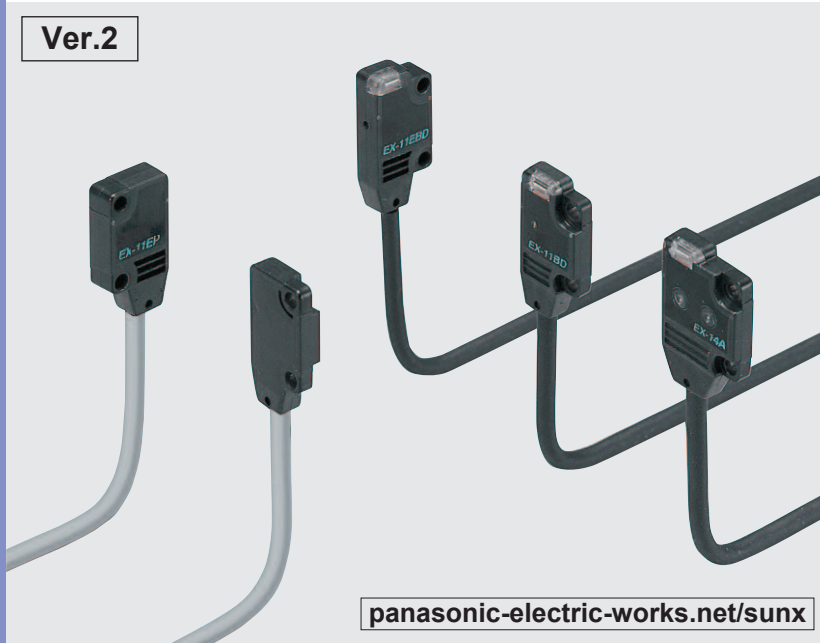


# EX-10 SERIES Ver.2

Related Information

- General terms and conditions..... F-17
- Sensor selection guide..... P.283~
- Glossary of terms / General precautions ..... P.1359~ / P.1405
- Korea's S-mark..... P.1410

Ver.2



[panasonic-electric-works.net/sunx](http://panasonic-electric-works.net/sunx)



PNP output type available

## Amplifier built-in extraordinarily small and slim size

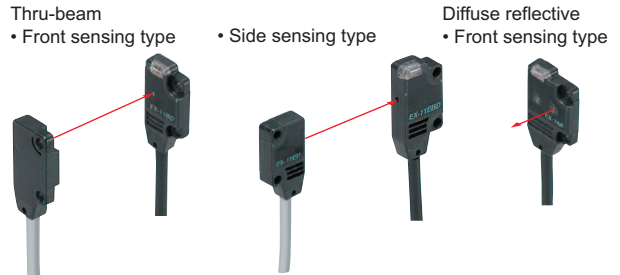
### Smallest body, just 3.5 mm 0.138 in thick

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.

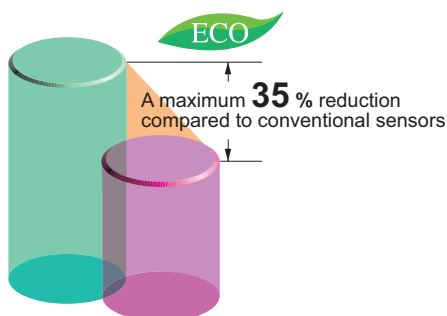


## BASIC PERFORMANCE

### Electric power saving \*

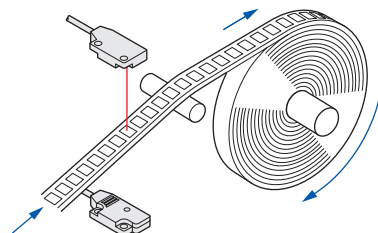
The EX-10 series achieves reductions in power consumption of up to 65%. These sensors contribute to environmental friendliness.

\* 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.



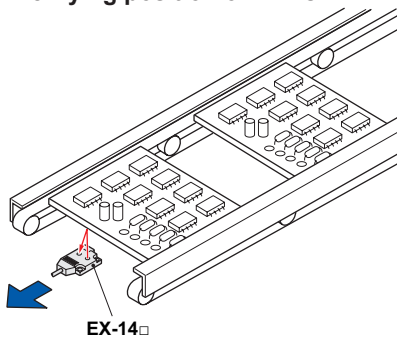
- FIBER SENSORS
- LASER SENSORS
- PHOTOELECTRIC SENSORS
- MICRO PHOTOELECTRIC SENSORS
- AREA SENSORS
- LIGHT CURTAINS
- PRESSURE / FLOW SENSORS
- INDUCTIVE PROXIMITY SENSORS
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- Selection Guide
- Amplifier Built-in
- Power Supply Built-in
- Amplifier-separated

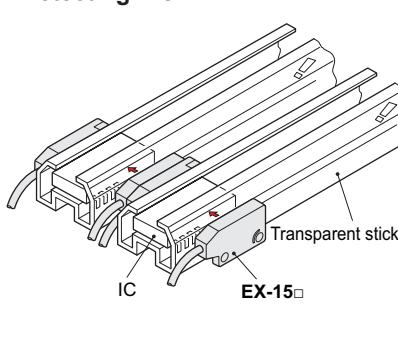
- CX-400
- EX-10
- EX-20
- EX-30
- EX-40
- CX-440
- EQ-30
- EQ-500
- MQ-W
- RX-LS200
- RX
- RT-610

**APPLICATIONS**

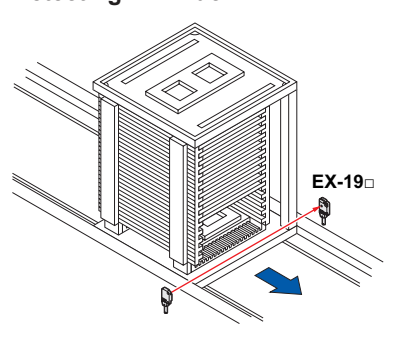
**Verifying position of PCBs**



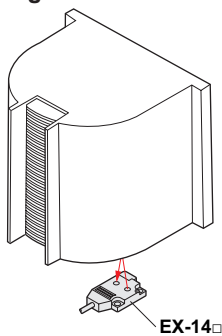
**Detecting ICs**



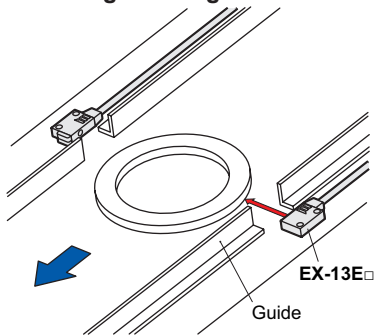
**Detecting PCB rack**



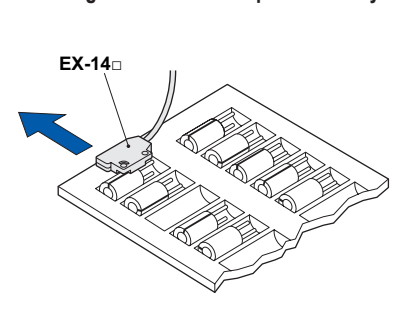
**Detecting wafer cassette**



**Detecting thin ring**



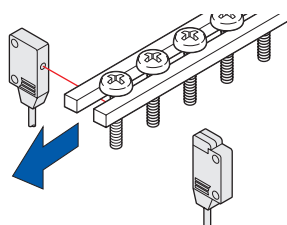
**Checking for absence of capacitor in tray**



