

Amplifier Built-in

## Threaded Miniature Photoelectric Sensor

EX-30 SERIES Ver.2



**EX-30** SERIES Ver.2

Ver.2

CE



## The next-generation new form series

### A new alternative to fiber sensors

#### Simpler design

All you need to do is to make a  $\varnothing 4$  mm  $\varnothing 0.157$  in hole where you would like to stop or check the object ( $\varnothing 6$  mm  $\varnothing 0.236$  in hole for reflective type). Furthermore, the center of the sensing axis is the same as the center of the mounting hole, which makes it much easier to set the sensing position.



#### New design solves all weak points of fiber sensors

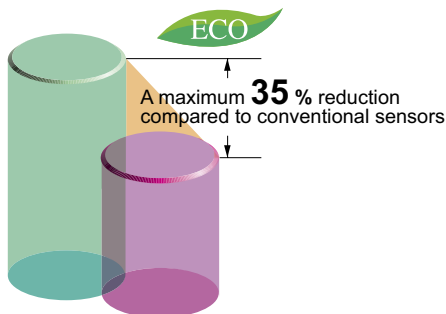
The **EX-30** series solves all of the difficulties associated with fiber sensors, such as:

- Difficulty finding a suitable place for the amplifier
- Fragility of the fiber
- Extra space needed because of difficulty in bending the fiber
- The nuisance of having to use a protective tube to prevent fiber breakage

#### BASIC PERFORMANCE

#### Electric power saving\*

The **EX-30** series achieves reductions in power consumption of up to 65%. These sensors contribute to environmental friendliness.



\*Effective from production in April 2011.

#### Long sensing range

The **EX-30** series achieves long distance sensing [thru-beam type: 500 mm **19.685 in** (**EX-33(-PN)**); 800 mm **31.496 in**], reflective type: 50 mm **1.969 in**.]



#### High response speed of 0.5 ms

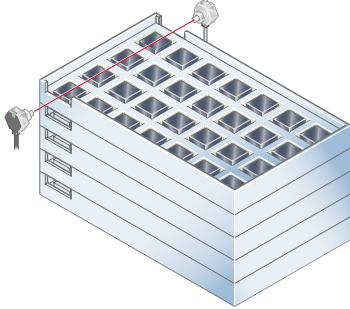
The same high response speed of 0.5 ms as fiber sensor amplifiers is provided, making these sensors ideal for sensing small objects, counting objects that are moving quickly and positioning items such as circuit boards.

#### Globally usable

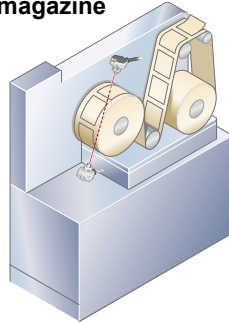
It conforms to the EMC Directive and obtains the UL Recognition. (excluding 5 m **16.405 ft** cable length type) Moreover, PNP output type which is much in demand in Europe, is also available.

**APPLICATIONS**

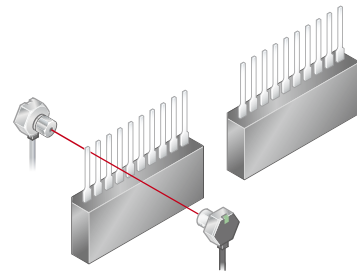
**Detecting IC height**



**Detecting quantity of labels in label magazine**



**Checking IC pins (using slit masks)**



**VARIETIES**

New thru-beam types now feature operation mode switch and sensitivity adjuster! **EX-33(-PN)**

**EX-33(-PN)**

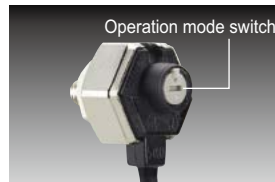


- ① Operation mode switch
- ② Sensitivity adjuster
- ③ Bright 2-color indicator

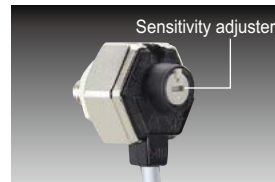
Switching between light-ON and dark-ON operating modes is possible with a single model.

It is convenient when you need fine adjustment.

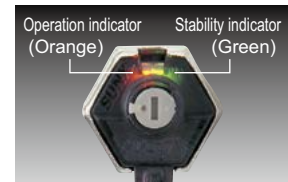
A bright 2-color indicator has been incorporated in all types.



