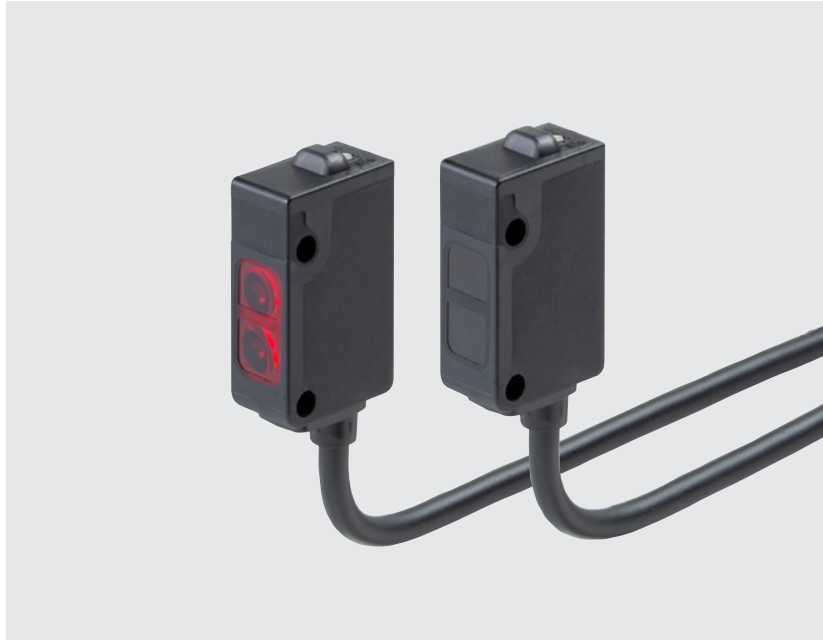


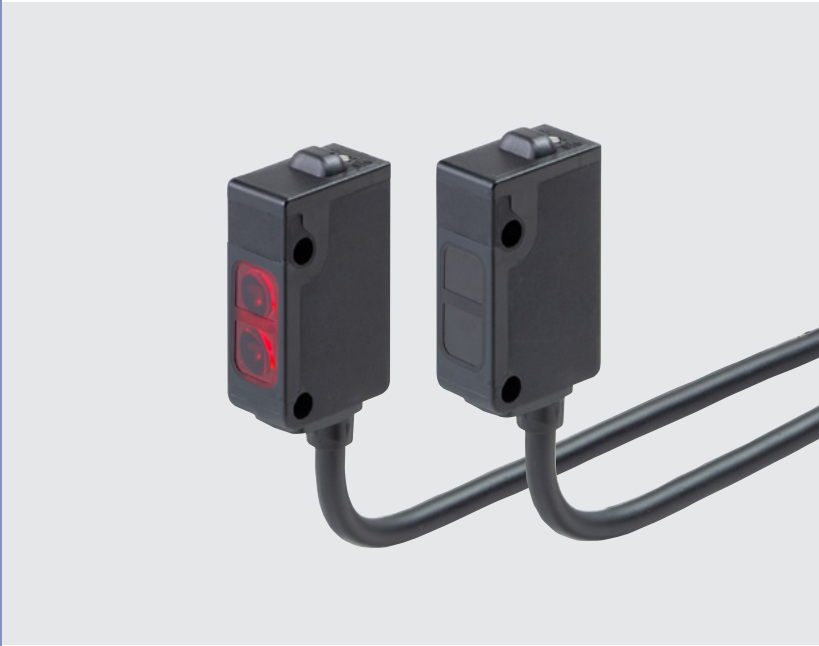
Amplifier Built-in

# Convergent Reflective Photoelectric Sensor

EX-40 SERIES



# EX-40 SERIES

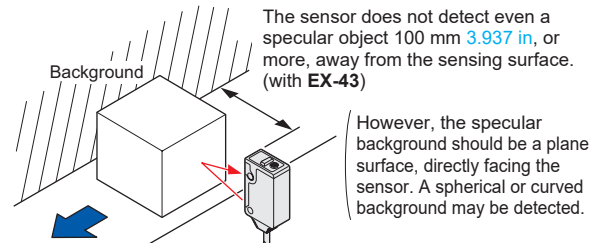
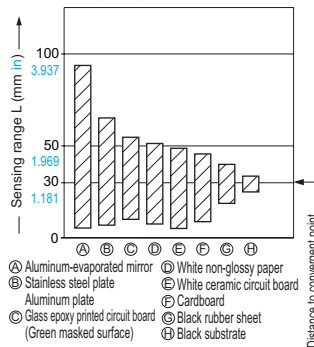


## Reliable object detection in limited area

### Stable convergent distance sensing

Due to convergent distance sensing, the color or material of the object has almost no effect. Further, the background also has very little effect, enabling stable sensing.

