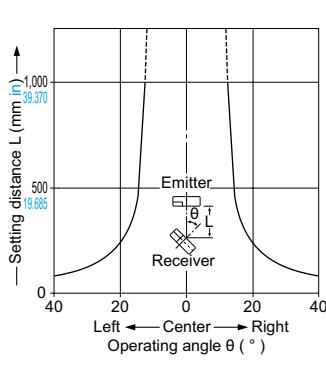


### EX-19□

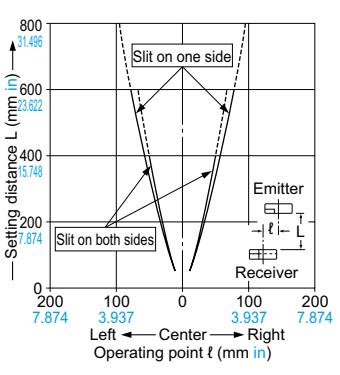
#### Parallel deviation



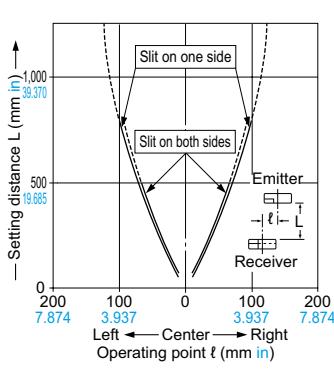
#### Angular deviation



#### Parallel deviation with slit masks ( $\varnothing 1.2$ mm $\varnothing 0.047$ in)



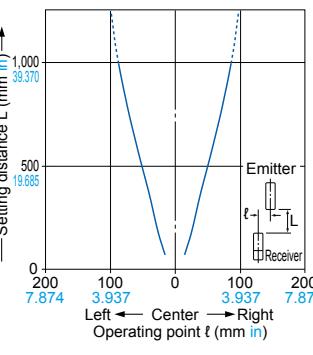
#### Parallel deviation with slit masks ( $\varnothing 1.5$ mm $\varnothing 0.059$ in)



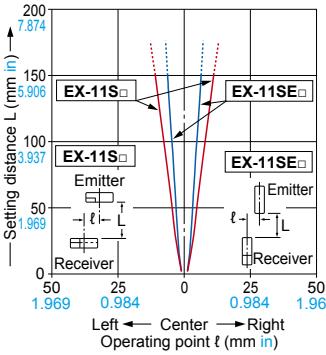
### EX-19E□ Thru-beam type

### EX-11S□/EX-11SE□ Thru-beam type

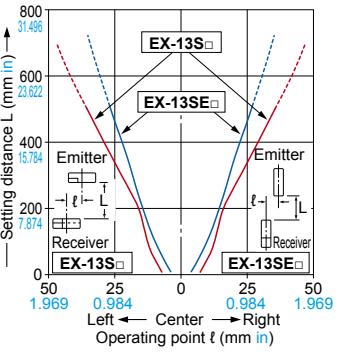
#### Parallel deviation



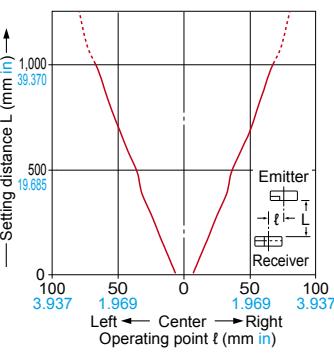
#### Parallel deviation



#### Parallel deviation



#### Parallel deviation



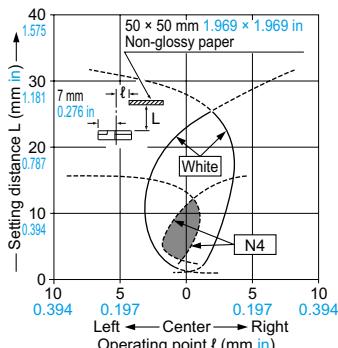
## SENSING CHARACTERISTICS (TYPICAL)

