

# EX-10 SERIES

Related Information

General terms and conditions .....P.1

Sensor selection guide .....P.11~ / P.229~

Glossary of terms / General precautions .....P.983~ / P.986~

Korea's S-mark..... P.1034~



SUNX website <http://www.sunx.com>



## Amplifier built-in extraordinarily small and slim size

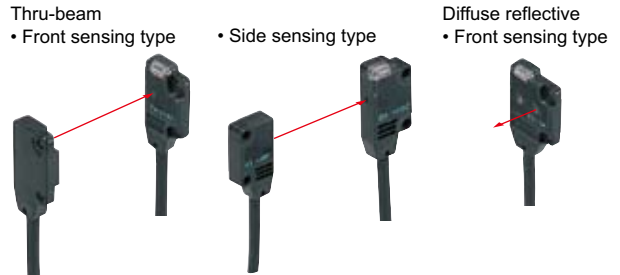
### Smallest body, just 3.5 mm 0.138 in thick

It can be mounted in a very small space as its size is just  $W10 \times H14.5 \times D3.5$  mm  
 $W0.394 \times H0.571 \times D0.138$  in (thru-beam, front sensing type).



### Flexible mounting

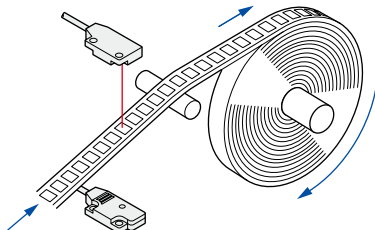
The diffuse reflective type sensor is front sensing and is so thin that it gives an impression of being just pasted on the mounting base. The thru-beam type is available as front sensing type, as well as, side sensing type, allowing flexible mounting.



## BASIC PERFORMANCE

### High-speed response time: 0.5 ms

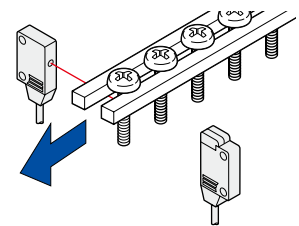
The sensor is suitable for detecting small and high-speed traveling objects.



### Minimum sensing object: $\phi 1$ mm $\phi 0.039$ in

EX-11(E) EX-15(E)

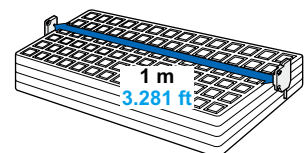
EX-11, EX-11E, EX-15 and EX-15E are incorporated with  $\phi 1$  mm  $\phi 0.039$  in slit masks so that  $\phi 1$  mm  $\phi 0.039$  in, or more, object can be detected. Hence, they are suitable for precise positioning or small parts detection.



### 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.

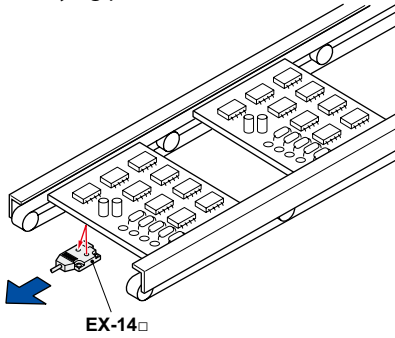


- Selection Guide
- Amplifier Built-in
- CX-400**
- EX-10
- EX-20
- EX-30
- EX-40
- EQ-30
- EQ-500
- MQ-W
- RX-LS200
- RX
- CY
- PX-2
- RT-610
- Power Supply Built-in
- NX5
- VF
- Amplifier-separated
- SU-7 / SH
- SS-A5 / SH
- Other Products

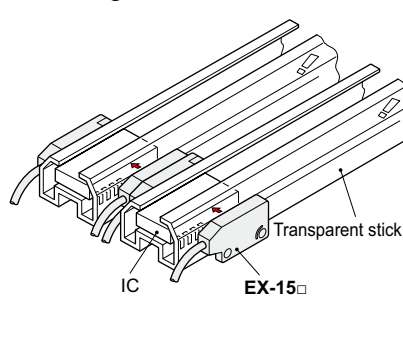
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P.258~SPECIFICATIONS  
P.260I/O CIRCUIT DIAGRAMS  
P.261~SENSING CHARACTERISTICS  
P.262~PRECAUTIONS FOR PROPER USE  
P.264DIMENSIONS  
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## APPLICATIONS

