Threaded Miniature Photoelectric Sensor Amplifier Built-in
EX-30 SERIES

Related Information
■ General terms and conditions..... P.1
■ Sensor selection guide.....P.11~ / P.229~
■ Glossary of terms..... P.983~
■ General precautions ..... P.986~

Conforming to EMC Directive

UL Recognition (Excluding 5 m cable length type)

PNP output type available

The next-generation new form series. A new alternative to fiber sensors.

Simpler design

All you need to do is make a ø4 mm ø0.157 in hole where you would like to stop or check the workpiece (ø6 mm ø0.236 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.

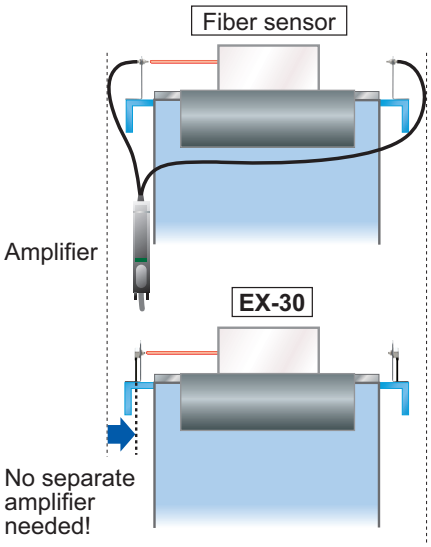
New design solves all weak points of fiber sensors

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 breakages

BASIC PERFORMANCE

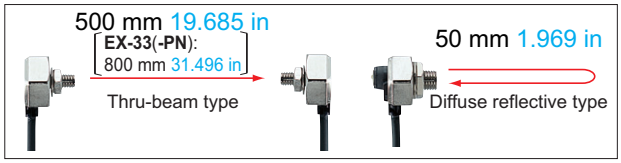
No amplifier needed

The amplifier is built in, so a separate amplifier is not required.



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 useable

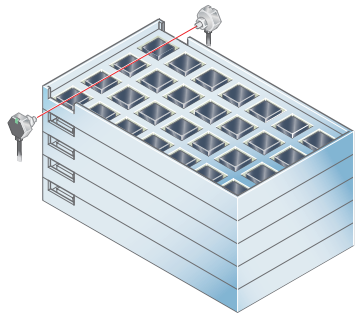
It conforms to the EMC Directive and obtains UL Recognition. (excluding 5 m 16.405 ft cable length type) Moreover, PNP output type which is much demand in Europe, is also available.

FIBER SENSORS
LASER SENSORS
PHOTOELECTRIC SENSORS
MICRO PHOTOELECTRIC SENSORS
AREA SENSORS
SAFETY COMPONENTS
PRESSURE SENSORS
INDUCTIVE PROXIMITY SENSORS
PARTICULAR USE SENSORS
SENSOR OPTIONS
WIRE-SAVING SYSTEMS
MEASUREMENT SENSORS
STATIC CONTROL DEVICES
LASER MARKERS

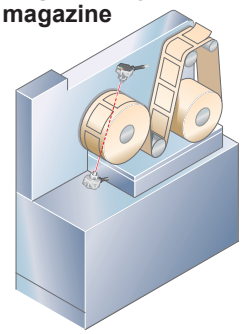
Selection Guide
Amplifier Built-in
CX-400
EX-10
EX-20
EX-30
EX-40
EQ-30
EQ-500
MQ-W
RX-LS200
RX
CY
PX-2
RT-610
Power Supply Built-in
NX5
VF
Amplifier-separated
SU-7 / SH
SS-A5 / SH
Other Products

APPLICATIONS

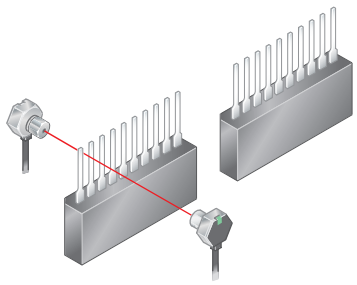
Detecting IC height



Detecting quantity of labels in label magazine



Checking IC pins (using slit masks)

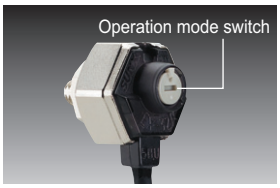


VARIETIES

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

1 Operation mode switch

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



Receiver

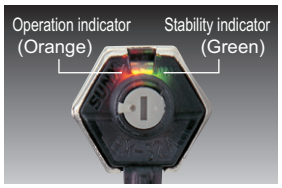
2 Sensitivity adjuster

It is convenient when you need fine adjustment.