**BASIC PERFORMANCE**

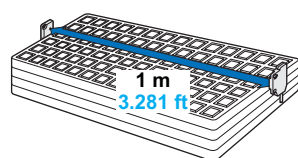
Minimum sensing object:  $\varnothing 1 \text{ mm } \varnothing 0.039 \text{ in}$  **EX-11(E), EX-15(E)**

**EX-11, EX-11E, EX-15** and **EX-15E** are incorporated with  $\varnothing 1 \text{ mm } \varnothing 0.039 \text{ in}$  slit masks so that  $\varnothing 1 \text{ mm } \varnothing 0.039 \text{ in}$ , 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**

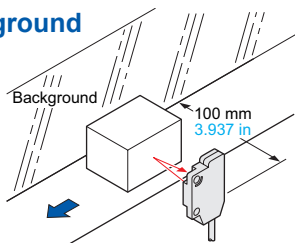
A sensing range of 1 m 3.281 ft has been realized with a slim size of just 3.5 mm 0.138 in. It can be used to detect even wide IC trays.



**Background suppression**

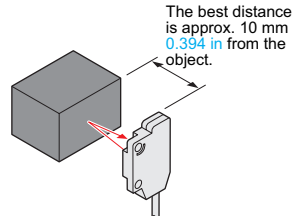
**Hardly affected by background**

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.



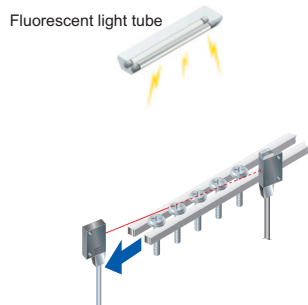
**EX-14**

**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 sensor can be hosed down because of its IP67 construction and the non-corrosive stainless steel mounting bracket.

Note: However, take care that if it is exposed to water splashes during operation, it may detect a water drop itself.

**Bending durability**

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

**EX-□-R**

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**EX-10**

**EX-20**

**EX-30**

**EX-40**

**CX-440**

**EQ-30**

**EQ-500**

**MQ-W**

**RX-LS200**

**RX**

**RT-610**

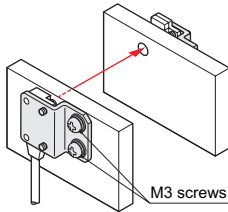
- FIBER SENSORS
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**MOUNTING / SIZE**

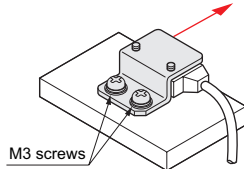
**Mountable with M3 screws**

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

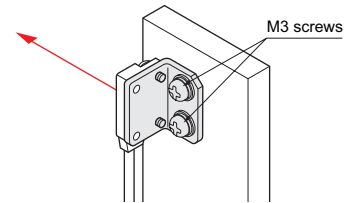
- **MS-EX10-1**  
[Cold rolled carbon steel (SPCC)]  
**MS-EX10-11**  
[Stainless steel (SUS304)]  
(mounting bracket for the front sensing type)



- **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)



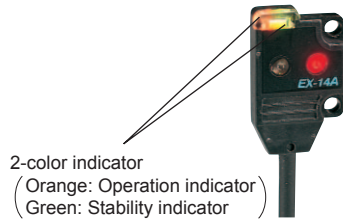
**Red beam makes beam alignment easy**

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.



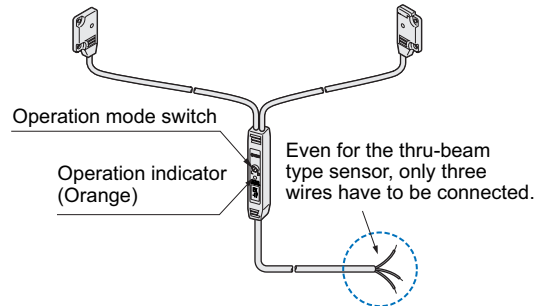
2-color indicator  
(Orange: Operation indicator)  
(Green: Stability indicator)

**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.



Operation mode switch  
Operation indicator (Orange)  
Even for the thru-beam type sensor, only three wires have to be connected.

**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.



ECO

CX-400

EX-10

EX-20

EX-30

EX-40

CX-440

EQ-30

EQ-500

MQ-W

RX-LS200

RX

RT-610

**ORDER GUIDE**

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

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

- 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. (e.g.) Emitter of **EX-11A**: **EX-11P**, Receiver of **EX-11A**: **EX-11AD**

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Power Supply Built-in

Amplifier-separated

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**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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- EQ-500
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- RX-LS200
- RX
- RT-610

## ORDER GUIDE

### Flexible cable type

Flexible cable type is also available for NPN output type. (excluding sensor with operation mode switch on the bifurcation **EX-15□/17□**)  
 When ordering this type, suffix "-R" to the model No.  
 (e.g.) Flexible 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 flexible 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

Designation	Model No.	Description
Sensor mounting bracket	<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)	Slit on one side <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 ø0.079 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□, 200 mm <b>7.874 in</b> [EX-13□, EX-17□]</li> <li>• Min. sensing object: ø1.2 mm ø0.047 in</li> </ul>
	<b>OS-EX10-15</b> (Slit size ø1.5 mm ø0.059 in)	Slit on one side <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 ø0.079 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□, 300 mm <b>11.811 in</b> [EX-13□]</li> <li>• Min. sensing object: ø1.5 mm ø0.059 in</li> </ul>
	<b>OS-EX10E-12</b> (Slit size ø1.2 mm ø0.047 in)	Slit on one side <ul style="list-style-type: none"> <li>• Sensing range: 250 mm <b>9.843 in</b> [EX-13E□, EX-17E□]</li> <li>• Min. sensing object: ø2 mm ø0.079 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: ø1.2 mm ø0.047 in</li> </ul>
Sensor checker (Note)	<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.

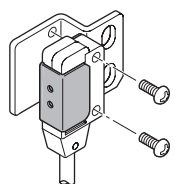
Note: Refer to the sensor checker **CHX-SC2** pages for details.

### Slit mask

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



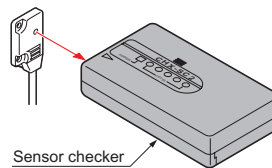
Example of mounting  
(**OS-EX10E-12**)



Tighten along with the sensor mounting bracket.