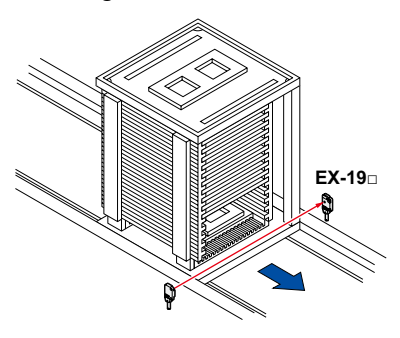
## Verifying position of PCBs



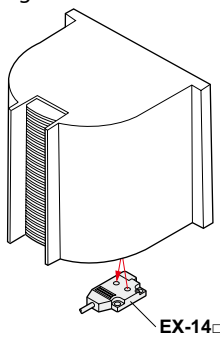
## Detecting ICs



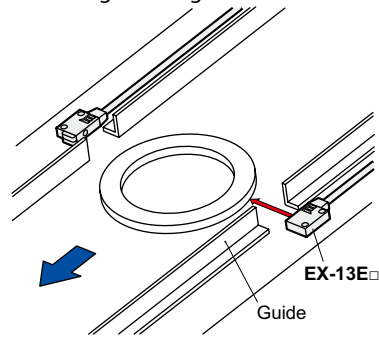
## Detecting PCB rack



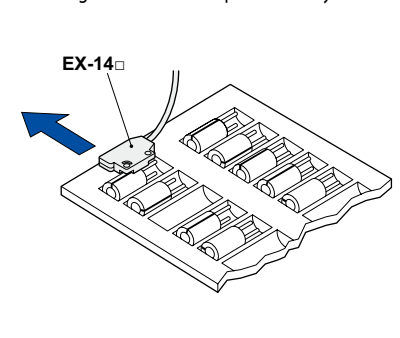
## Detecting wafer cassette



## Detecting thin ring



## Checking for absence of capacitor in tray



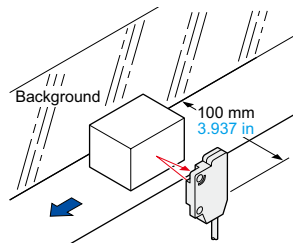
## BASIC PERFORMANCE

## Background suppression

EX-14

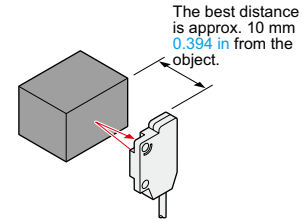
## Hardly affected by background

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.



The best distance is approx. 10 mm 0.394 in from the object.

## ENVIRONMENTAL RESISTANCE

## Waterproof

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.

## Ten times durable

EX-R

Flexible cable on EX- R is 10 times as durable as conventional model. It is most suitable for moving parts, such as robot arm, etc.

## FUNCTIONS

## Bright 2-color indicator

A convenient 2-color indicator has been incorporated in the miniature body.



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

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

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- LASER SENSORS
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- INDUCTIVE PROXIMITY SENSORS
- PARTICULAR USE SENSORS
- SENSOR OPTIONS
- WIRE-SAVING SYSTEMS
- MEASUREMENT SENSORS
- STATIC CONTROL DEVICES
- LASER MARKERS

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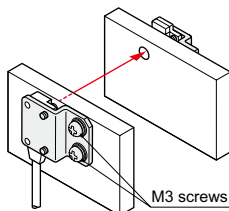
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## MOUNTING / SIZE

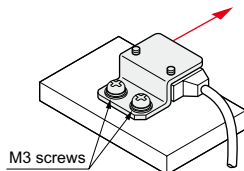
### Mountable with M3 screws

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

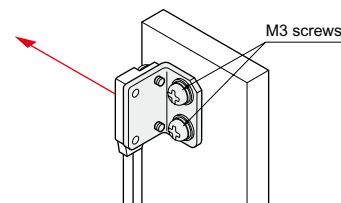
- MS-EX10-1 [Cold rolled carbon steel (SPCC)]
- MS-EX10-11 [Stainless steel (SUS304)]  
(mounting bracket for the front sensing type)



- 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

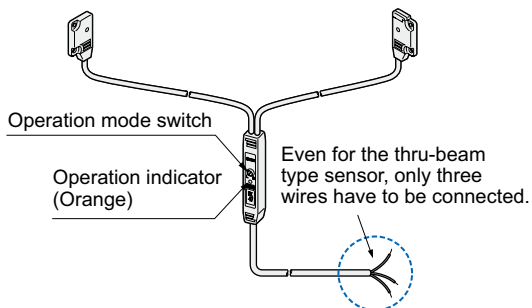
The red LED beam projected from the emitter helps you to align the sensor heads.