Emitter

3 Bright 2-color indicator

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

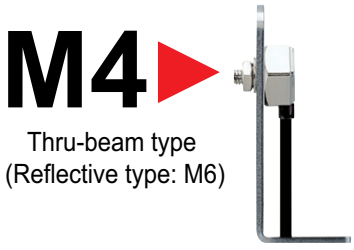


Receiver

MOUNTING / SIZE

Can be installed in the same way as standard fibers

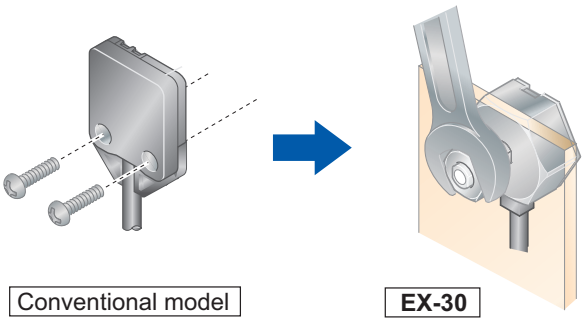
The **EX-30** series can be screwmounted (M4 for thru-beam type, M6 for reflective type) in the same way as standard fiber sensors. This means that they can be inserted into production lines in exactly the same way as conventional high-priced fiber sensors.



Thru-beam type
(Reflective type: M6)

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.

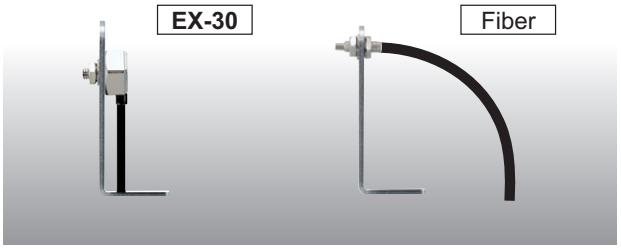


Conventional model

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

Unbreakable

A cabtyre cable is used, so that the sensor cable will not break like conventional fibers.

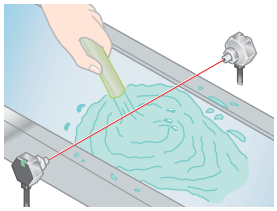
No protective tube needed

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

Waterproof IP67 (IEC)

The sensor can be hosed down because of its IP67 construction.

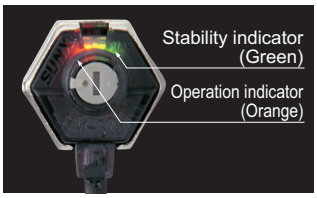
Note: However, take care that if it is exposed to water splashes during operation, it may detect a water drop itself.



FUNCTIONS

Bright 2-color indicator

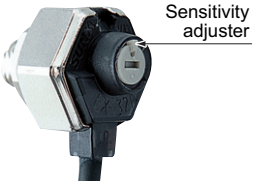
A bright 2-color indicator has been incorporated in all types.



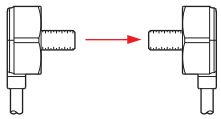
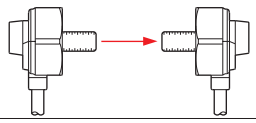
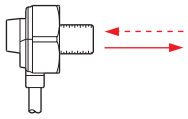
OPERABILITY

Incorporates a sensitivity adjuster (Excluding EX-31□)

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



ORDER GUIDE

Type	Appearance	Sensing range	Model No. (Note)	Output	Output operation
Thru-beam		500 mm 19.685 in	**EX-31A**	NPN open-collector transistor	Light-ON
			EX-31B		Dark-ON
			EX-31A-PN	PNP open-collectr transitor	Light-ON
			EX-31B-PN		Dark-ON
With operation mode switch		800 mm 31.496 in	**EX-33**	NPN open-collector transistor	Switchable either Light-ON or Dark-ON
			EX-33-PN	PNP open-collectr transitor	
Diffuse reflective		50 mm 1.969 in	**EX-32A**	NPN open-collector transistor	Light-ON
			EX-32B		Dark-ON
			EX-32A-PN	PNP open-collectr transitor	Light-ON
			EX-32B-PN		Dark-ON

Note: The model No. with suffix "**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-31A**: **EX-31P**, Receiver of **EX-31A**: **EX-31AD**

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**".

