Convergent Reflective Photoelectric Sensor Amplifier Built-in
EX-40 SERIES

Related Information
■ General terms and conditions..... F-7
■ Glossary of terms / General precautions .....P.1455~ / P.1458~
■ Sensor selection guide ..... P.271~
■ Korea's S-mark..... P.1506

panasonic.net/id/pidsx/global

Conforming to EMC Directive

Certified (Excluding 5 m cable length type)

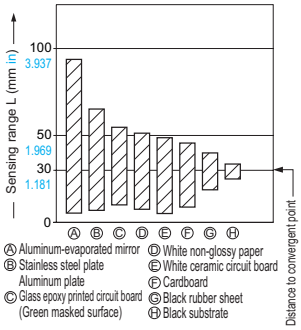
Timer

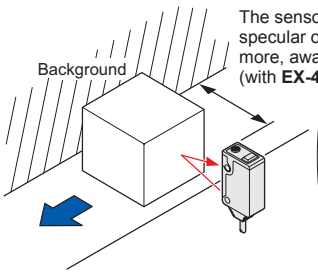
Reliable object detection in limited area

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





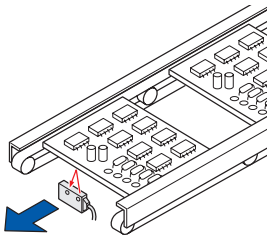
The sensor does not detect even a specular object 100 mm 3.937 in, or more, away from the sensing surface. (with **EX-43**)

However, the specular background should be a plane surface, directly facing the sensor. A spherical or curved background may be detected.

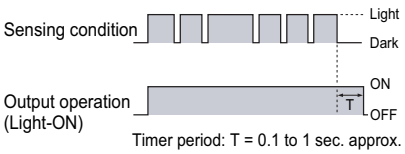
FUNCTIONS

Variable OFF-delay timer — EX-43T

The spot-beam type **EX-43T** is incorporated with an OFF-delay timer. The variable OFF-delay timer is useful for detecting a printed circuit board regardless of small holes, cutouts, or electronic parts on it.



Time Chart



Timer period: T = 0.1 to 1 sec. approx.

MOUNTING / SIZE

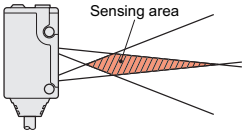
Compact size (W10 × H30 × D18 mm W0.394 × H1.181 × D0.709 in)

It can be installed in a limited space.

VARIETIES

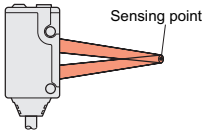
Various applications

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.

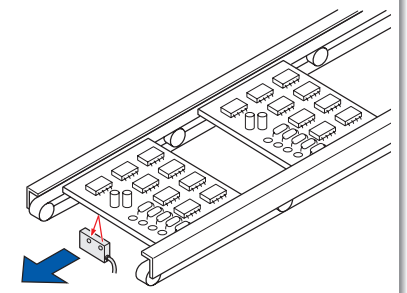
Spot-beam type



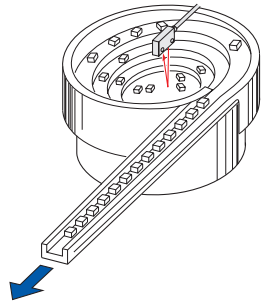
- Visible red spot beam allows easy targetting.
- It is suitable for positioning because of its 0.05 mm 0.002 in repeatability.

APPLICATIONS

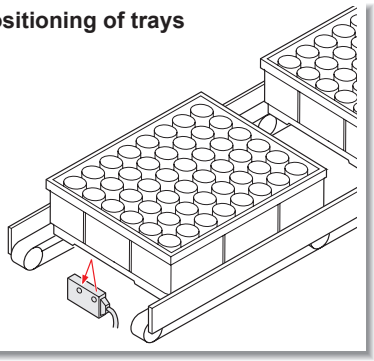
Positioning of a PCB



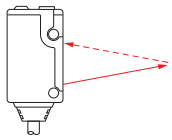
Sensing parts in feeder



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 0.197 to 1.496 in (Convergent point: 20 mm 0.787 in)	**EX-42**	NPN open-collector transistor	—	—	Infrared LED
		10 to 70 mm 0.394 to 2.756 in (Convergent point: 40 mm 1.575 in)	**EX-44**		Incorporated		
Spot-beam type / With timer		20 to 35 mm 0.787 to 1.378 in (Convergent point: 30 mm 1.181 in)	**EX-43**				Red LED
			EX-43T		—	Incorporated	

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** and **EX-43T**...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**".