## 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.



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	EX-11A	Light-ON	NPN open-collector transistor
				EX-11B	Dark-ON	
			500 mm 19.685 in	EX-13A	Light-ON	
				EX-13B	Dark-ON	
			1 m 3.281 ft	EX-19A	Light-ON	
				EX-19B	Dark-ON	
		Series connection type <small>With operation mode switch on the bifurcation</small>	150 mm 5.906 in	EX-15	Switchable either Light-ON or Dark-ON	
			500 mm 19.685 in	EX-17		
			500 mm 19.685 in	EX-17W		
	Side sensing <small>With operation mode switch on the bifurcation</small>	150 mm 5.906 in	EX-11EA	Light-ON		
			EX-11EB	Dark-ON		
			EX-13EA	Light-ON		
		500 mm 19.685 in	EX-13EB	Dark-ON		
			EX-15E	Switchable either Light-ON or Dark-ON		
			EX-17E			
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)	EX-14A		Light-ON	
			EX-14B	Dark-ON		
	PNP output	Thru-beam	Front sensing	150 mm 5.906 in	EX-11A-PN	Light-ON
					EX-11B-PN	Dark-ON
				500 mm 19.685 in	EX-13A-PN	Light-ON
					EX-13B-PN	Dark-ON
1 m 3.281 ft				EX-19A-PN	Light-ON	
				EX-19B-PN	Dark-ON	
Side sensing		150 mm 5.906 in	EX-11EA-PN	Light-ON		
			EX-11EB-PN	Dark-ON		
			EX-13EA-PN	Light-ON		
500 mm 19.685 in	EX-13EB-PN	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)	EX-14A-PN	Light-ON	
				EX-14B-PN	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 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-11A: EX-11P, Receiver of EX-11A: EX-11AD

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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 and series connection type EX-17W.)  
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

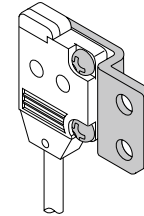
5 m 16.404 ft cable length type (standard: 2 m 6.562 ft) is also available for NPN output type. (excluding series connection type EX-17W and flexible cable type.)  
When ordering this type, suffix “-C5” to the model No.  
(e.g.) 5 m 16.404 ft cable length type of EX-11A is “EX-11A-C5”.

OPTIONS

Designation	Model No.	Description
Sensor mounting bracket	MS-EX10-1	Mounting bracket for the front sensing type sensor [Cold rolled carbon steel (SPCC)] (The thru-beam type sensor needs two brackets.)
	MS-EX10-2	Mounting bracket for the side sensing type sensor [Cold rolled carbon steel (SPCC)] (The thru-beam type sensor needs two brackets.)
	MS-EX10-3	L-shaped mounting bracket sensor [Cold rolled carbon steel (SPCC)] (The thru-beam type sensor needs two brackets.)
	MS-EX10-11	Mounting bracket for the front sensing type sensor [Stainless steel (SUS304)] (The thru-beam type sensor needs two brackets.)
	MS-EX10-12	Mounting bracket for the side sensing type sensor [Stainless steel (SUS304)] (The thru-beam type sensor needs two brackets.)
	MS-EX10-13	L-shaped mounting bracket [Stainless steel (SUS304)] (The thru-beam type sensor needs two brackets.)
Slit mask	OS-EX10-12 (Slit size ø1.2 mm ø0.047 in)	Slit on one side Sensing range: 600 mm 23.622 in [EX-19 ] 250 mm 9.843 in [EX-13 , EX-17 ] Min. sensing object: ø2 mm ø0.079 in
		Slit on both sides Sensing range: 400 mm 15.748 in [EX-19 ] 200 mm 7.874 in [EX-13 , EX-17 ] Min. sensing object: ø1.2 mm ø0.047 in
	OS-EX10-15 (Slit size ø1.5 mm ø0.059 in)	Slit on one side Sensing range: 800 mm 31.496 in [EX-19 ] 350 mm 13.780 in [EX-13 ] Min. sensing object: ø2 mm ø0.079 in
		Slit on both sides Sensing range: 500 mm 19.685 in [EX-19 ] 300 mm 11.811 in [EX-13 ] Min. sensing object: ø1.5 mm ø0.059 in
	OS-EX10E-12 (Slit size ø1.2 mm ø0.047 in)	Slit on one side Sensing range: 250 mm 9.843 in [EX-13E , EX-17E ] Min. sensing object: ø2 mm ø0.079 in
		Slit on both sides Sensing range: 200 mm 7.874 in [EX-13E , EX-17E ] Min. sensing object: ø1.2 mm ø0.047 in
Sensor checker (Note)	CHX-SC2	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	MS-M2	Mounting screws with washers (50 pcs. lot). It can mount securely as it is spring washer attached.