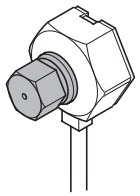
OPTIONS

Designation	Model No.	Description
Slit mask (For thru-beam type sensor only)	**OS-EX30-1** (Slit size ø1 mm ø0.039 in)	Slit on one side: • Sensing range: 200 mm 7.874 in [**EX-31□(-PN)**] 320 mm 12.598 in [**EX-33(-PN)**] • Min. sensing object: ø2 mm ø0.079 in
		Slit on both sides: • Sensing range: 150 mm 5.906 in [**EX-31□(-PN)**] 240 mm 9.449 in [**EX-33(-PN)**] • Min. sensing object: ø1 mm ø0.039 in

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

Slit mask

• **OS-EX30-1**



SPECIFICATIONS

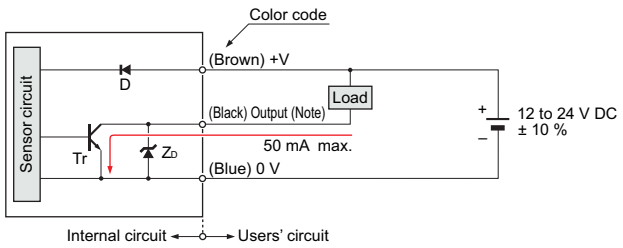
Item \ Type		Thru-beam		With operation mode switch	Diffuse reflective	
Model No.	NPN output	**EX-31A**	**EX-31B**	**EX-33**	**EX-32A**	**EX-32B**
	PNP output	**EX-31A-PN**	**EX-31B-PN**	**EX-33-PN**	**EX-32A-PN**	**EX-32B-PN**
Sensing range		500 mm 19.685 in		800 mm 31.496 in	50 mm 1.969 in (Note 2)	
Sensing object		ø2 mm ø0.079 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 0.002 in or less			0.5 mm 0.020 in or less	
Supply voltage		12 to 24 V DC ± 10 % Ripple P-P 10 % or less				
Current consumption		Emitter: 10 mA or less, Receiver: 15 mA or less			20 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: 1 V or less (at 50 mA sink current) 0.4 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: 1 V or less (at 50 mA source current) 0.4 V or less (at 16 mA source current)	
	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) (Refer to p.984 for details of standards.)				
	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				
	Ambient humidity	35 to 85 % RH, Storage: 35 to 85 % RH				
	Ambient illuminance	Incandescent light: 3,000 ℓx at the light-receiving face				
	EMC	EN 60947-5-2				
	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 0.118 in amplitude (20 G max.) in X, Y and Z directions for two hours each				
	Shock resistance	500 m/s² acceleration (50 G approx.) in X, Y and Z directions for 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 mm² 3-core (thru-beam type sensor emitter: 2-core) cabtyre cable, 2 m 6.562 ft long				
Cable extension		Extension up to total 50 m 164.042 ft is possible with 0.3 mm², 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