### EX-14□

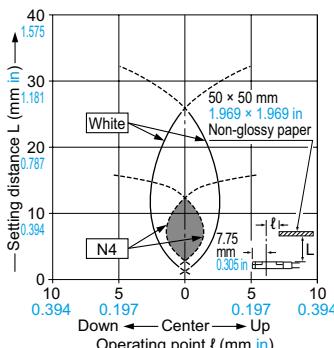
Convergent reflective type

#### Sensing fields

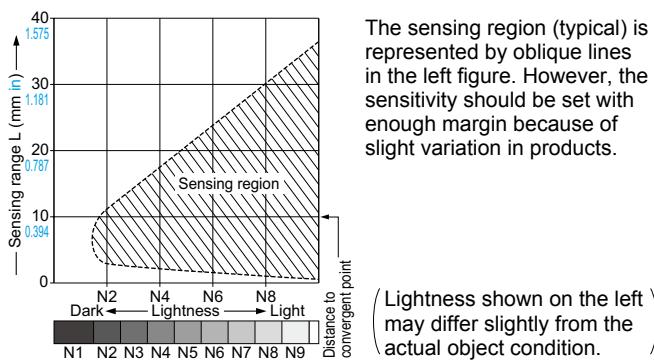
- Horizontal (left and right) direction



- Vertical (up and down) direction

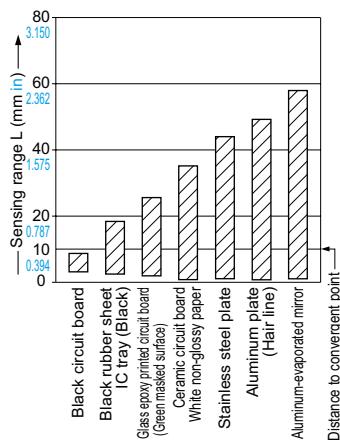


#### Correlation between lightness and sensing range



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.

#### Correlation between material (50 x 50 mm 1.969 x 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

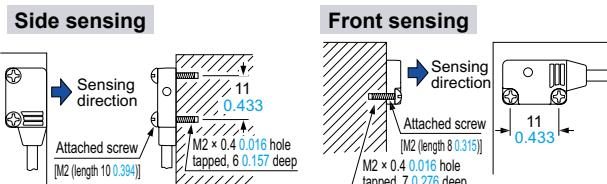
Refer to p.1552~ for general precautions.



- 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.

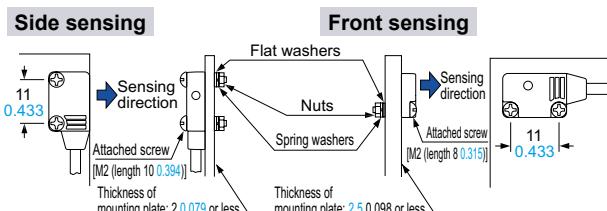
#### Mounting

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



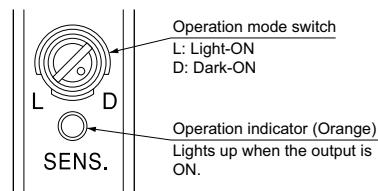
The tightening torque should be 0.2 N·m or less.

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



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.

- 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

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

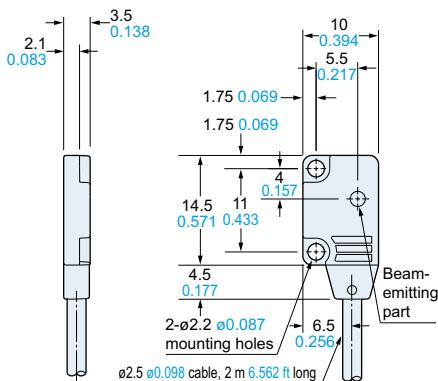
RT-610

The CAD data can be downloaded from our website.