EX-43: Correlation between material and sensing range



### MOUNTING / SIZE

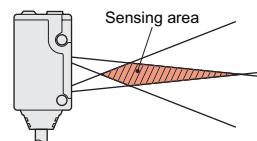
Compact size (W10 × H29 × D18 mm **W0.394 × H1.142 × D0.709 in**)

It can be installed in a limited space.

### VARIETIES

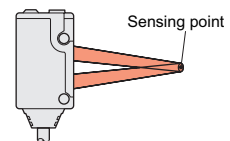
#### Various applications

##### Diffused beam type



Even in a limited sensing area, the sensor is not affected by small perforations or unevenness. It is suitable for presence detection.

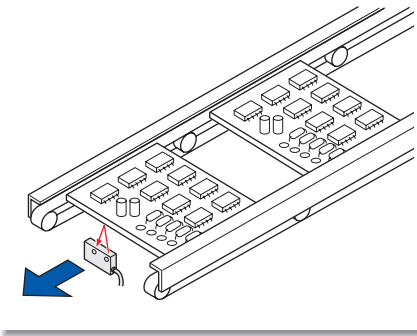
##### Spot-beam type



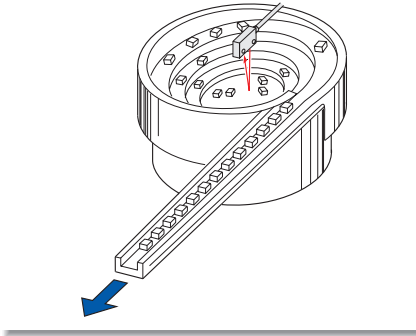
- Visible red spot beam allows easy targeting.
- It is suitable for positioning because of its 0.05 mm 0.002 in repeatability.

**APPLICATIONS**

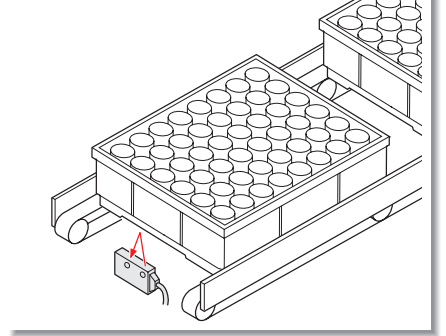
**Positioning of a PCB**



**Sensing parts in feeder**



**Positioning of trays**



**ORDER GUIDE**

Type	Appearance	Sensing range (Note 1)	Model No.	Output	Sensitivity adjuster	Timer function	Emitting element
Diffused beam type Long sensing range		5 to 38 mm <b>0.197 to 1.496 in</b> (Convergent point: 20 mm <b>0.787 in</b> )	<b>EX-42</b>	NPN open-collector transistor	Incorporated	—	Infrared LED
		10 to 70 mm <b>0.394 to 2.756 in</b> (Convergent point: 40 mm <b>1.575 in</b> )	<b>EX-44</b>				
Spot-beam type	20 to 35 mm <b>0.787 to 1.378 in</b> (Convergent point: 30 mm <b>1.181 in</b> )	<b>EX-43</b>	Red LED				

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

Note: The sensor does not detect even a specular background if it is separated by the distance specified below.

**EX-42**...150 mm **5.906 in** or more, **EX-44**...300 mm **11.811 in** or more, **EX-43**...100 mm **3.937 in** or more

(These are typical values. However, the specular background should be a plane surface, directly facing the sensor.)  
(A spherical or curved background may be detected.)

**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.

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

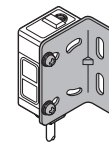
(e.g.) 5 m **16.404 ft** cable length type of **EX-42** is “**EX-42-C5**”.