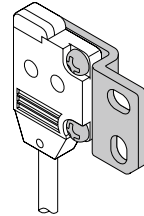
Sensor mounting bracket

MS-EX10-1



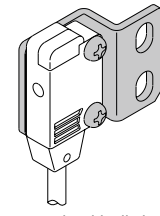
Material: Cold rolled carbon steel (SPCC) (Uni-chrome plated)  
Two M2 (length 4 mm 0.157 in) pan head screws are attached.

MS-EX10-11



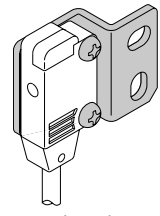
Material: Stainless steel (SUS304)  
Two M2 (length 4 mm 0.157 in) pan head screws [stainless steel (SUS304)] are attached.

MS-EX10-2



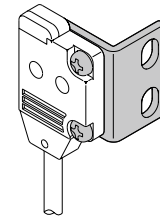
Material: Cold rolled carbon steel (SPCC) (Uni-chrome plated)  
Two M2 (length 8 mm 0.315 in) pan head screws are attached.

MS-EX10-12



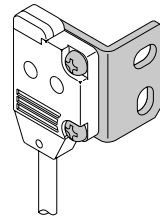
Material: Stainless steel (SUS304)  
Two M2 (length 8 mm 0.315 in) pan head screws [stainless steel (SUS304)] are attached.

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

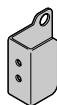
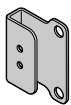


Material: Stainless steel (SUS304)  
Two M2 (length 4 mm 0.157 in) pan head screws [stainless steel (SUS304)] and two M2 (length 8 mm 0.315 in) pan head screws [stainless steel (SUS304)] are attached.

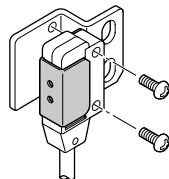
Note: Refer to p.800 for details of the sensor checker CHX-SC2.

Slit mask

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



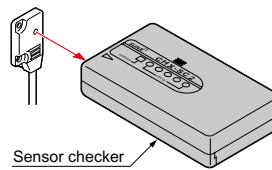
Example of mounting (OS-EX10E-12)



Tighten along with the sensor mounting bracket.

Sensor checker

CHX-SC2





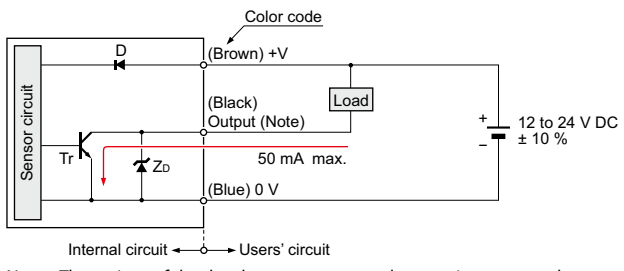
I/O CIRCUIT AND WIRING DIAGRAMS

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EX-11  EX-13  EX-19  EX-14

NPN output type

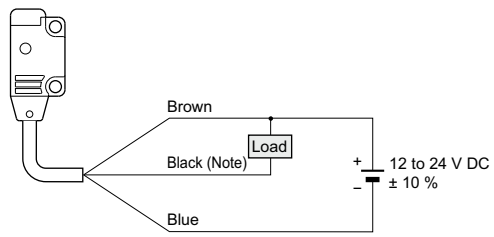
I/O circuit diagram



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

Symbols ... D : Reverse supply polarity protection diode  
 Zd: Surge absorption zener diode  
 Tr: NPN output transistor

Wiring diagram

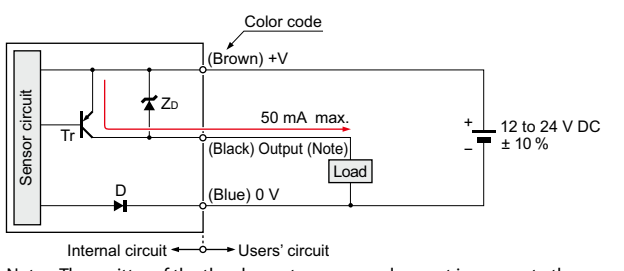


Note: The emitter of the thru-beam type sensor does not incorporate the black wire.