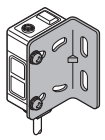
OPTIONS

Designation	Model No.	Description	
Sensor mounting bracket	**MS-EX40-1**	Rear mounting bracket	
	MS-EX40-2	Bottom mounting bracket	
Universal sensor mounting stand (Note)	**MS-AJ1**	Horizontal mounting type	Basic assembly
	MS-AJ2	Vertical mounting type	
	MS-AJ1-A	Horizontal mounting type	Lateral arm assembly
	MS-AJ2-A	Vertical mounting type	

Note: Refer to p.979 for details of the universal sensor mounting stand **MS-AJ**.

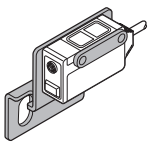
Sensor mounting bracket

• MS-EX40-1



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

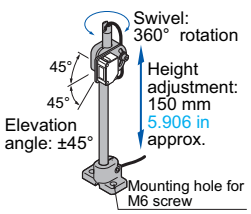
• MS-EX40-2



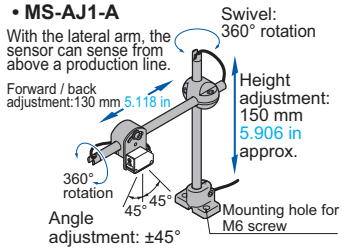
Two M3 (length 16 mm 0.630 in) screws with washers are attached.

Universal sensor mounting stand

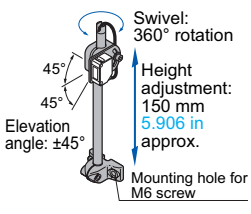
• MS-AJ1



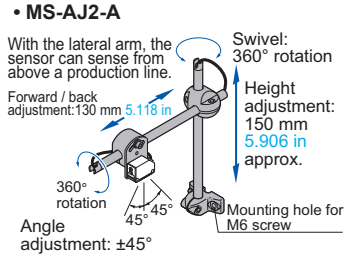
• MS-AJ1-A



• MS-AJ2



• MS-AJ2-A



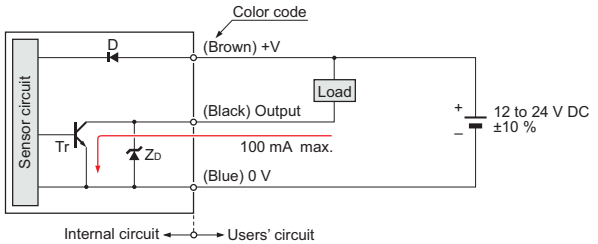
SPECIFICATIONS

Item \ Type	Diffused beam type		Spot-beam type	
		Long sensing range		With timer
Model No.	EX-42	EX-44	EX-43	EX-43T
Sensing range	5 to 38 mm 0.197 to 1.496 in (Conv. point: 20 mm 0.787 in) with white non-glossy paper (50 × 50 mm 1.969 × 1.969 in)	10 to 70 mm 0.394 to 2.756 in (Conv. point: 40 mm 1.575 in) with white non-glossy paper (50 × 50 mm 1.969 × 1.969 in)	20 to 35 mm 0.787 to 1.378 in (Conv. point: 30 mm 1.181 in) with white non-glossy paper (50 × 50 mm 1.969 × 1.969 in)	
Min. sensing object	ø0.2 mm ø0.008 in copper wire (Setting distance: 20 mm 0.787 in)	ø0.2 mm ø0.008 in copper wire (Setting distance: 40 mm 1.575 in)	ø0.03 mm ø0.001 in gold wire (Setting distance: 30 mm 1.181 in)	
Hysteresis	15 % or less of operation distance with white non-glossy paper (50 × 50 mm 1.969 × 1.969 in)		10 % or less of operation distance with white non-glossy paper (50 × 50 mm 1.969 × 1.969 in)	
Repeatability (perpendicular to sensing axis)	0.1 mm 0.004 in or less (Setting distance: 20 mm 0.787 in)	0.2 mm 0.008 in or less (Setting distance: 40 mm 1.575 in)	0.05 mm 0.002 in or less (Setting distance: 30 mm 1.181 in)	
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 • Maximum sink current: 100 mA • Applied voltage: 30 V DC or less (between output and 0 V) • Residual voltage: 1.5 V or less (at 100 mA sink current) 0.4 V or less (at 16 mA sink current)			
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		———
Timer function	———			Variable OFF-delay timer (0.1 to 1 sec. approx.) (Note 2)
Environmental resistance: Pollution degree	3 (Industrial environment)			
Environmental resistance: Protection	IP67 (IEC)			
Environmental resistance: Ambient temperature	–25 to +55 °C –13 to +131 °F (No dew condensation or icing allowed), Storage: –30 to +70 °C –22 to +158 °F			
Environmental resistance: Ambient humidity	35 to 85 % RH, Storage: 35 to 85 % RH			
Environmental resistance: Ambient illuminance	Incandescent light: 3,000 ℓx at the light-receiving face			
Environmental resistance: EMC	EN 60947-5-2			
Environmental resistance: Voltage withstandability	1,000 V AC for one min. between all supply terminals connected together and enclosure			
Environmental resistance: Insulation resistance	20 MΩ, or more, with 250 V DC megger between all supply terminals connected together and enclosure			
Environmental resistance: Vibration resistance	10 to 500 Hz frequency, 3 mm 0.118 in amplitude (20 G max.) in X, Y and Z directions for two hours each			
Environmental resistance: Shock resistance	500 m/s² acceleration (50 G approx.) in X, Y and Z directions for three times each			
Emitting element	Infrared LED (Peak emission wavelength: 880 nm 0.035 mil, modulated)		Red LED (Peak emission wavelength: 680 nm 0.027 mil, modulated)	
Material	Polyalylate			
Cable	0.2 mm² 3-core cabtyre cable, 2 m 6.562 ft long			
Cable extension	Extension up to total 100 m 328.084 ft is possible with 0.3 mm², or more, cable.			
Weight	Net weight: 45 g approx., Gross weight: 70 g approx.			
Accessory	———	Adjusting screwdriver: 1 pc.		