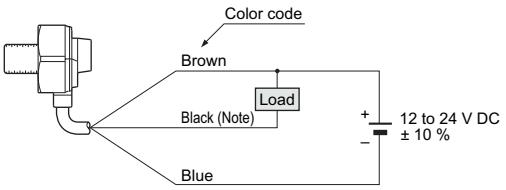
I/O circuit diagram



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

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

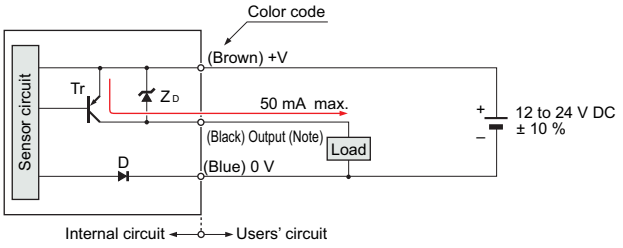
Wiring diagram



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

PNP output type

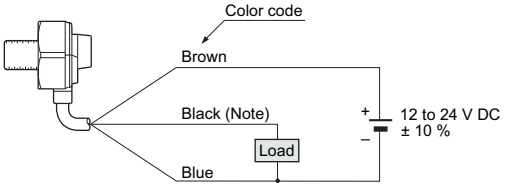
I/O circuit diagram



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

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

Wiring diagram

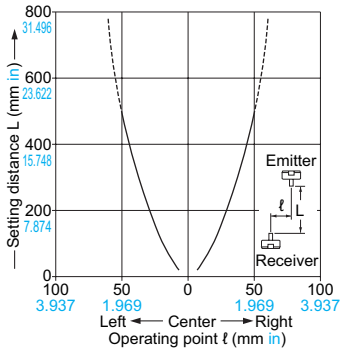


Note: The emitter of the thru-beam type sensor does not incorporate the black wire.

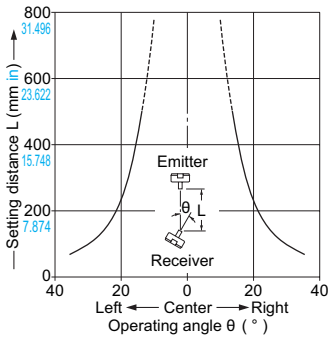
SENSING CHARACTERISTICS (TYPICAL)