**OPTIONS**

Designation	Model No.	Description	
Sensor mounting bracket	<b>MS-EX40-1</b>	Rear mounting bracket	
	<b>MS-EX40-2</b>	Bottom mounting bracket	
Universal sensor mounting stand	<b>MS-AJ1</b>	Horizontal mounting type	Basic assembly
	<b>MS-AJ2</b>	Vertical mounting type	
	<b>MS-AJ1-A</b>	Horizontal mounting type	Lateral arm assembly
	<b>MS-AJ2-A</b>	Vertical mounting type	

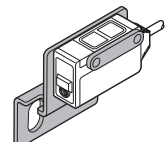
**Sensor mounting bracket**

• **MS-EX40-1**



Two M3 (length 16 mm **0.630 in**) screws with washers are attached.

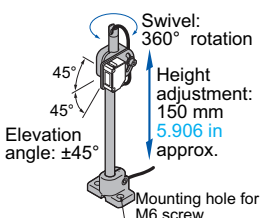
• **MS-EX40-2**



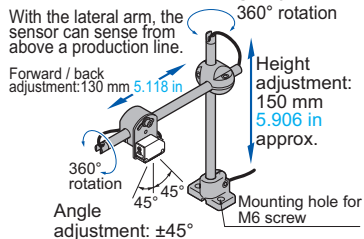
Two M3 (length 16 mm **0.630 in**) screws with washers are attached.

**Universal sensor mounting stand**

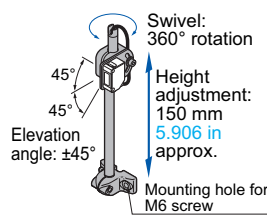
• **MS-AJ1**



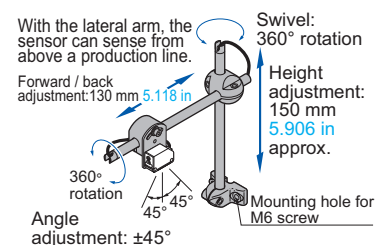
• **MS-AJ1-A**



• **MS-AJ2**



• **MS-AJ2-A**



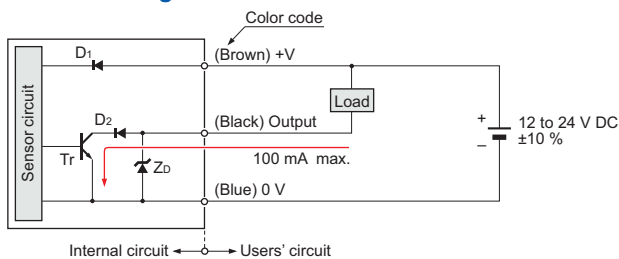
## SPECIFICATIONS

Item	Type Model No.	Diffused beam type		Spot-beam type
		EX-42	EX-44	EX-43
CE marking directive compliance	EMC Directive, RoHS Directive			
Sensing range	5 to 38 mm <b>0.197 to 1.496 in</b> (Conv. point: 20 mm <b>0.787 in</b> ) with white non-glossy paper (50 × 50 mm <b>1.969 × 1.969 in</b> )	10 to 70 mm <b>0.394 to 2.756 in</b> (Conv. point: 40 mm <b>1.575 in</b> ) with white non-glossy paper (50 × 50 mm <b>1.969 × 1.969 in</b> )	20 to 35 mm <b>0.787 to 1.378 in</b> (Conv. point: 30 mm <b>1.181 in</b> ) with white non-glossy paper (50 × 50 mm <b>1.969 × 1.969 in</b> )	
Min. sensing object	∅0.2 mm <b>∅0.008 in</b> copper wire (Setting distance: 20 mm <b>0.787 in</b> )	∅0.2 mm <b>∅0.008 in</b> copper wire (Setting distance: 40 mm <b>1.575 in</b> )	∅0.03 mm <b>∅0.001 in</b> gold wire (Setting distance: 30 mm <b>1.181 in</b> )	
Hysteresis	15 % or less of operation distance with white non-glossy paper (50 × 50 mm <b>1.969 × 1.969 in</b> )		10 % or less of operation distance with white non-glossy paper (50 × 50 mm <b>1.969 × 1.969 in</b> )	
Repeatability (perpendicular to sensing axis)	0.1 mm <b>0.004 in</b> or less (Setting distance: 20 mm <b>0.787 in</b> )	0.2 mm <b>0.008 in</b> or less (Setting distance: 40 mm <b>1.575 in</b> )	0.05 mm <b>0.002 in</b> or less (Setting distance: 30 mm <b>1.181 in</b> )	
Supply voltage	12 to 24 V DC ±10 % Ripple P-P 10 % or less			
Current consumption	35 mA or less			
Output	NPN open-collector transistor <ul style="list-style-type: none"> <li>• Maximum sink current: 100 mA</li> <li>• Applied voltage: 30 V DC or less (between output and 0 V)</li> <li>• Residual voltage: 2 V or less (at 100 mA sink current) 1 V or less (at 16 mA sink current)</li> </ul>			
Utilization category	DC-12 or DC-13			
Output operation	Light-ON			
Short-circuit protection	Incorporated			
Response time	0.5 ms or less			
Operation indicator	Red LED (lights up when the output is ON)			
Stability indicator	Green LED (lights up under stable light received condition or stable dark condition)			
Sensitivity adjuster	—————		Continuously variable adjuster	
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 (20 G max.) 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	Infrared LED (Peak emission wavelength: 880 nm <b>0.035 mil</b> , modulated)		Red LED (Peak emission wavelength: 680 nm <b>0.027 mil</b> , modulated)	
Material	Enclosure: PBT (Polybutylene terephthalate), Lens: Polycarbonate, Display cover: Polycarbonate			
Cable	0.2 mm <sup>2</sup> 3-core cabtyre cable, 2 m <b>6.562 ft</b> long			
Cable extension	Extension up to total 100 m <b>328.084 ft</b> is possible with 0.3 mm <sup>2</sup> , or more, cable.			
Weight	Net weight: 45 g approx., Gross weight: 70 g approx.			
Accessory	—————		Adjusting screwdriver: 1 pc.	