Notes: 1) Where measurement conditions heve not been specified precisely, the conditions used were an ambient temperature of +23 °C +73.4 °F.
2) The timer is always effective.

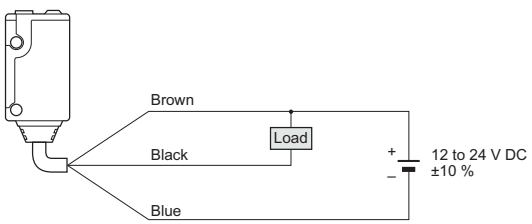
I/O CIRCUIT AND WIRING DIAGRAMS

I/O circuit diagram



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

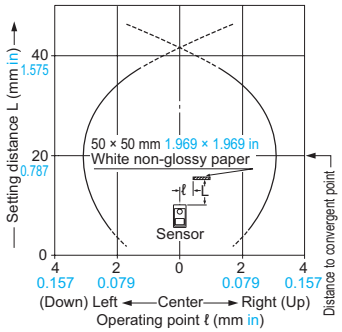
Wiring diagram



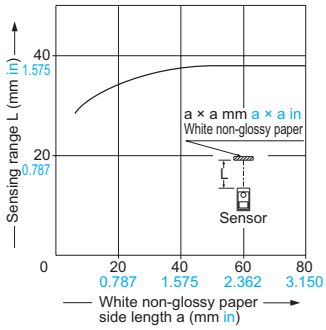
SENSING CHARACTERISTICS (TYPICAL)

EX-42

Sensing field



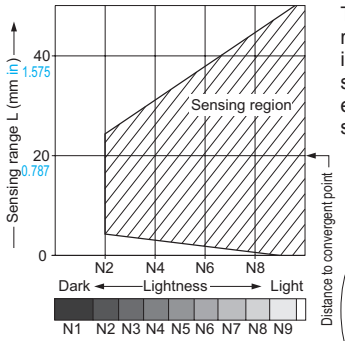
Correlation between sensing object size and sensing range



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.)

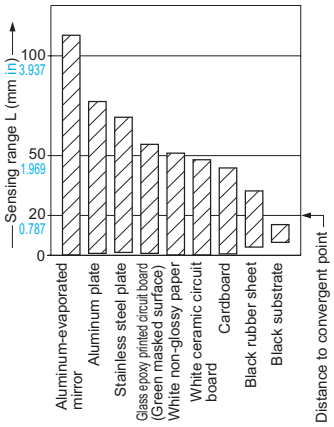
Correlation between lightness and sensing range



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.)