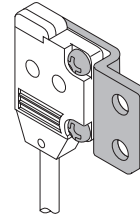
### Sensor checker

- **CHX-SC2**



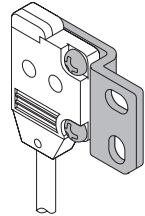
### Sensor mounting bracket

- **MS-EX10-1**



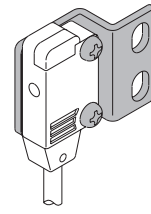
Material: Cold rolled carbon steel (SPCC) (Uni-chrome plated)  
 Two M2 (length 4 mm **0.157 in**) pan head screws are attached.

- **MS-EX10-11**



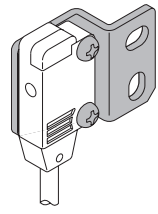
Material: Stainless steel (SUS304)  
 Two M2 (length 4 mm **0.157 in**) pan head screws [stainless steel (SUS304)] are attached.

- **MS-EX10-2**



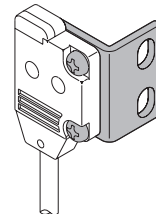
Material: Cold rolled carbon steel (SPCC) (Uni-chrome plated)  
 Two M2 (length 8 mm **0.315 in**) pan head screws are attached.

- **MS-EX10-12**



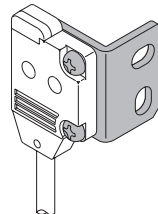
Material: Stainless steel (SUS304)  
 Two M2 (length 8 mm **0.315 in**) pan head screws [stainless steel (SUS304)] are attached.

- **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.

## SPECIFICATIONS

Item	Type		Thru-beam					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-11A(-PN)	EX-11EA(-PN)	EX-13A(-PN)	EX-13EA(-PN)	EX-19A(-PN)	EX-14A(-PN)	EX-15 (Note 3)	EX-15E (Note 3)	EX-17 (Note 3)	EX-17E (Note 3)	
	Dark-ON	EX-11B(-PN)	EX-11EB(-PN)	EX-13B(-PN)	EX-13EB(-PN)	EX-19B(-PN)	EX-14B(-PN)						
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			$\phi 1$ mm <b><math>\phi 0.039</math> in</b> opaque object (Completely beam interrupted object) (Setting distance between emitter and receiver: 150 mm <b>5.906 in</b> )		$\phi 2$ mm <b><math>\phi 0.079</math> in</b> opaque object (Completely beam interrupted object) (Setting distance between emitter and receiver: 500 mm <b>19.685 in</b> )		$\phi 2$ mm <b><math>\phi 0.079</math> in</b> opaque object (Completely beam interrupted object) (Setting distance between emitter and receiver: 1 m <b>3.281 ft</b> )	$\phi 0.1$ mm <b><math>\phi 0.004</math> in</b> copper wire (Completely beam interrupted object) (Setting distance: 10 mm <b>0.394 in</b> )	$\phi 1$ mm <b><math>\phi 0.039</math> in</b> opaque object (Completely beam interrupted object) (Setting distance between emitter and receiver: 150 mm <b>5.906 in</b> )		$\phi 2$ mm <b><math>\phi 0.079</math> 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		0.05 mm <b>0.002 in</b> or less		0.1 mm <b>0.004 in</b> or less	0.1 mm <b>0.004 in</b> or less	0.05 mm <b>0.002 in</b> or less		0.05 mm <b>0.002 in</b> or less		
Supply voltage			12 to 24 V DC $\pm 10$ %		12 to 24 V DC $\pm 10$ %		Ripple P-P 10 % or less	Ripple P-P 10 % or less	12 to 24 V DC $\pm 10$ %		12 to 24 V DC $\pm 10$ %		
Current consumption			Emitter: 10 mA or less, Receiver: 10 mA or less		Emitter: 10 mA or less, Receiver: 10 mA or less		13 mA or less	13 mA or less	25 mA or less		25 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)		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)		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)		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			DC-12 or DC-13		DC-12 or DC-13		DC-12 or DC-13		DC-12 or DC-13		DC-12 or DC-13		
Short-circuit protection			Incorporated		Incorporated		Incorporated		Incorporated		Incorporated		
Response time			0.5 ms or less		0.5 ms or less		0.5 ms or less		0.5 ms or less		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)		Orange LED (lights up when the output is ON)		Orange LED (lights up when the output is ON), located on the bifurcation		Orange LED (lights up when the output is ON), located on the bifurcation		
Incident beam indicator			—————		—————		—————		Red LED (lights up under light received condition), located on the receiver		Red 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)		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		Green LED (lights up under stable light received condition or stable dark condition), located on the receiver		
Environmental resistance	Pollution degree			3 (Industrial environment)		3 (Industrial environment)		3 (Industrial environment)		3 (Industrial environment)		3 (Industrial environment)	
	Protection			IP67 (IEC)		IP67 (IEC)		IP67 (IEC)		IP67 (IEC)		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>		-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>		-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>		-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>		-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		35 to 85 % RH, Storage: 35 to 85 % RH		35 to 85 % RH, Storage: 35 to 85 % RH		35 to 85 % RH, Storage: 35 to 85 % RH		35 to 85 % RH, Storage: 35 to 85 % RH	
	Ambient illuminance			Incandescent light: 3,000 lx at the light-receiving face		Incandescent light: 3,000 lx at the light-receiving face		Incandescent light: 3,000 lx at the light-receiving face		Incandescent light: 3,000 lx at the light-receiving face		Incandescent light: 3,000 lx at the light-receiving face	
	EMC			EN 60947-5-2		EN 60947-5-2		EN 60947-5-2		EN 60947-5-2		EN 60947-5-2	
	Voltage withstandability			1,000 V AC for one min. between all supply terminals connected together and enclosure		1,000 V AC for one min. between all supply terminals connected together and enclosure		1,000 V AC for one min. between all supply terminals connected together and enclosure		1,000 V AC for one min. between all supply terminals connected together and enclosure		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		20 M $\Omega$ , or more, with 250 V DC megger between all supply terminals connected together and enclosure		20 M $\Omega$ , or more, with 250 V DC megger between all supply terminals connected together and enclosure		20 M $\Omega$ , or more, with 250 V DC megger between all supply terminals connected together and enclosure		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> amplitude in X, Y and Z directions for two hours each		10 to 500 Hz frequency, 3 mm <b>0.118 in</b> amplitude in X, Y and Z directions for two hours each		10 to 500 Hz frequency, 3 mm <b>0.118 in</b> amplitude in X, Y and Z directions for two hours each		10 to 500 Hz frequency, 3 mm <b>0.118 in</b> amplitude in X, Y and Z directions for two hours each		10 to 500 Hz frequency, 3 mm <b>0.118 in</b> 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 for three times each		500 m/s <sup>2</sup> acceleration (50 G approx.) in X, Y and Z directions for three times each		500 m/s <sup>2</sup> acceleration (50 G approx.) in X, Y and Z directions for three times each		500 m/s <sup>2</sup> acceleration (50 G approx.) in X, Y and Z directions for three times each		500 m/s <sup>2</sup> acceleration (50 G approx.) in X, Y and Z directions for three times each		
Emitting element			Red LED (Peak emission wavelength: 680 nm <b>0.027 mil</b> , modulated)		Red LED (Peak emission wavelength: 680 nm <b>0.027 mil</b> , modulated)		Red LED (Peak emission wavelength: 680 nm <b>0.027 mil</b> , modulated)		Red LED (Peak emission wavelength: 680 nm <b>0.027 mil</b> , modulated)		Red LED (Peak emission wavelength: 680 nm <b>0.027 mil</b> , modulated)		
Material			Enclosure: Polyethylene terephthalate Lens: Polyallylate		Enclosure: Polyethylene terephthalate Lens: Polyallylate		Enclosure: Polyethylene terephthalate Lens: Polyallylate		Enclosure: Polyethylene terephthalate Lens: Polyallylate		Enclosure: Polyethylene terephthalate Lens: Polyallylate		
Cable (Note 5)			0.1 mm <sup>2</sup> 3-core (thru-beam type emitter: 2-core) cabtyre cable, 2 m <b>6.562 ft</b> long		0.1 mm <sup>2</sup> 3-core (thru-beam type emitter: 2-core) cabtyre cable, 2 m <b>6.562 ft</b> long		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)		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 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 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.		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: 60 g approx.		Net weight (each emitter and receiver): 20 g approx., Gross weight: 60 g approx.		Net weight: 20 g approx. Gross weight: 40 g approx.		Net weight: 55 g approx., Gross weight: 80 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		Mounting screws: 1 set, Adjusting screwdriver: 1 pc.		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 (located on the bifurcation).