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

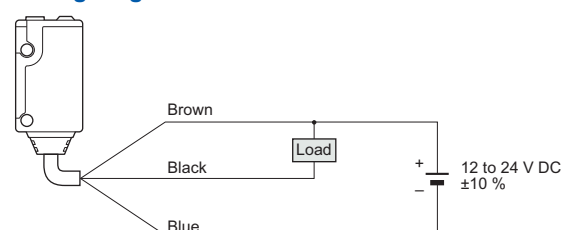
## I/O CIRCUIT AND WIRING DIAGRAMS

### 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

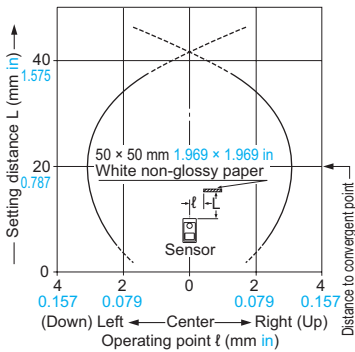
### Wiring diagram



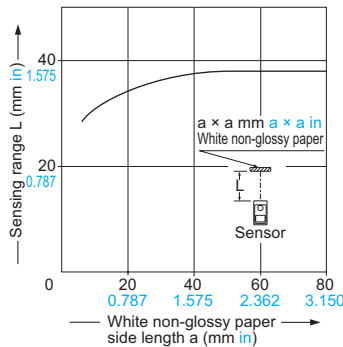
**SENSING CHARACTERISTICS (TYPICAL)**

**EX-42**

**Sensing field**



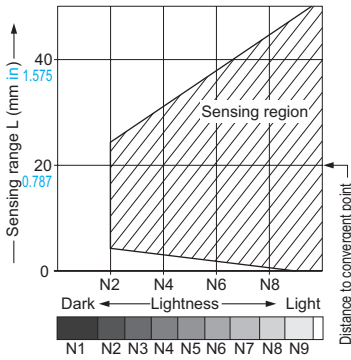
**Correlation between sensing object size and sensing range**



As the sensing object size becomes smaller than the standard size (white non-glossy paper 50 × 50 mm 1.969 × 1.969 in), the sensing range shortens, as shown in the left graph.

(For plotting the left graph, a sensor having a sensitivity such that it can just detect a 50 × 50 mm 1.969 × 1.969 in white non-glossy paper at a distance of 38 mm 1.496 in has been used.)

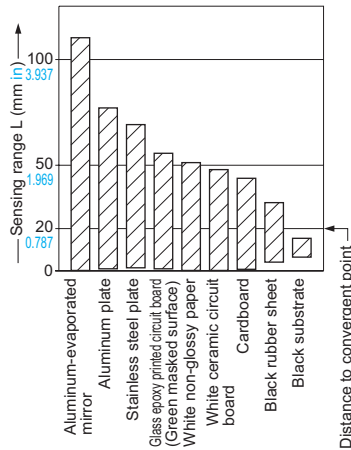
**Correlation between lightness and sensing range**



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.)