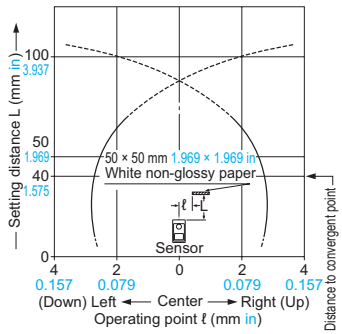
Correlation between material (50 × 50 mm 1.969 × 1.969 in) and sensing range



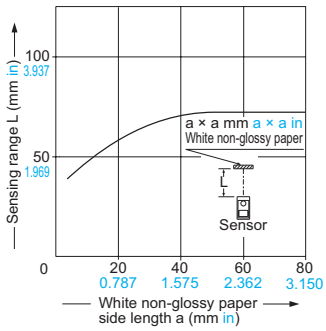
The bars in the graph indicate the sensing range (typical) for the respective material. However, there is a slight variation in the sensing range depending on the product. Further, if there is a reflective object (conveyor, etc.) in the background of the sensing object, since it affects the sensing,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

EX-44

Sensing field



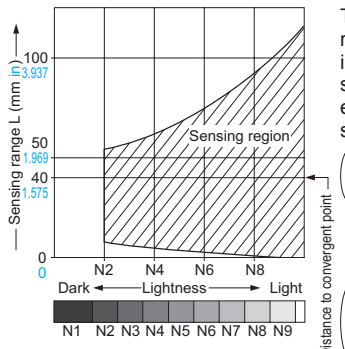
Correlation between sensing object size and sensing range



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

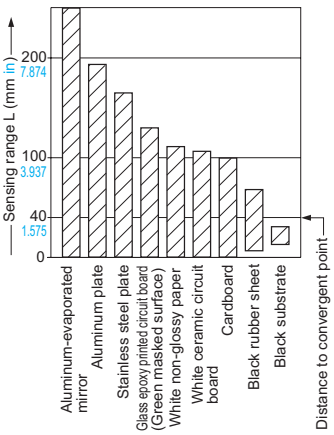


The sensing region (typical) is represented by oblique lines in the left figure. However, the sensitivity should be set with enough margin because of slight variation in products.

(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



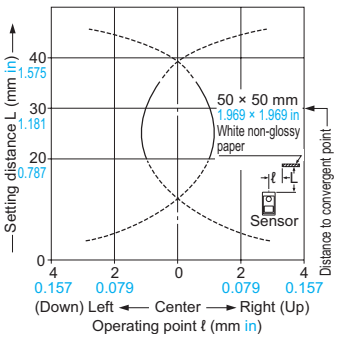
The bars in the graph indicate the sensing range (typical) for the respective material. However, there is a slight variation in the sensing range depending on the product. Further, if there is a reflective object (conveyor, etc.) in the background of the sensing object, since it affects the sensing,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

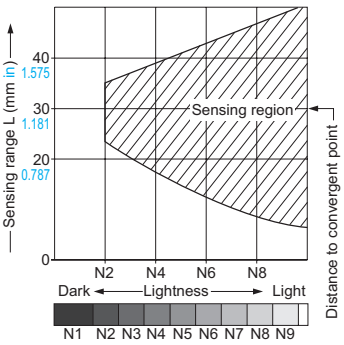
SENSING CHARACTERISTICS (TYPICAL)

EX-43 EX-43T

Sensing field



Correlation between lightness and sensing range

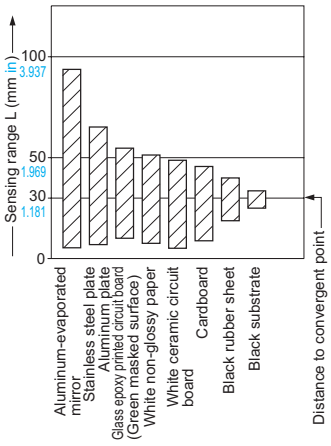


The sensing region (typical) is represented by oblique lines in the left figure. However, the sensitivity should be set with enough margin because of slight variation in products.

(The graph is drawn for the maximum sensitivity setting. However, **EX-43T** does not incorporate the sensitivity adjuster.)

(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. However, **EX-43T** does not incorporate the sensitivity adjuster.)

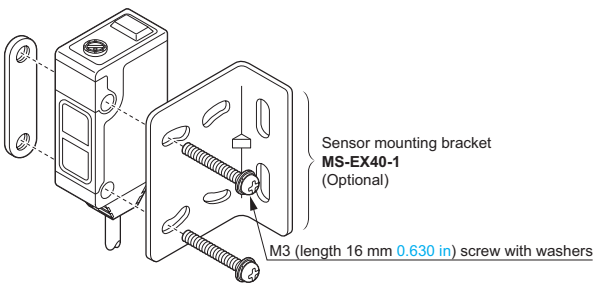
PRECAUTIONS FOR PROPER USE

Refer to p.1458~ 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

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



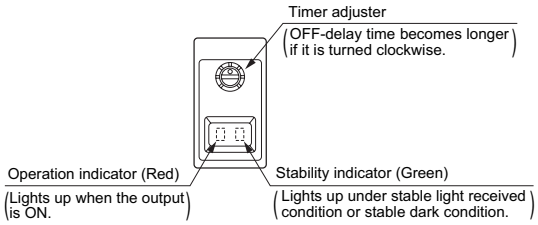
Others

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

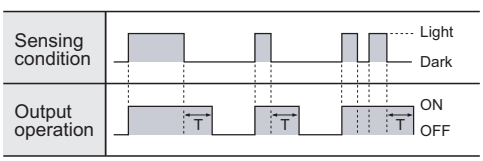
Timer function (Only for EX-43T)