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

PNP output type

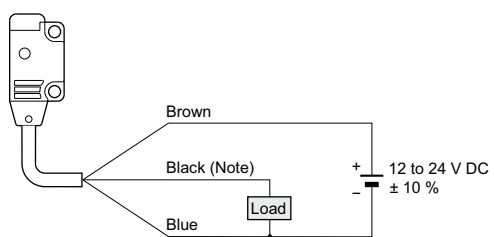
I/O circuit diagram



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

Symbols ... D : Reverse supply polarity protection diode  
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Wiring diagram



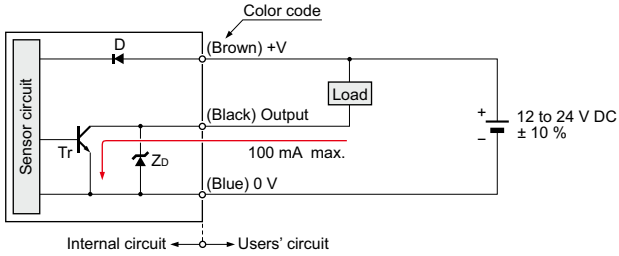
Note: The emitter of the thru-beam type sensor does not incorporate the black wire.

I/O CIRCUIT AND WIRING DIAGRAMS

EX-15, EX-15E, EX-17, EX-17E, EX-17W

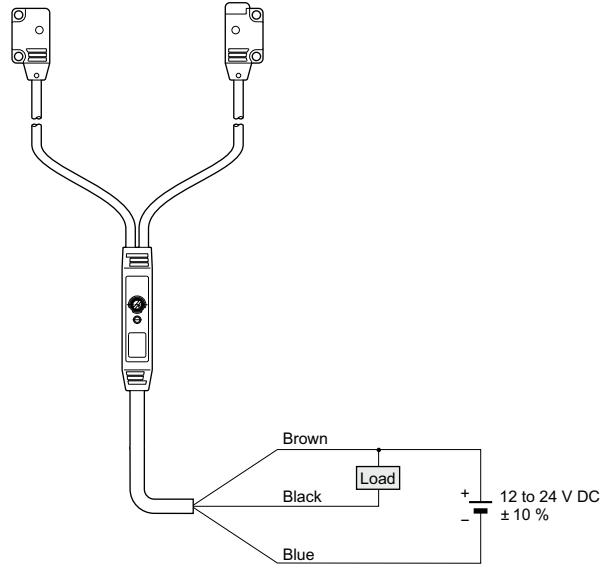
NPN output type

I/O circuit diagram

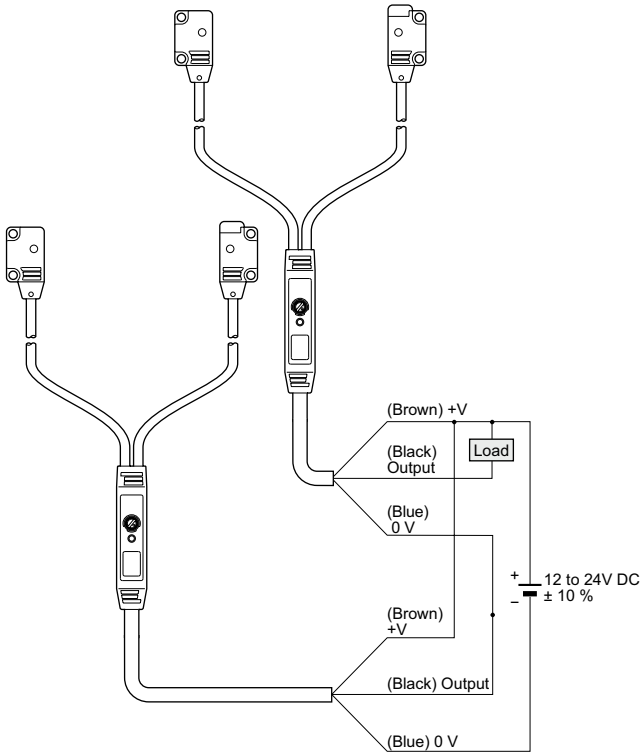


Symbols ... D : Reverse supply polarity protection diode  
Zd: Surge absorption zener diode  
Tr : NPN output transistor