EX-31□ EX-31□-PN — Thru-beam type

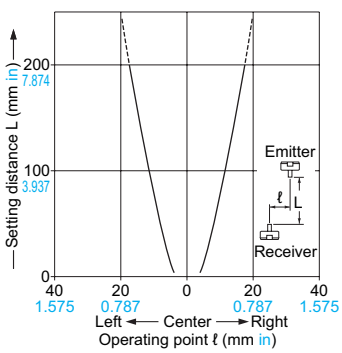
Parallel deviation



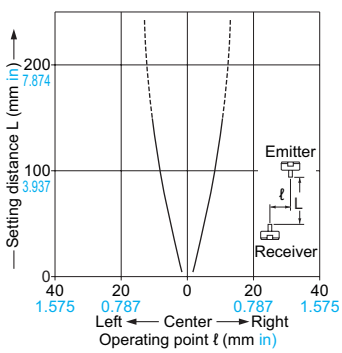
Angular deviation



Parallel deviation with slit mask on one side

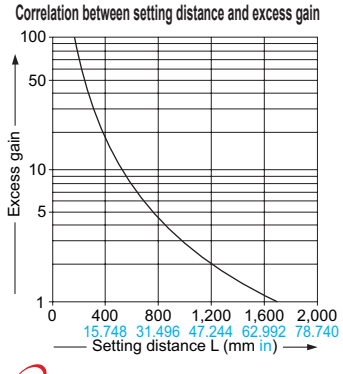


Parallel deviation with slit masks on both sides



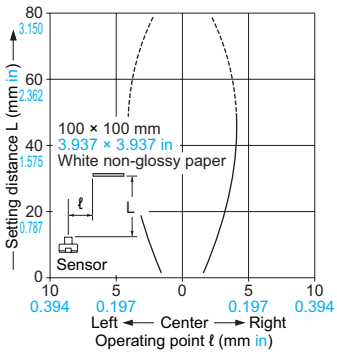
EX-31□ EX-31□-PN — Thru-beam type

Correlation between setting distance and excess gain

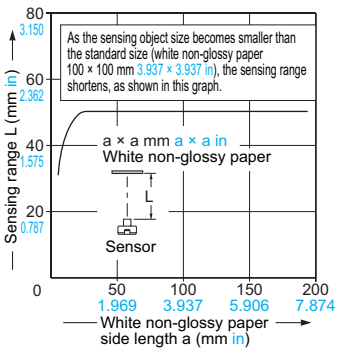


EX-32□ EX-32□-PN — Diffuse reflective type

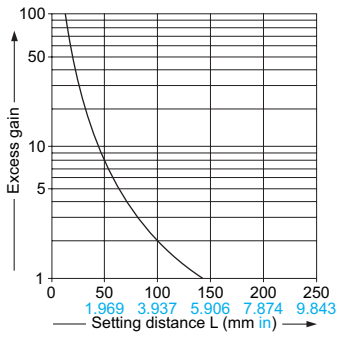
Sensing field



Correlation between sensing object size and sensing range



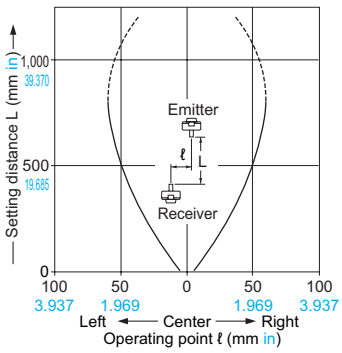
Correlation between setting distance and excess gain



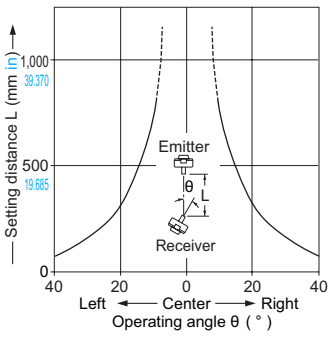
SENSING CHARACTERISTICS (TYPICAL)

EX-33 EX-33-PN Thru-beam type

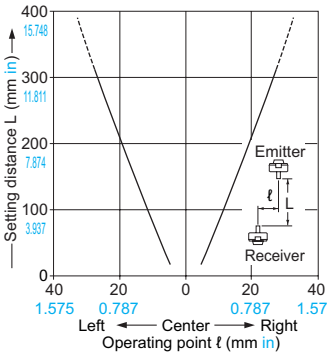
Parallel deviation



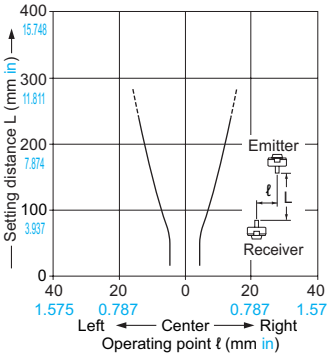
Angular deviation



Parallel deviation with slit mask on one side



Parallel deviation with slit masks on both sides



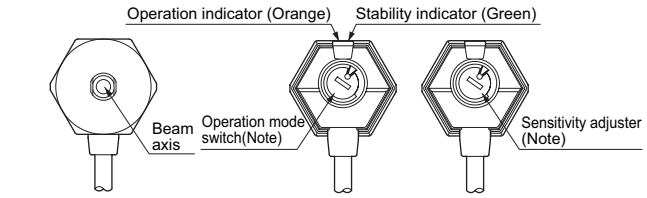
PRECAUTIONS FOR PROPER USE

Refer to P.986~ 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.

Part description

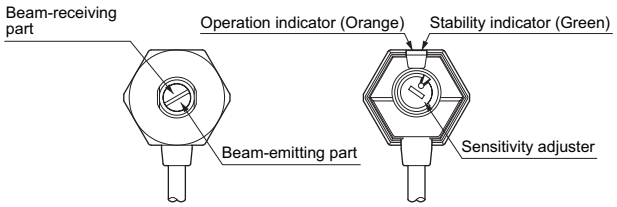
EX-31□(-PN), EX-33(-PN)



<Emitter / Receiver> <Receiver> <Emitter>

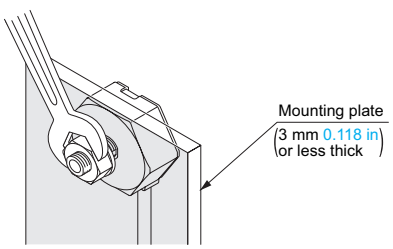
Note: Not incorporated on **EX-31□(-PN)**.