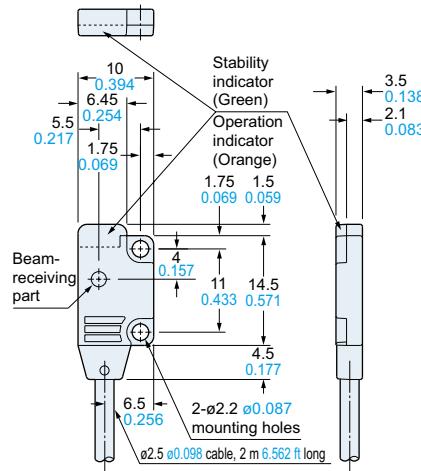
## DIMENSIONS (Unit: mm in)

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

Sensor



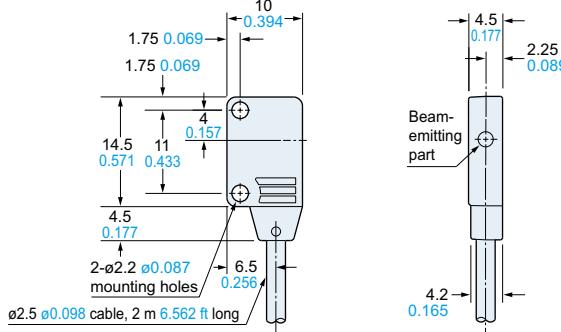
Emitter



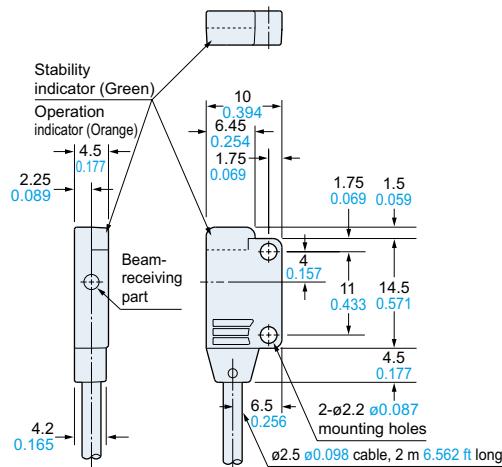
Receiver

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