Receiver



Emitter



Receiver

**MOUNTING / SIZE**

**Can be installed in the same way as standard fibers**

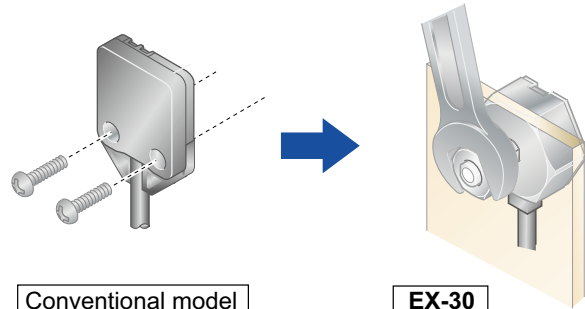
The EX-30 series can be screwmounted (M4 for thru-beam type, M6 for reflective type) in the same way as standard fiber sensors. This means that they can be inserted into production lines in exactly the same way as conventional high-priced fiber sensors.

**Single-point tightening cuts down on installation work by half**

Conventional photoelectric sensors required four (for thru-beam type) or two (for reflective type) mounting holes and screws to be used. However, the EX-30 series is installed with a single screw, thus cutting down on installation work by half.

**M4**

Thru-beam type  
(Reflective type: M6)

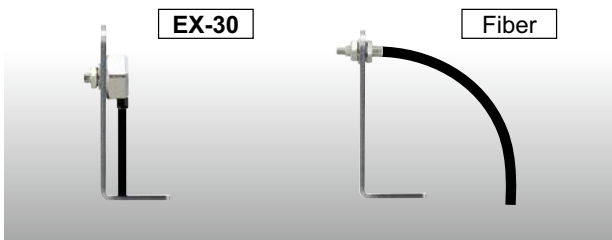


Conventional model

EX-30

**Takes up very little space**

Unlike conventional fibers, bending radius is not a problem, so that the sensor can be securely installed alongside conveyors.



**ENVIRONMENTAL RESISTANCE**

**Incorporated an inverter countermeasure circuit\***

The **EX-30** series become significantly stronger against inverter light and other extraneous light.

\*Effective from production in April 2011.



**FUNCTIONS**

**Bright 2-color indicator**

A bright 2-color indicator is incorporated in all types.



**No protective tube needed**

The **EX-30** series has high bending strength, so that the protective tube used to protect conventional fiber from breakage is not needed. This also adds up to excellent cost performance.



**OPERABILITY**

**Incorporates a sensitivity adjuster (Excluding EX-31□)**

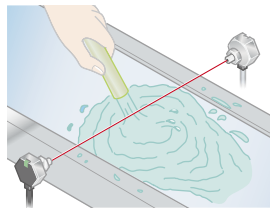
The sensor incorporates a sensitivity adjuster. It is convenient when you need fine adjustment.



\*This photo is a reflective type.

**Waterproof IP67 (IEC)**

The sensors features an IP67 rating to allow their use in process lines where water is used or splashed.



Note: If water splashes on the sensor during sensing operation, it may sense water as an object.

**ORDER GUIDE**

Type	Appearance	Sensing range	Model No. (Note)	Output	Output operation
Thru-beam			<b>EX-31A</b>	NPN open-collector transistor	Light-ON
			<b>EX-31B</b>		Dark-ON
			<b>EX-31A-PN</b>	PNP open-collector transistor	Light-ON
			<b>EX-31B-PN</b>		Dark-ON
With operation mode switch			<b>EX-33</b>	NPN open-collector transistor	Switchable either Light-ON or Dark-ON
			<b>EX-33-PN</b>	PNP open-collector transistor	
Diffuse reflective			<b>EX-32A</b>	NPN open-collector transistor	Light-ON
			<b>EX-32B</b>		Dark-ON
			<b>EX-32A-PN</b>	PNP open-collector transistor	Light-ON
			<b>EX-32B-PN</b>		Dark-ON

Note: 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.

**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 EX-33(-PN)]. When ordering this type, suffix "-C5" to the model No. (e.g.) 5 m 16.404 ft cable length type of EX-31A is "EX-31A-C5".