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

FIBER SENSORS

LASER SENSORS

PHOTO-ELECTRIC SENSORS

MICRO PHOTO-ELECTRIC SENSORS

AREA SENSORS

LIGHT CURTAINS

PRESSURE / FLOW SENSORS

INDUCTIVE PROXIMITY SENSORS

PARTICULAR USE SENSORS

SENSOR OPTIONS

SIMPLE WIRE-SAVING UNITS

WIRE-SAVING SYSTEMS

MEASUREMENT SENSORS

STATIC CONTROL DEVICES

ENDOSCOPE

LASER MARKERS

PLC / TERMINALS

HUMAN MACHINE INTERFACES

ENERGY CONSUMPTION VISUALIZATION COMPONENTS

FA COMPONENTS

MACHINE VISION SYSTEMS

UV CURING SYSTEMS

Selection Guide

Amplifier Built-in

Power Supply Built-in

Amplifier-separated

CX-400

EX-10

EX-20

EX-30

EX-40

CX-440

EQ-30

EQ-500

MQ-W

RX-LS200

RX

RT-610

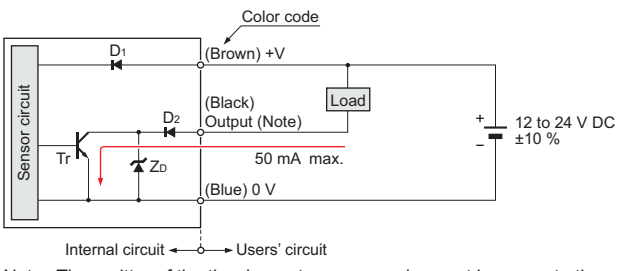
- FIBER SENSORS
- LASER SENSORS
- PHOTO-ELECTRIC SENSORS
- MICRO PHOTO-ELECTRIC SENSORS
- AREA SENSORS
- LIGHT CURTAINS
- PRESSURE / FLOW SENSORS
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- FA COMPONENTS
- MACHINE VISION SYSTEMS
- UV CURING SYSTEMS

## I/O CIRCUIT AND WIRING DIAGRAMS

EX-11□ EX-13□ EX-19□ EX-14□

NPN output type

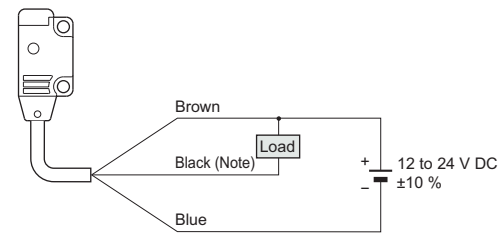
### I/O circuit diagram



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

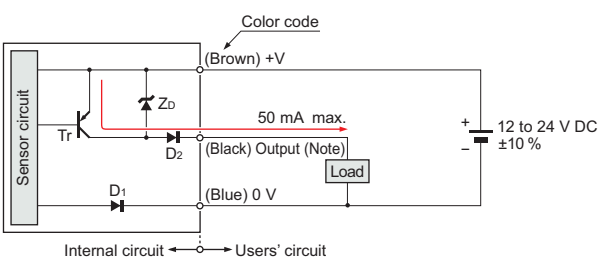


Note: The emitter of the thru-beam type sensor does not incorporate the black wire.

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

PNP output type

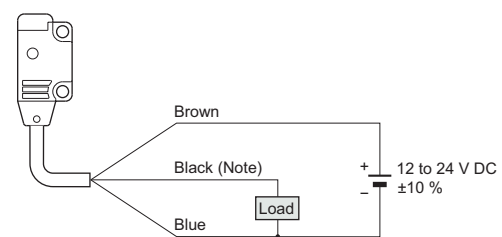
### I/O circuit diagram



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.

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

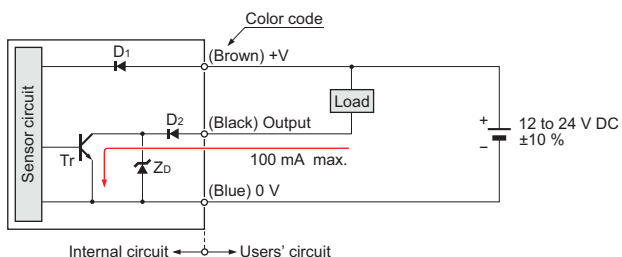
- CX-400
- EX-10**
- EX-20
- EX-30
- EX-40
- CX-440
- EQ-30
- EQ-500
- MQ-W
- RX-LS200
- RX
- RT-610