Sensor



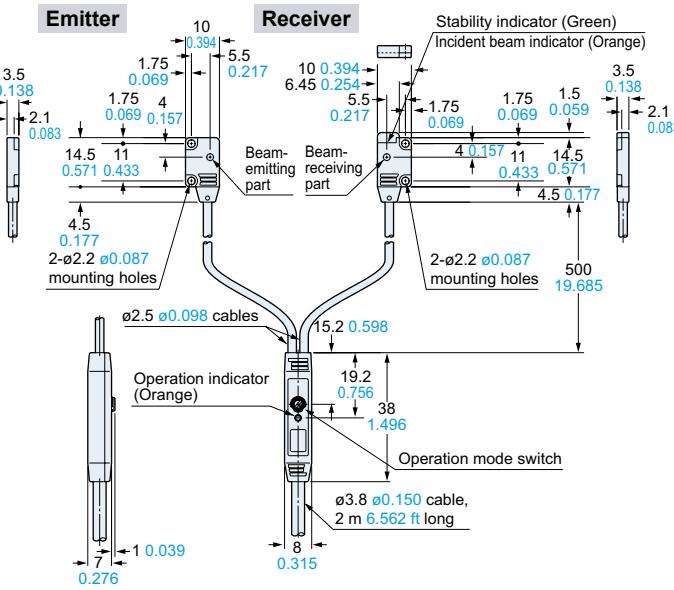
Emitter



Receiver

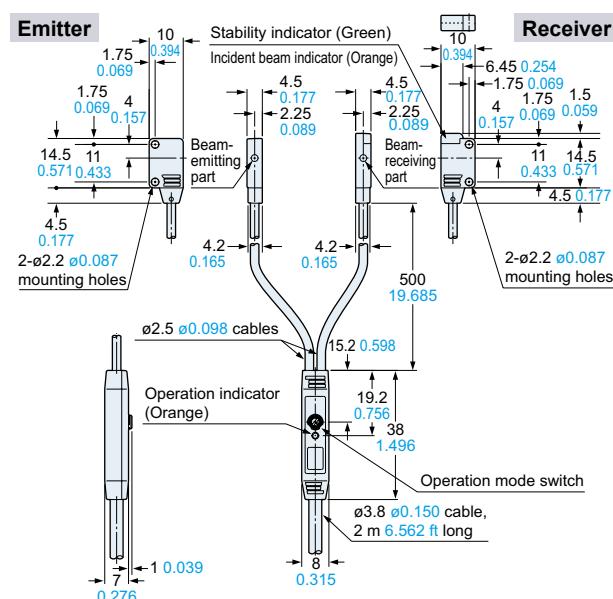
EX-15 EX-17

Sensor



EX-15E EX-17E

Sensor

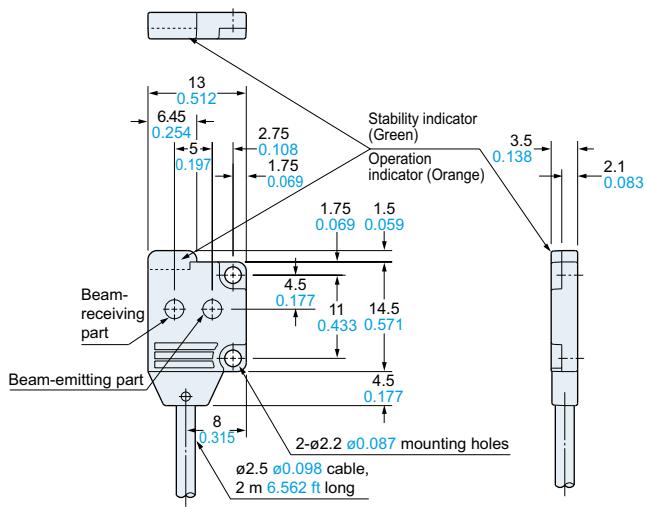


## DIMENSIONS (Unit: mm in)

The CAD data can be downloaded from our website.