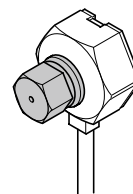
## OPTIONS

Designation	Model No.	Description
Slit mask (For thru-beam type sensor only)	<b>OS-EX30-1</b> (Slit size $\phi 1$ mm) ( $\phi 0.039$ in)	Slit on one side <ul style="list-style-type: none"> <li>• Sensing range: 200 mm <b>7.874 in</b> [EX-31□(-PN)]</li> <li>320 mm <b>12.598 in</b> [EX-33(-PN)]</li> <li>• Min. sensing object: <math>\phi 2</math> mm <math>\phi 0.079</math> in</li> </ul>
		Slit on both sides <ul style="list-style-type: none"> <li>• Sensing range: 150 mm <b>5.906 in</b> [EX-31□(-PN)]</li> <li>240 mm <b>9.449 in</b> [EX-33(-PN)]</li> <li>• Min. sensing object: <math>\phi 1</math> mm <math>\phi 0.039</math> in</li> </ul>

Note: One slit and two spacers are provided per set. Two sets are required when installing on both sides.

### Slit mask

#### • OS-EX30-1



Apply the optional slit mask when detecting small objects or for increasing the accuracy of sensing position.

However, the sensing range is reduced when the slit mask is mounted.

## SPECIFICATIONS

Item	Model No.	Type		Thru-beam			Diffuse reflective		
		NPN output	PNP output	EX-31A	EX-31B	EX-33	EX-32A	EX-32B	
				With operation mode switch					
				EX-31A-PN	EX-31B-PN	EX-33-PN	EX-32A-PN	EX-32B-PN	
CE marking directive compliance		EMC Directive, RoHS Directive							
Sensing range		500 mm <b>19.685 in</b>			800 mm <b>31.496 in</b>	50 mm <b>1.969 in</b> (Note 2)			
Sensing object		$\phi 2$ mm $\phi 0.079$ in or more opaque object (Completely beam interrupted objects)				Opaque, translucent or transparent object (Note 3)			
Hysteresis		—			15 % or less of operation distance (Note 2)				
Repeatability (perpendicular to sensing axis)		0.05 mm <b>0.002 in</b> or less			0.5 mm <b>0.020 in</b> or less				
Supply voltage		12 to 24 V DC $\pm 10$ % Ripple P-P 10 % or less							
Current consumption		Emitter: 10 mA or less, Receiver: 10 mA or less				13 mA or less			
Output		<NPN output type> NPN open-collector transistor <ul style="list-style-type: none"> <li>• Maximum sink current: 50 mA</li> <li>• Applied voltage: 30 V DC or less (between output and 0 V)</li> <li>• Residual voltage: 2 V or less (at 50 mA sink current)</li> <li>1 V or less (at 16 mA sink current)</li> </ul>				<PNP output type> PNP open-collector transistor <ul style="list-style-type: none"> <li>• Maximum source current: 50 mA</li> <li>• Applied voltage: 30 V DC or less (between output and +V)</li> <li>• Residual voltage: 2 V or less (at 50 mA source current)</li> <li>1 V or less (at 16 mA source current)</li> </ul>			
Utilization category		DC-12 or DC-13							
Output operation		Light-ON	Dark-ON	Switchable either Light-ON or Dark-ON		Light-ON	Dark-ON		
Short-circuit protection		Incorporated							
Response time		0.5 ms or less							
Operation indicator		Orange LED (lights up when the output is ON) (incorporated on the receiver for thru-beam type)							
Stability indicator		Green LED (lights up under stable light received condition or stable dark condition, incorporated on the receiver)				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 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> 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		Red LED (modulated)							
Material		Enclosure: Die-cast zinc (Nickel plated), Lens: Polycarbonate [EX-32□(-PN): Acrylic], Enclosure cover: Polycarbonate							
Cable		0.1 mm <sup>2</sup> 3-core (thru-beam type sensor emitter: 2-core) cabtyre cable, 2 m <b>6.562 ft</b> long							
Cable extension		Extension up to total 50 m <b>164.042 ft</b> is possible with 0.3 mm <sup>2</sup> , or more, cable (thru-beam type: both emitter and receiver).							
Weight		Net weight (each emitter and receiver): 20 g approx. Gross weight: 65 g approx.				Net weight: 20 g approx., Gross weight: 45 g approx.			
Accessories		Nut: 2 pcs., Toothed lock washer: 2 pcs.				Nut: 1 pc., Toothed lock washer: 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**.