## I/O CIRCUIT AND WIRING DIAGRAMS

EX-15□ EX-15E□ EX-17□ EX-17E□ EX-17W

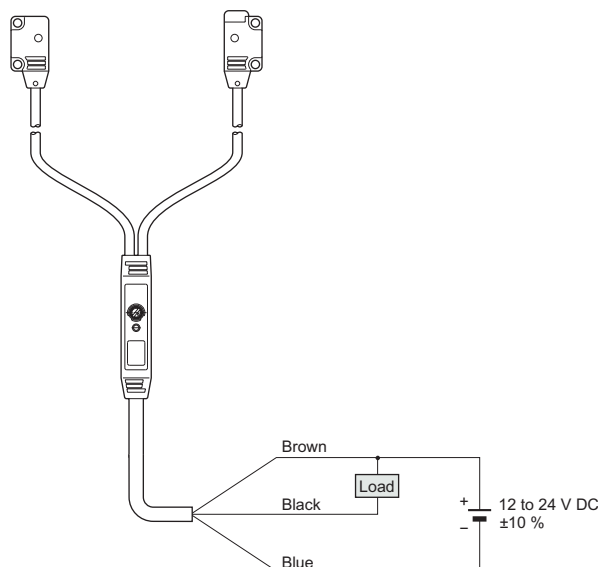
NPN output type

### 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

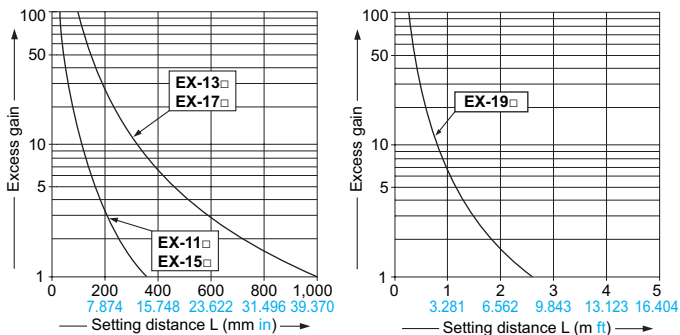


## SENSING CHARACTERISTICS (TYPICAL)

All models

Thru-beam type

### Correlation between setting distance and excess gain



FIBER SENSORS

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RX

RT-610

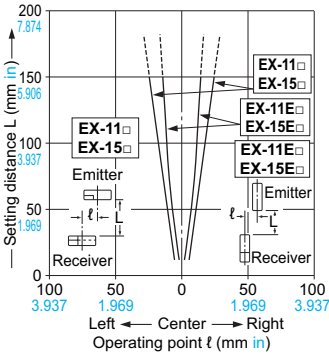


**SENSING CHARACTERISTICS (TYPICAL)**

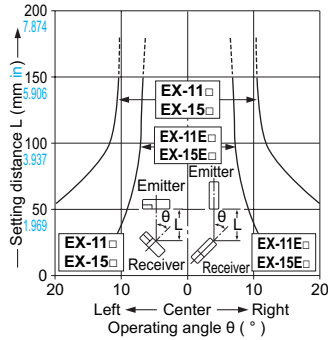
**EX-11□ EX-11E□ EX-15□ EX-15E□**

Thru-beam type

**Parallel deviation**



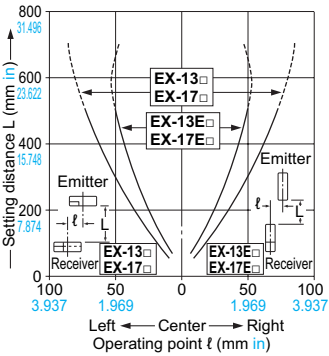
**Angular deviation**



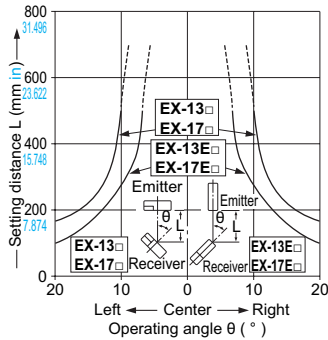
**EX-13□ EX-13E□ EX-17□ EX-17E□**

Thru-beam type

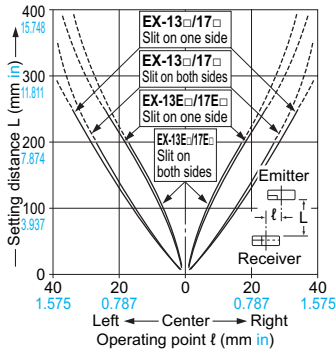
**Parallel deviation**



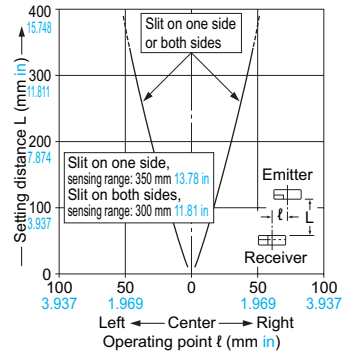
**Angular deviation**



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



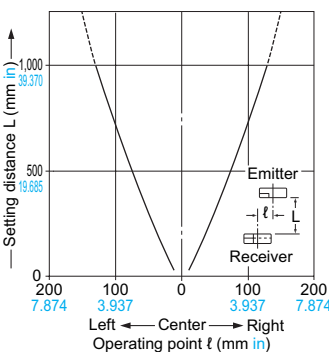
**Parallel deviation with slit masks (ø1.5 mm ø0.059 in)**



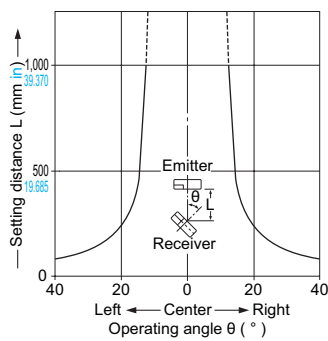
**EX-19□**

Thru-beam type

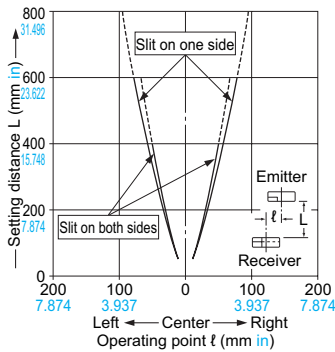
**Parallel deviation**



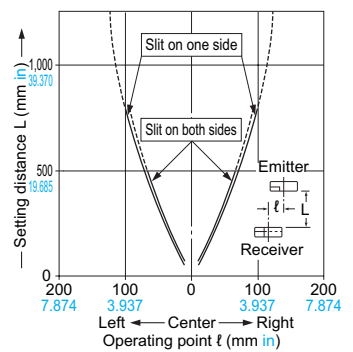
**Angular deviation**



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

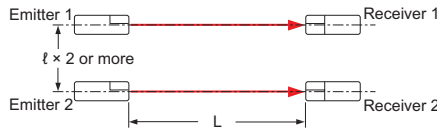
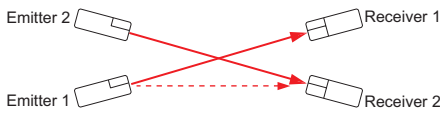


**Parallel deviation with slit masks (ø1.5 mm ø0.059 in)**



\*Optical properties of side sensing types (EX-11E/13E/15E/17E)

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).