**EX-14□**

## Sensor

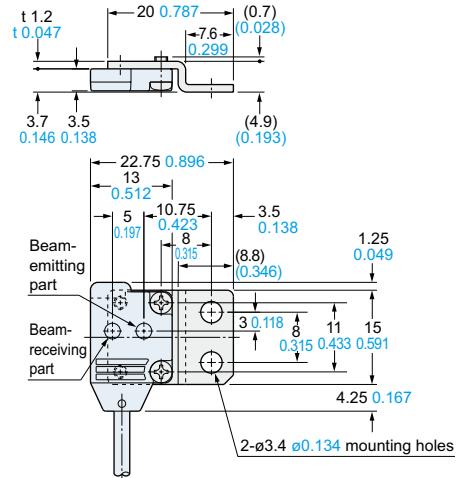


MS-EX10-1

#### Sensor mounting bracket (Optional)

## Assembly dimensions

## Mounting drawing with EX-14□

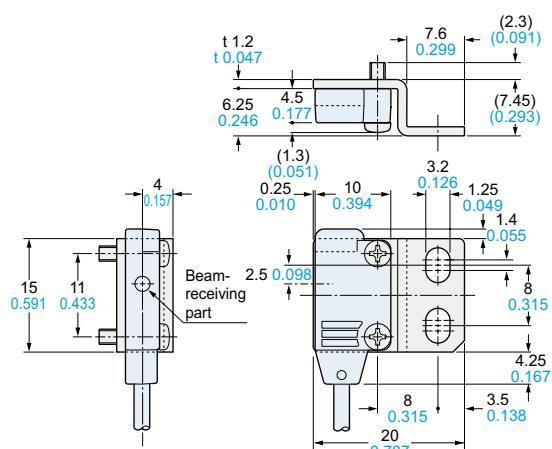


MS-EX10-2

### 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.

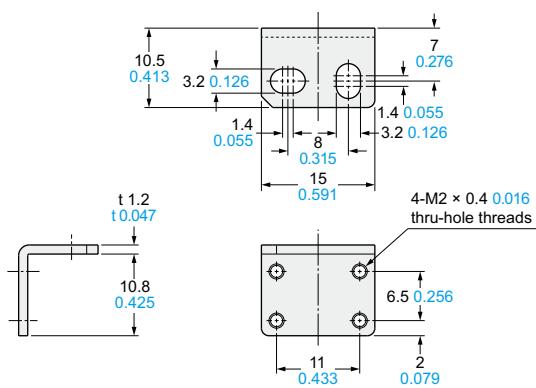
FIBER SENSORS	Selection Guide
LASER SENSORS	Amplifier Built-in
PHOTO-ELECTRIC SENSORS	Power Supply Built-in
MICRO PHOTO ELECTRIC SENSORS	Amplifier-separated
AREA SENSORS	<b>EX-Z</b>
SAFETY/LIGHT SAFETY COMPONENTS	<b>CX-400</b>
PRESSURE FLOW SENSORS	<b>CY-100</b>
INDUCTIVE PROXIMITY SENSORS	<b>EX-10</b>
PARTICULATE USE SENSORS	<b>EX-20</b>
SENSOR OPTIONS	<b>EX-30</b>
WIRE-SAVING UNITS	<b>EX-40</b>
WIRE-SAVING SYSTEMS	<b>CX-440</b>
MEASUREMENT SENSORS	<b>EQ-30</b>
STATIC CONTROL DEVICES	<b>EQ-500</b>
LASER MARKERS	<b>MQ-W</b>
PLC	<b>RX-LS200</b>
HUMAN MACHINE INTERFACES	<b>RX</b>
ENERGY MANAGEMENT SOLUTIONS	<b>RT-610</b>
FA COMPONENTS	
MACHINE VISION SYSTEMS	
UV CURING SYSTEMS	



## DIMENSIONS (Unit: mm in)

The CAD data can be downloaded from our website.

MS-EX10-13



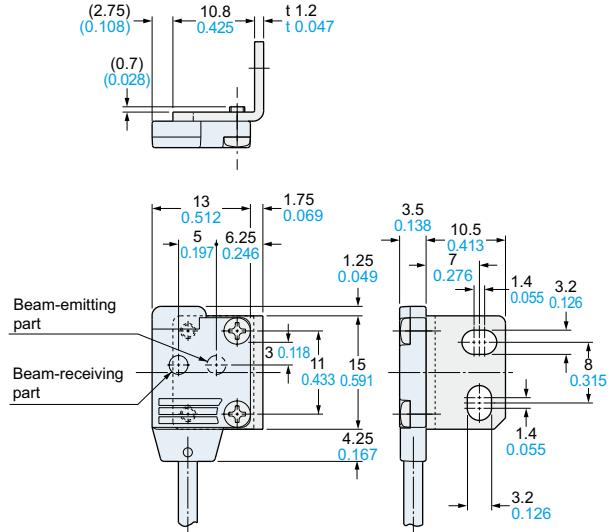
Material: Stainless steel (SUS304)

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.

Sensor mounting bracket (Optional)

### Assembly dimensions

Mounting drawing with EX-14□



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

MEASURE-  
MENT  
SENSORS

STATIC  
CONTROL  
DEVICES

LASER  
MARKERS

PLC

HUMAN  
MACHINE  
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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-300

EQ-500

MQ-W

RX-LS200

RX

RT-610