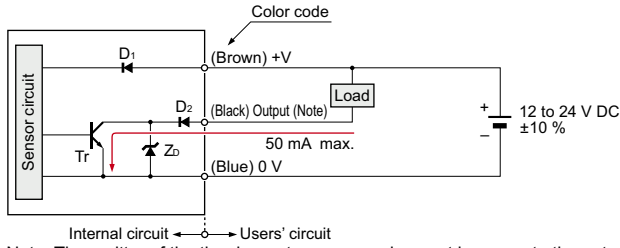
2) The sensing range and the hysteresis are specified for white non-glossy paper (100 × 100 mm **3.937 × 3.937 in**) as the object.

3) Make sure to confirm detection with an actual sensor before use.

**I/O CIRCUIT AND WIRING DIAGRAMS**

**NPN output type**

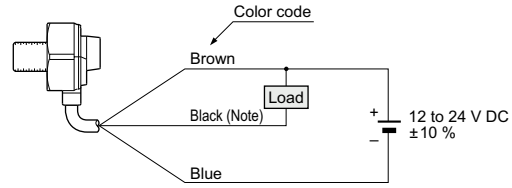
**I/O circuit diagram**



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

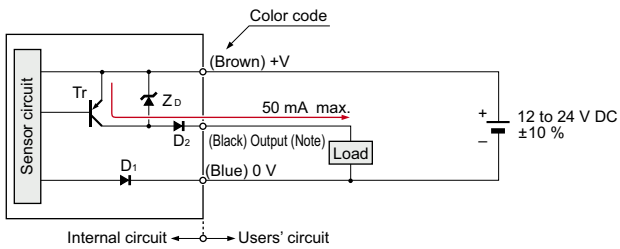
**Wiring diagram**



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

**PNP output type**

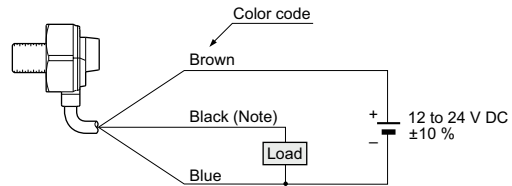
**I/O circuit diagram**



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**



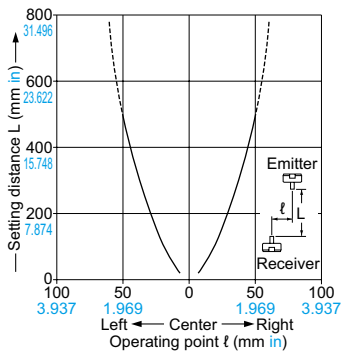
Note: The emitter of the thru-beam type sensor does not incorporate the black wire.