EX-32□, EX-32□-PN

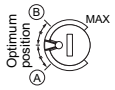


Mounting

- Mount the sensor on a mounting plate 3 mm 0.118 in or less thick, using the enclosed nut and toothed lock washer.
  When tightening the nut, hold the sensor with hand or a spanner and make sure that the tightening torque is 0.6 N·m [**EX-32□(-PN)**: 1.0 N·m] or less.
  Do not tighten the sensor itself with a spanner, etc.



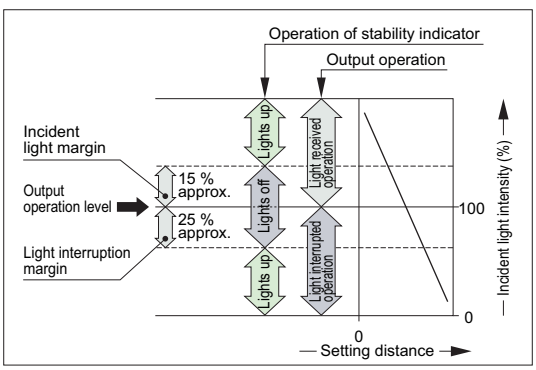
Sensitivity adjustment (Excluding EX-31□)

Step	Sensitivity adjuster	Description
①		Turn the sensitivity adjuster fully counterclockwise to the minimum sensitivity position.
②		In the light received condition, turn the sensitivity adjuster slowly clockwise and confirm the point Ⓐ where the sensor enters the “Light” state operation.
③		In the dark condition, turn the sensitivity adjuster further clockwise until the sensor enters the “Light” state operation and then bring it back to confirm point Ⓑ where the sensor just returns to the “Dark” state operation. (If the sensor does not enter the “Light” state operation even when the sensitivity adjuster is turned fully clockwise, this extreme position is point Ⓑ.)
④		The position at the middle of points Ⓐ and Ⓑ is the optimum sensing position.

Note: Use the attached adjusting screwdriver to turn the adjuster slowly. Turning with excessive strength will damage the adjuster.

Stability indicator

- The stability indicator (green) lights up when the incident light intensity has sufficient margin with respect to the operation level.
  If the incident light intensity level is such that the stability indicator lights up, stable sensing can be done without the light received operation and the light interrupted operation being affected by a change in ambient temperature or supply voltage.



PRECAUTIONS FOR PROPER USE

Refer to P.986~ for general precautions.

Wiring

- Extension up to total 50 m 164.042 ft (thru-beam type: both emitter and receiver) is possible with 0.3 mm², or more, cable.
  However, in order to reduce noise, make the wiring as short as possible.
- Excess bending of the cable or stress applied to the cable may disconnect the internal lead wire.

Optional slit mask (Thru-beam type only)

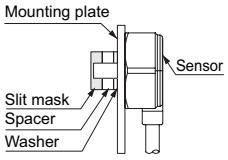
- Apply the optional slit mask when detecting small objects or for increasing the accuracy of sensing position. However, the sensing range is reduced when the slit mask is mounted.

Mounting method

①Insert the sensor into the mounting plate.
②Fit the washer and spacers enclosed with the slit mask. Note that the number of spacers to be fitted differs with the mounting plate thickness, as give in the table below. (Note)
③Mount the slit mask. Make sure that the tightening torque is 0.6 N·m or less.

Note: If the mounting plate thickness falls within the values mentioned in the table below, use the number of spacers that represents the thickness that comes closest to the actual thickness of the mounting plate being used. There will be no effect on the sensor if the slit mask comes out in the front because of the spacers.

Mounting plate thickness	No. of spacers
3 mm 0.118 in	0 pc.
2 mm 0.079 in	1 pc.
1 mm 0.039 in	2 pcs.