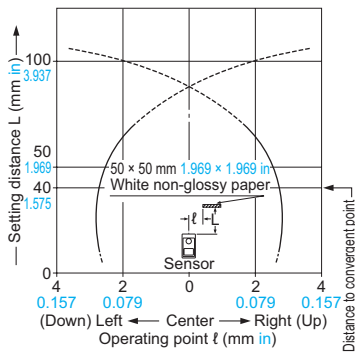
**Correlation between material (50 × 50 mm 1.969 × 1.969 in) and sensing range**



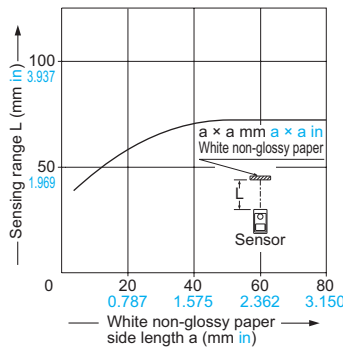
The bars in the graph indicate the sensing range (typical) for the respective material. However, there is a slight variation in the sensing range depending on the product. Further, if there is a reflective object (conveyor, etc.) in the background of the sensing object, since it affects the sensing,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

**EX-44**

**Sensing field**



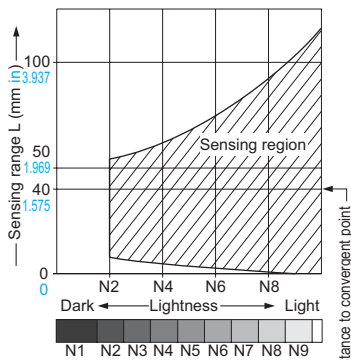
**Correlation between sensing object size and sensing range**



As the sensing object size becomes smaller than the standard size (white non-glossy paper 50 × 50 mm 1.969 × 1.969 in), the sensing range shortens, as shown in the left graph.

(For plotting the left graph, the sensitivity has been set such that a 50 × 50 mm 1.969 × 1.969 in white non-glossy paper is just detectable at a distance of 70 mm 2.756 in.)

**Correlation between lightness and sensing range**

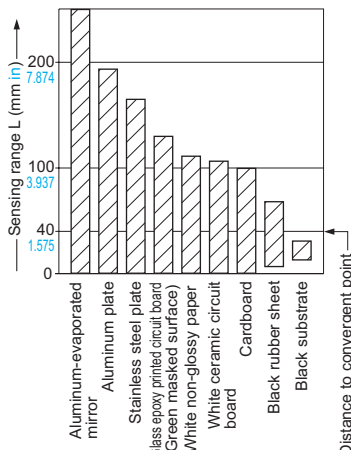


The sensing region (typical) is represented by oblique lines in the left figure. However, the sensitivity should be set with enough margin because of slight variation in products.

(The graph is drawn for the maximum sensitivity setting.)

(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**



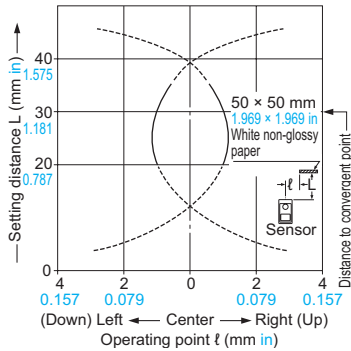
The bars in the graph indicate the sensing range (typical) for the respective material. However, there is a slight variation in the sensing range depending on the product. Further, if there is a reflective object (conveyor, etc.) in the background of the sensing object, since it affects the sensing,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

(The graph is drawn for the maximum sensitivity setting.)