**SENSING CHARACTERISTICS (TYPICAL)**

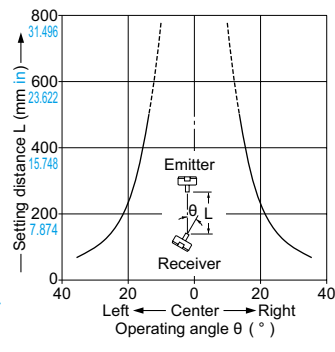
**EX-31 EX-31-PN**

**Thru-beam type**

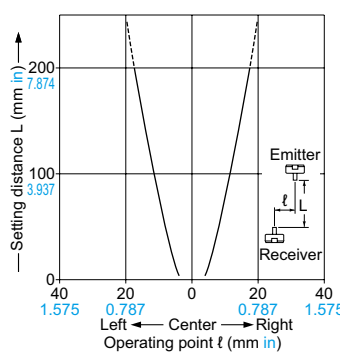
**Parallel deviation**



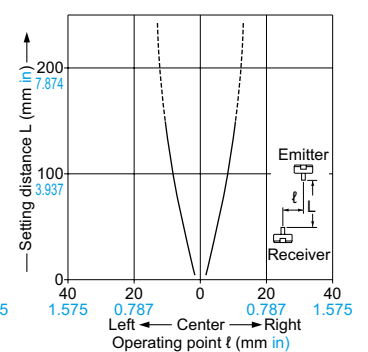
**Angular deviation**



**Parallel deviation with slit mask on one side**

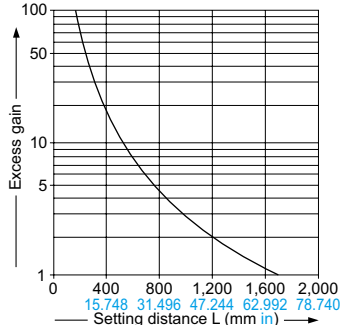


**Parallel deviation with slit masks on both sides**



**EX-31 EX-31-PN Thru-beam type**

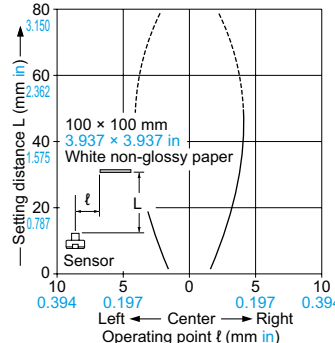
**Correlation between setting distance and excess gain**