CX-400

EX-10

EX-20

EX-30

EX-40

CX-440

EQ-30

EQ-500

MQ-W

RX-LS200

RX

RT-610

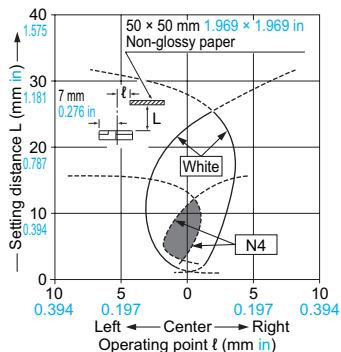
## SENSING CHARACTERISTICS (TYPICAL)

EX-14□

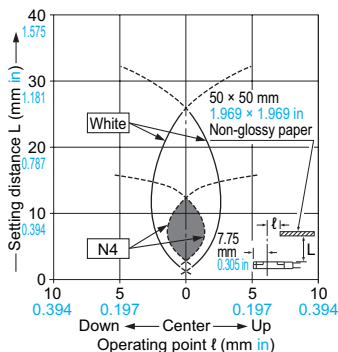
Convergent reflective type

### Sensing fields

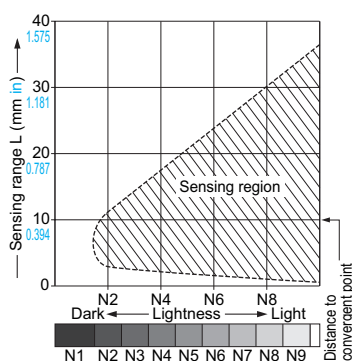
• Horizontal (left and right) direction



• Vertical (up and down) direction



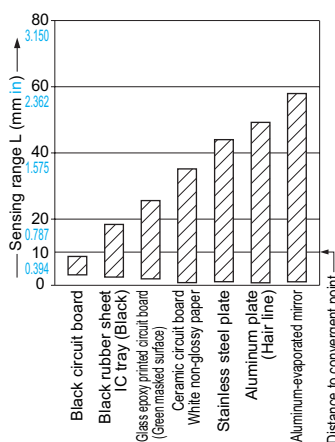
### Correlation between lightness and sensing range



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 General precautions.

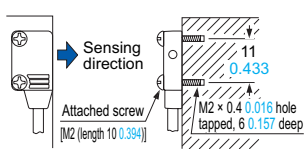


- Never use this product as a sensing device for personnel protection.
- In case of using sensing devices for personnel protection, use products which meet laws and standards, such as OSHA, ANSI or IEC etc., for personnel protection applicable in each region or country.

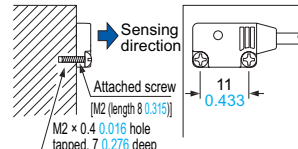
### Mounting

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

#### Side sensing



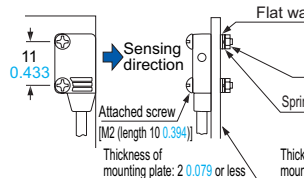
#### Front sensing



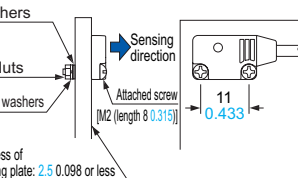
The tightening torque should be 0.2 N·m or less.

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

#### Side sensing

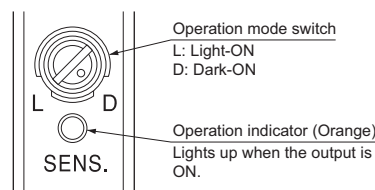


#### Front sensing



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) (EX-15□, EX-15E□, EX-17□, EX-17E□: 100 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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EQ-500

MQ-W

RX-LS200

RX

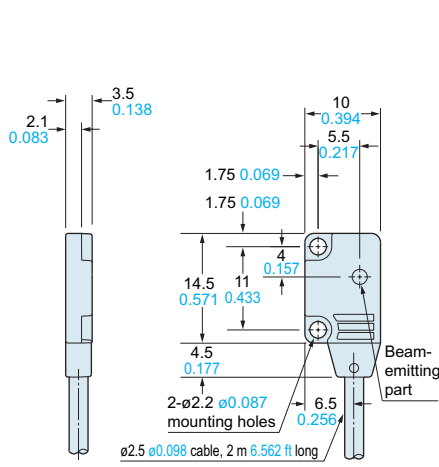
RT-610

**DIMENSIONS (Unit: mm in)**

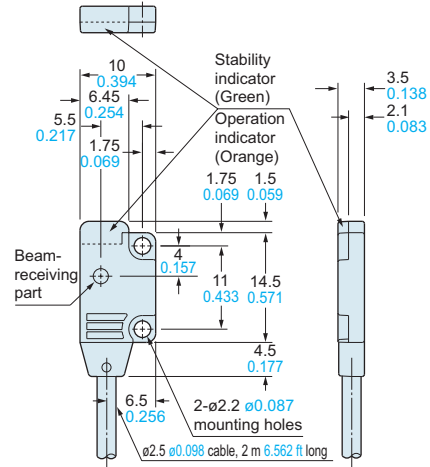
The CAD data in the dimensions can be downloaded from our website.