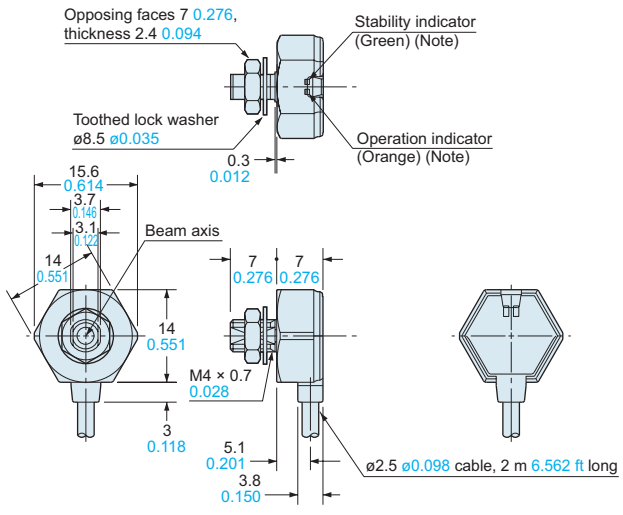
Others

- Do not use during the initial transient time (50 ms) 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)

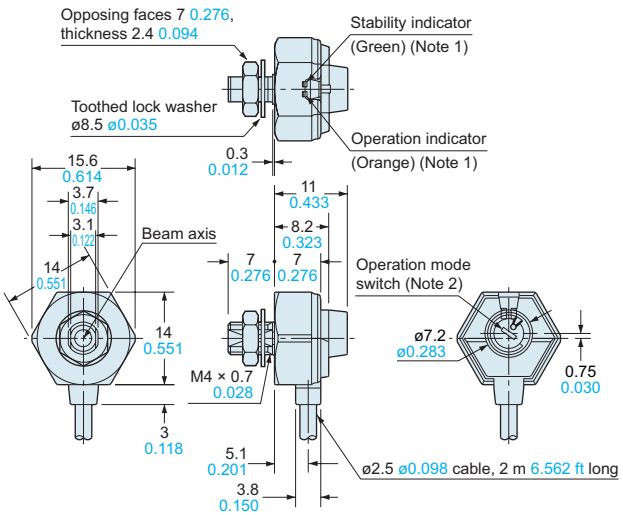
The CAD data in the dimensions can be downloaded from the SUNX website: http://www.sunx.com

EX-31□ EX-31□-PN Sensor



Note: Not incorporated on the emitter.

EX-33 EX-33-PN Sensor

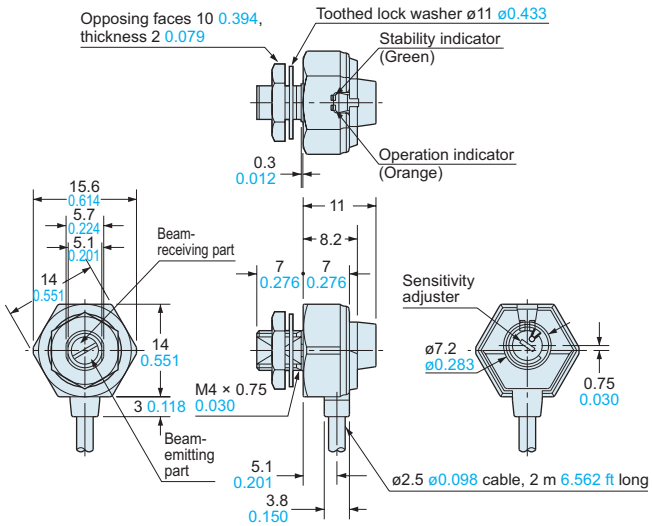


Notes: 1) Not incorporated on the emitter.
2) It is the sensitivity adjuster on the emitter.

DIMENSIONS (Unit: mm in)

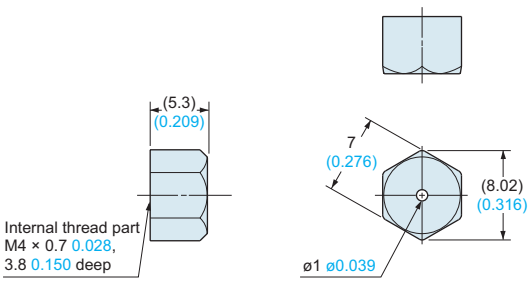
The CAD data in the dimensions can be downloaded from the SUNX website: http://www.sunx.com

EX-32□ EX-32□-PN — Sensor



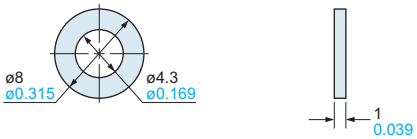
OS-EX30-1 — Slit mask (optional)

Slit mask



Material: Brass(Nickel plated)

Spacer



Material: POM