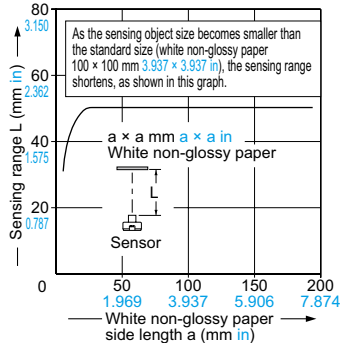
**EX-32 EX-32-PN**

**Diffuse reflective type**

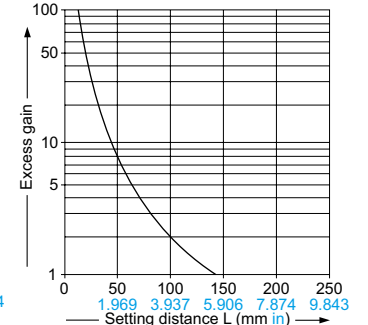
**Sensing field**



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



**Correlation between setting distance and excess gain**

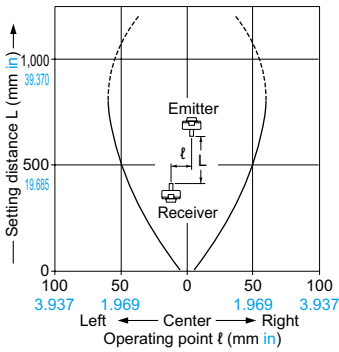


## SENSING CHARACTERISTICS (TYPICAL)

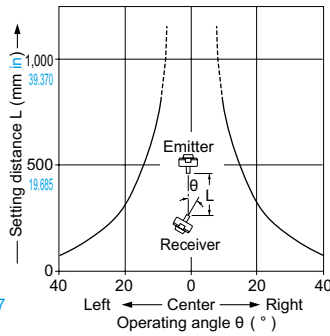
**EX-33 EX-33-PN**

Thru-beam type

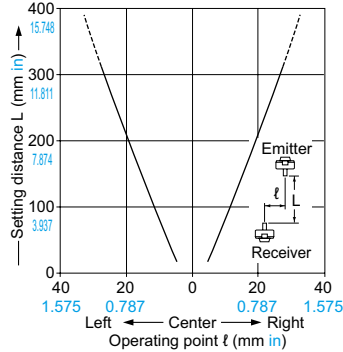
Parallel deviation



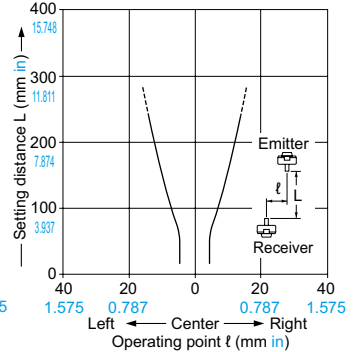
Angular deviation



Parallel deviation with slit mask on one side



Parallel deviation with slit masks on both sides



## 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.

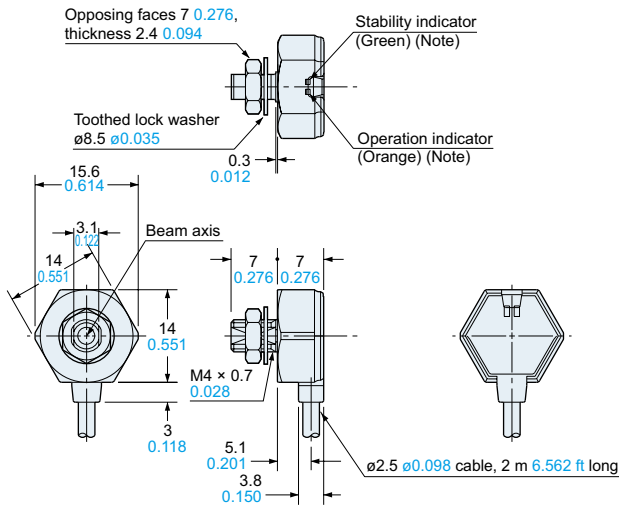
- Do not use during the initial transient time (50 ms approx.) after the power supply is switched on.
- In case of using the sensor at a place where static electricity is generated, use a metal mounting plate. Also, ensure to ground the mounting plate.

## DIMENSIONS (Unit: mm in)

The CAD data can be downloaded from our website.

**EX-31 EX-31-PN**

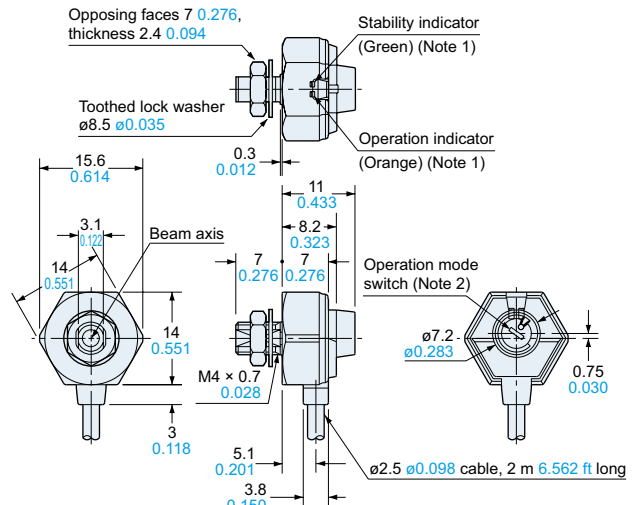
Sensor



Note: Not incorporated on the emitter.

**EX-33 EX-33-PN**

Sensor

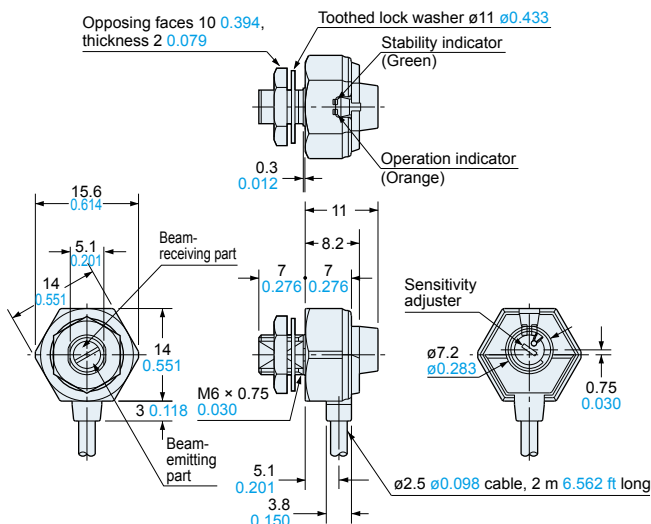


Notes: 1) Not incorporated on the emitter.

2) It is the sensitivity adjuster on the emitter.

**EX-32 EX-32-PN**

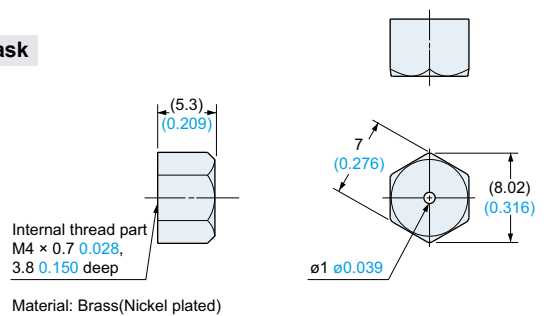
Sensor



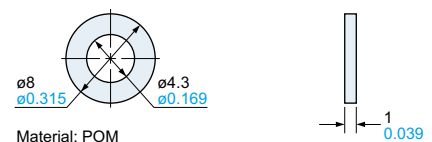
**OS-EX30-1**

Slit mask (optional)

Slit mask



Spacer



## Disclaimer

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