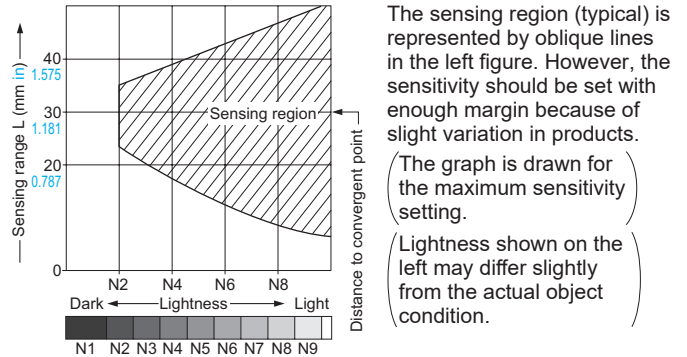
## SENSING CHARACTERISTICS (TYPICAL)

### EX-43

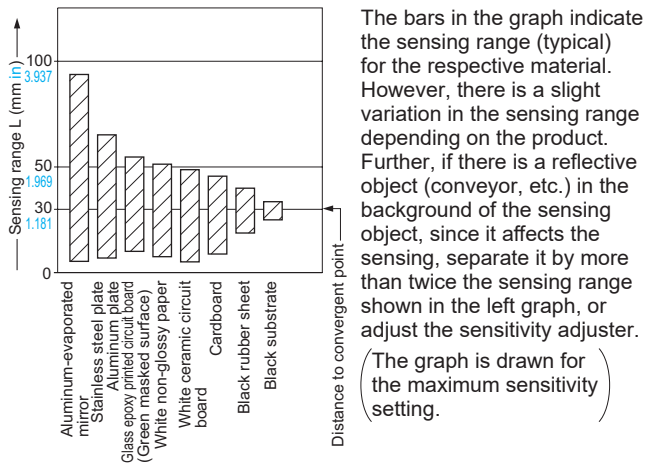
#### Sensing field



#### Correlation between lightness and sensing range



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



## PRECAUTIONS FOR PROPER USE



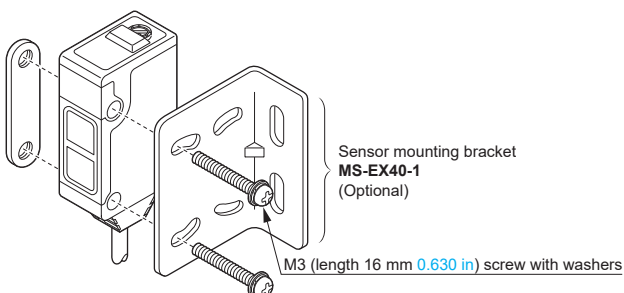
- Never use this product as a sensing device for personnel protection.
- In case of using sensing devices for personnel protection, use products which meet laws and standards, such as OSHA, ANSI or IEC etc., for personnel protection applicable in each region or country.

#### Others

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

#### Mounting

- With the optional sensor mounting bracket, the tightening torque should be 0.5 N·m or less.

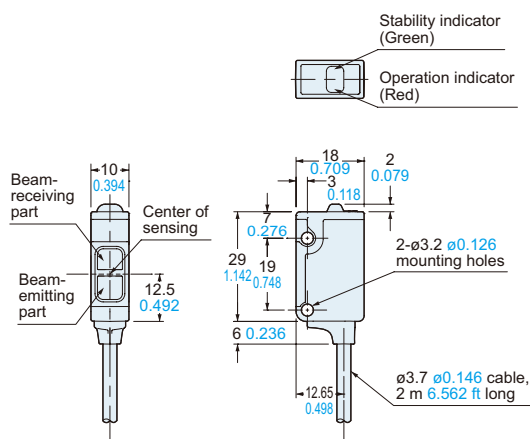


**DIMENSIONS (Unit: mm in)**

The CAD data can be downloaded from our website.