**EX-11A □ EX-11B □ EX-13A □ EX-13B □ EX-19A □ EX-19B □**

Sensor



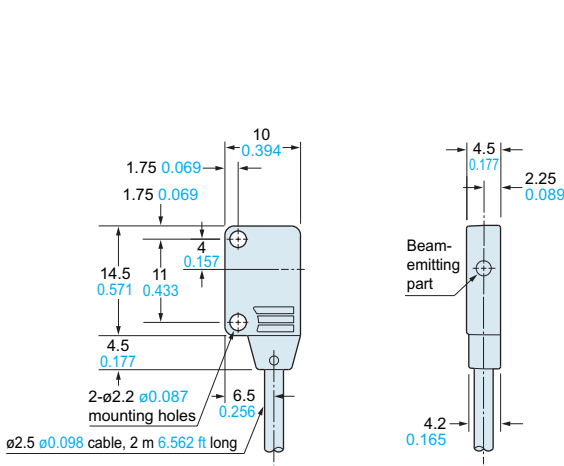
**Emitter**



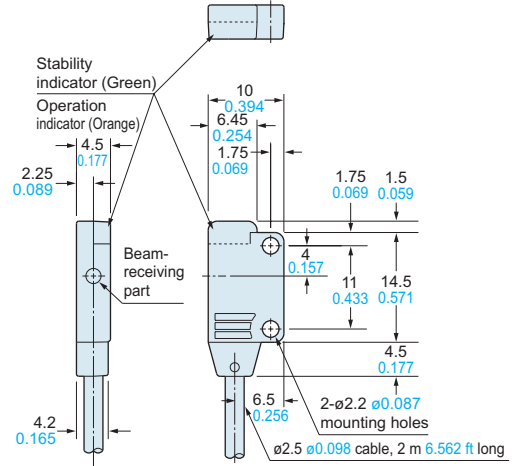
**Receiver**

**EX-11EA □ EX-11EB □ EX-13EA □ EX-13EB □**

Sensor



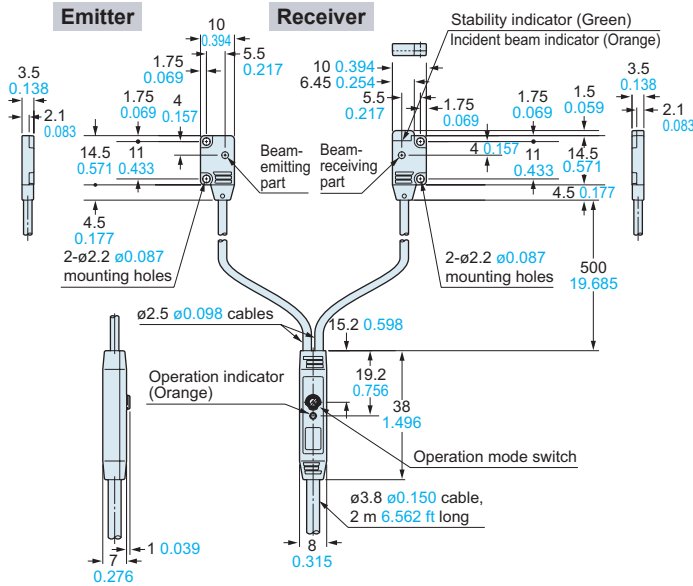
**Emitter**



**Receiver**

**EX-15 EX-17**

Sensor

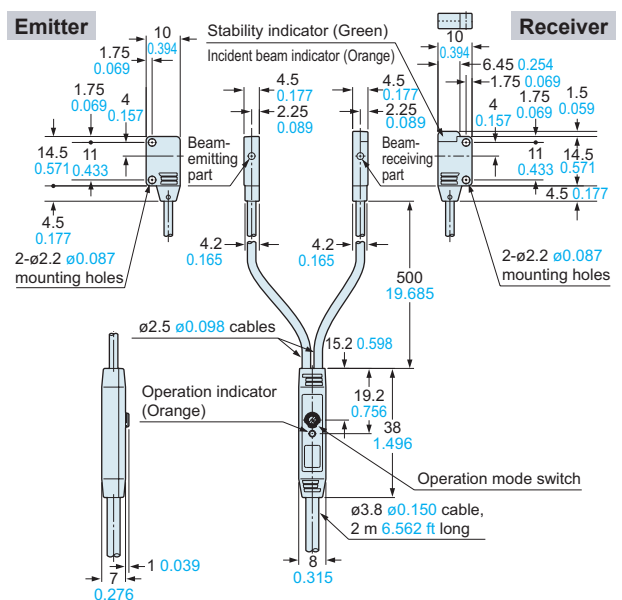


**Emitter**

**Receiver**

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

Sensor



**Emitter**

**Receiver**

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EQ-30

EQ-500

MQ-W

RX-LS200

RX

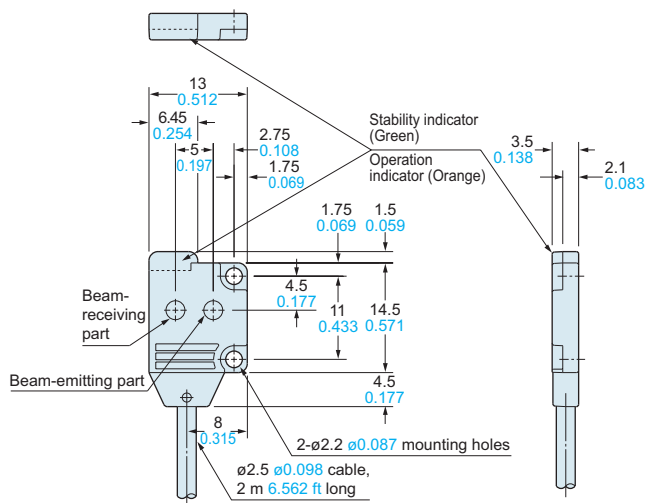
RT-610

**DIMENSIONS (Unit: mm in)**

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

**EX-14A□ EX-14B□**

Sensor

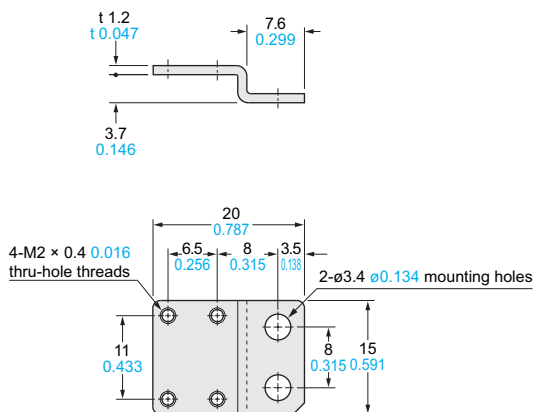


**MS-EX10-1**

Sensor mounting bracket (Optional)

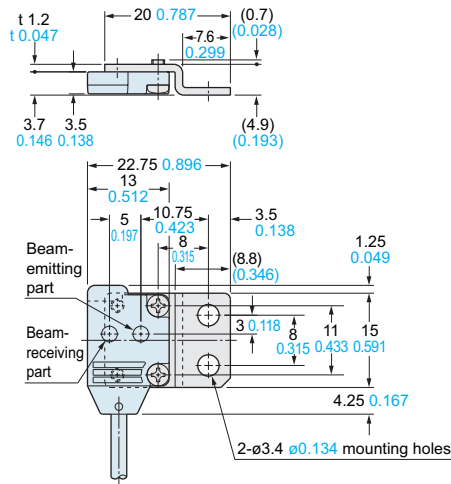
**Assembly dimensions**

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.

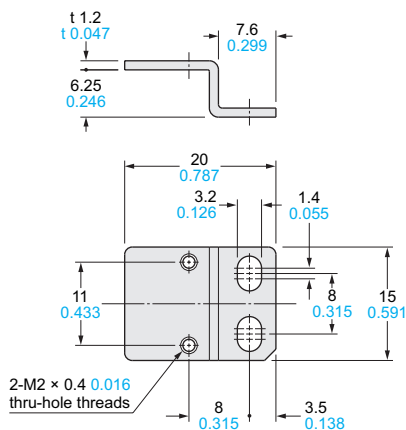


**MS-EX10-2**

Sensor mounting bracket (Optional)

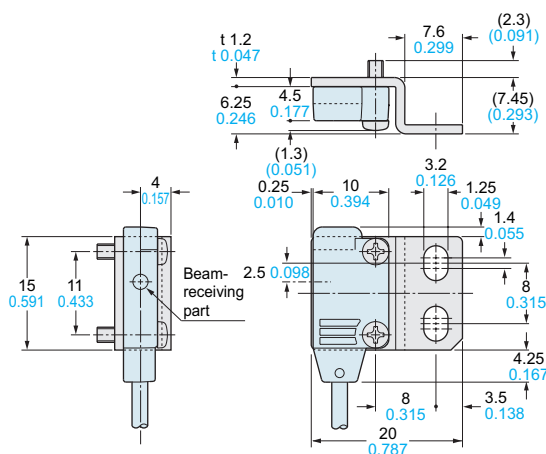
**Assembly dimensions**

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.