- The variable OFF-delay timer prolongs the output for a certain period (0.1 to 1 sec. approx.). It is useful when the connected device has a slow response time or when small objects are sensed and the signal width is small. (The timer is always effective.)

Adjusters



Time chart



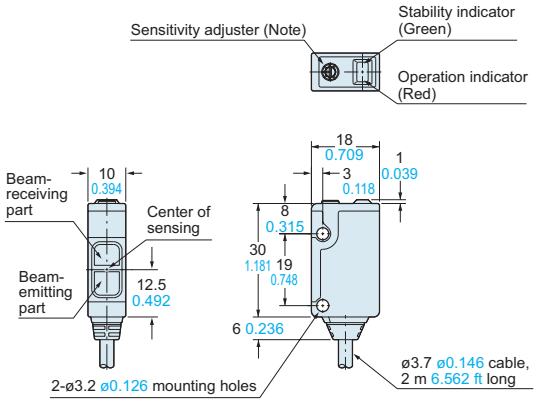
Timer period: T = 0.1 to 1 sec. approx.

DIMENSIONS (Unit: mm in)

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

EX-42 EX-44 EX-43 EX-43T

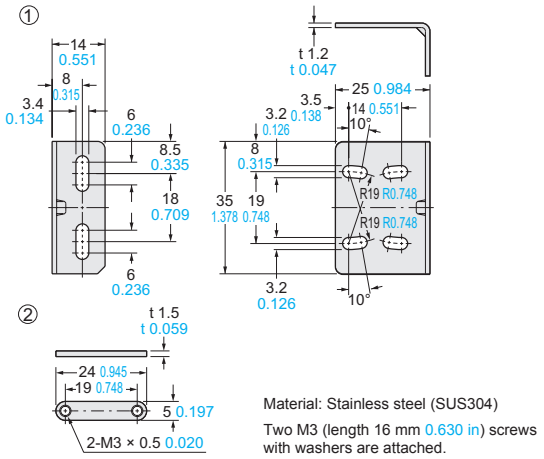
Sensor



Note: **EX-42** does not incorporate it.
In **EX-43T**, it is the timer adjuster.

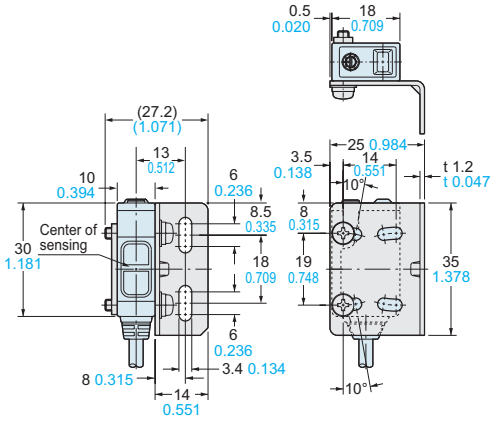
MS-EX40-1

Sensor mounting bracket (Optional)



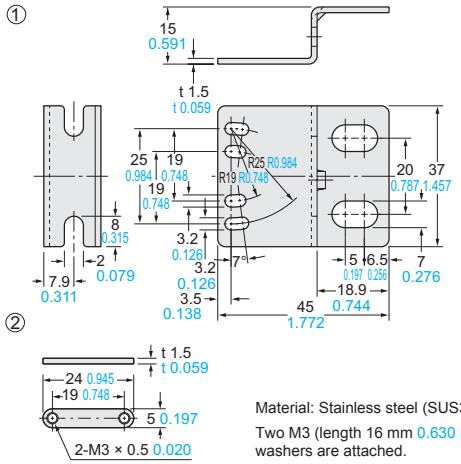
Material: Stainless steel (SUS304)
Two M3 (length 16 mm 0.630 in) screws with washers are attached.

Assembly dimensions



MS-EX40-2

Sensor mounting bracket (Optional)



Material: Stainless steel (SUS304)
Two M3 (length 16 mm 0.630 in) screws with washers are attached.

Assembly dimensions