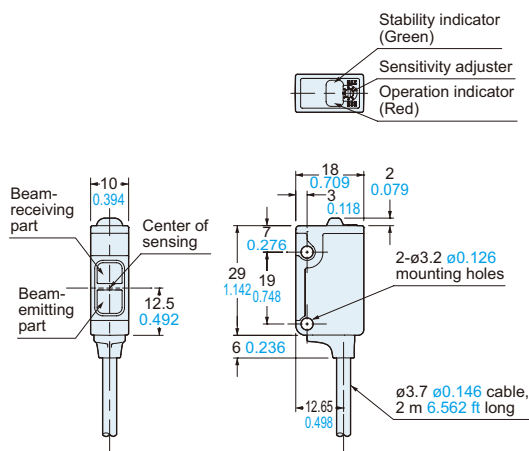
**EX-42**

Sensor



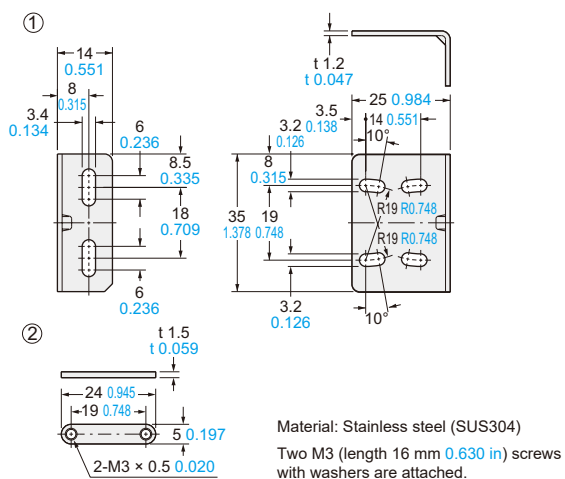
**EX-43 EX-44**

Sensor



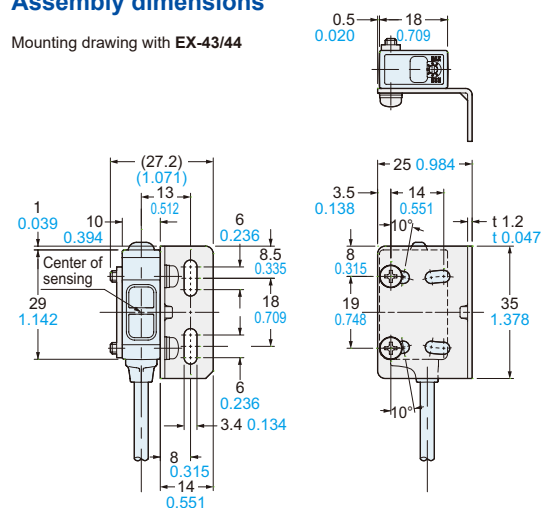
**MS-EX40-1**

Sensor mounting bracket (Optional)



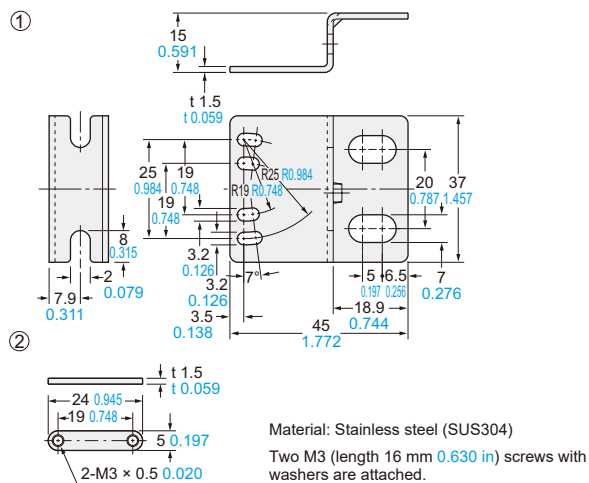
**Assembly dimensions**

Mounting drawing with EX-43/44



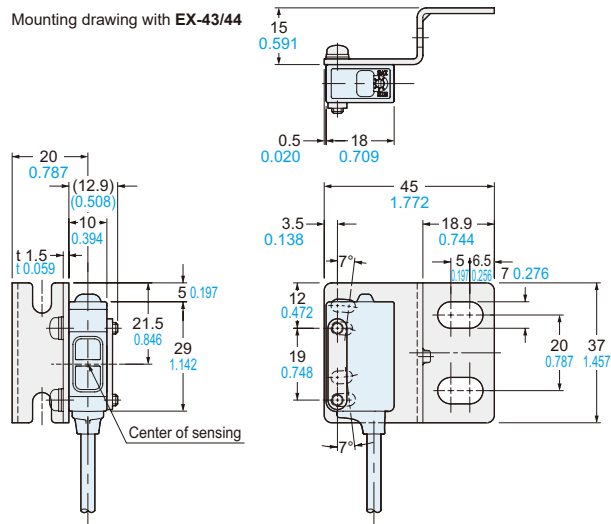
**MS-EX40-2**

Sensor mounting bracket (Optional)



**Assembly dimensions**

Mounting drawing with EX-43/44



## Disclaimer

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**Panasonic**  
INDUSTRY

**Panasonic Industry Co., Ltd.**

Industrial Device Business Division

7-1-1, Morofuku, Daito-shi, Osaka 574-0044, Japan

[industrial.panasonic.com/ac/e/](http://industrial.panasonic.com/ac/e/)