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EX-30

EX-40

CX-440

EQ-30

EQ-500

MQ-W

RX-LS200

RX

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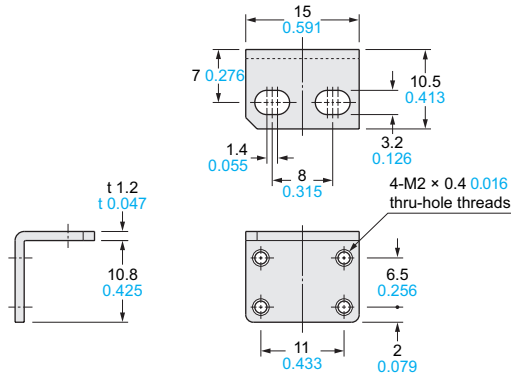
**DIMENSIONS (Unit: mm in)**

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

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**MS-EX10-3**

Sensor mounting bracket (Optional)

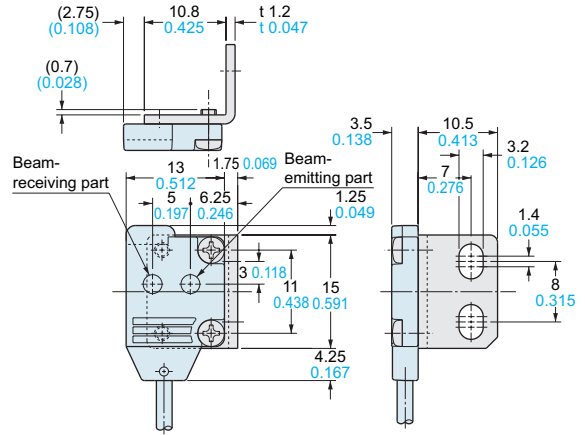


Material: Cold rolled carbon steel (SPCC)  
(Uni-chrome plated)

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.

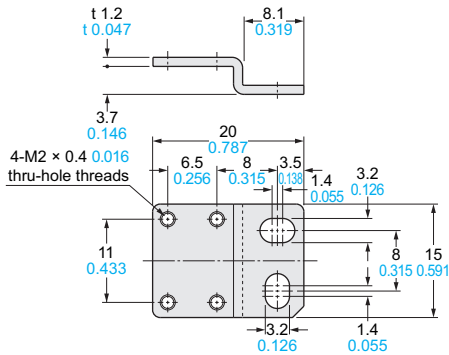
**Assembly dimensions**

Mounting drawing with EX-14□



**MS-EX10-11**

Sensor mounting bracket (Optional)

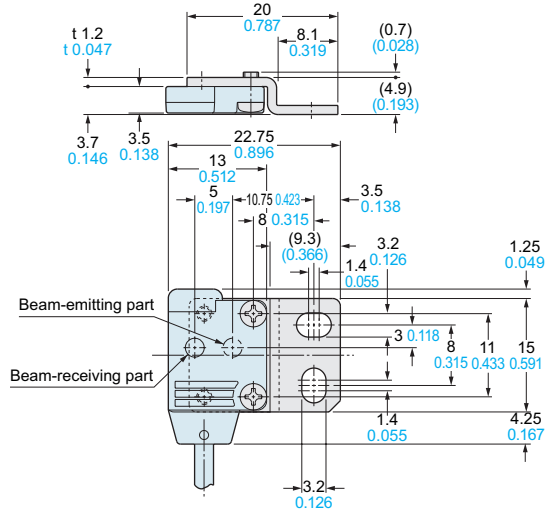


Material: Stainless steel (SUS304)

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

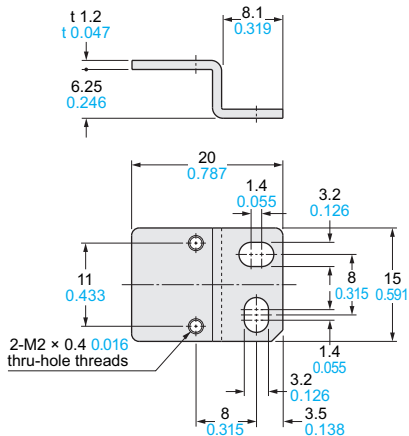
**Assembly dimensions**

Mounting drawing with EX-14□



**MS-EX10-12**

Sensor mounting bracket (Optional)

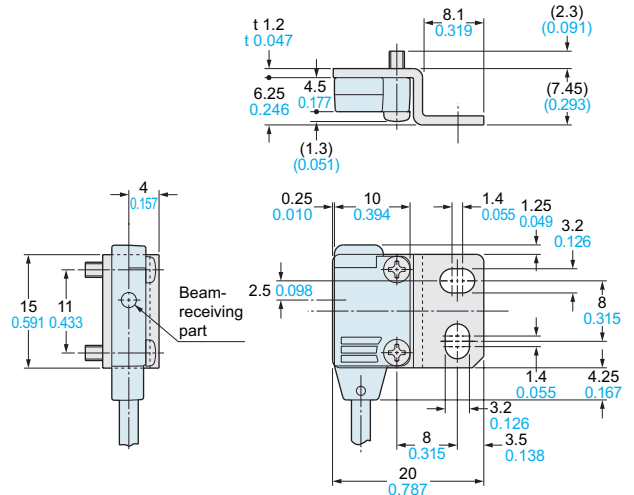


Material: Stainless steel (SUS304)

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□

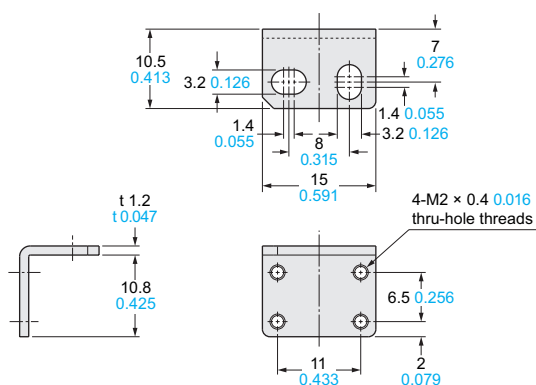


**DIMENSIONS (Unit: mm in)**

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

**MS-EX10-13**

Sensor mounting bracket (Optional)

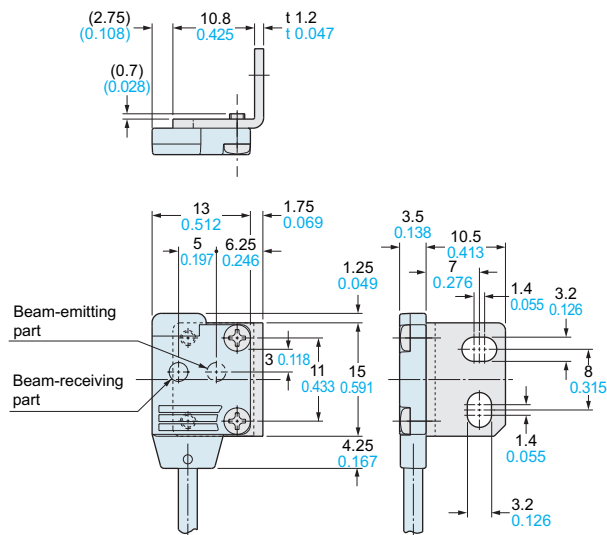


Material: Stainless steel (SUS304)

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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