EX-15, EX-15E, EX-17, EX-17E wiring diagram



EX-17W series connection wiring diagram

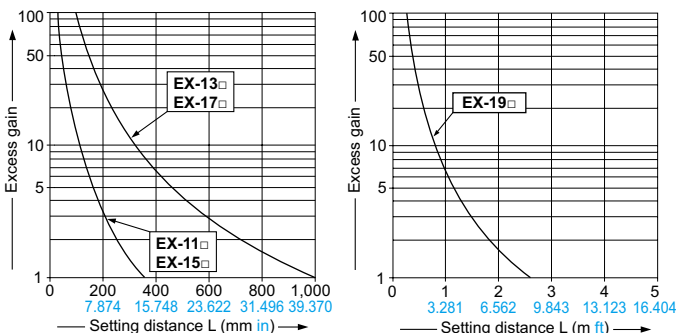


SENSING CHARACTERISTICS (TYPICAL)

All models

Thru-beam type

Correlation between setting distance and excess gain



FIBER SENSORS

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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

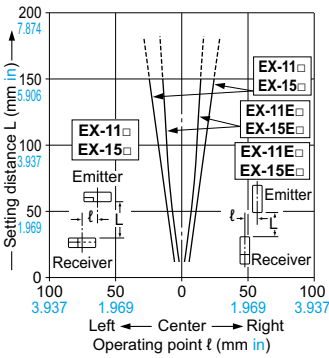


SENSING CHARACTERISTICS (TYPICAL)

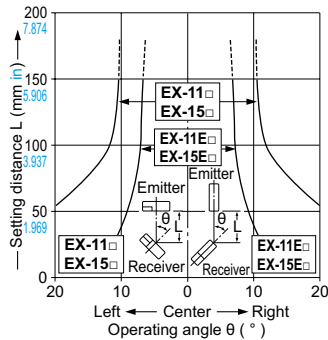
EX-11 □ EX-11E □ EX-15 □ EX-15E □

Thru-beam type

Parallel deviation



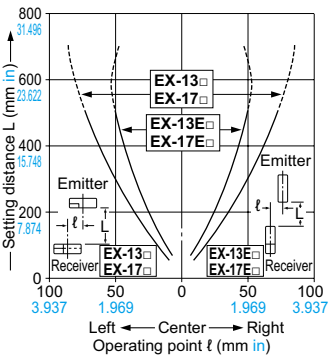
Angular deviation



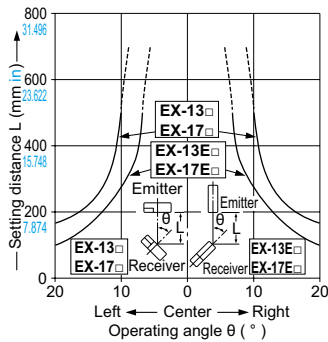
EX-13 □ EX-13E □ EX-17 □ EX-17E □

Thru-beam type

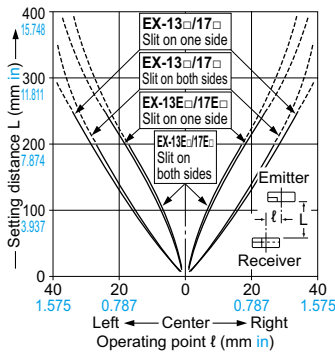
Parallel deviation



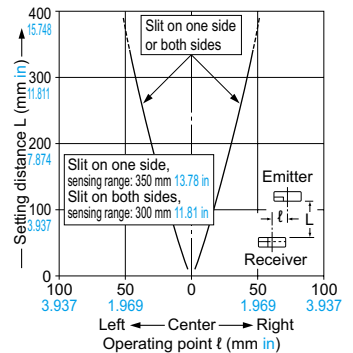
Angular deviation



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



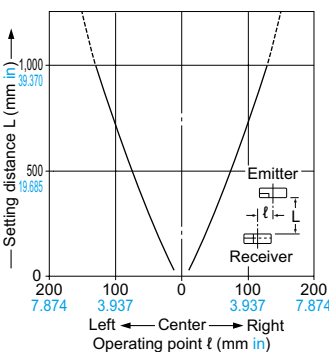
Parallel deviation with slit masks (ø1.5 mm ø0.059 in)



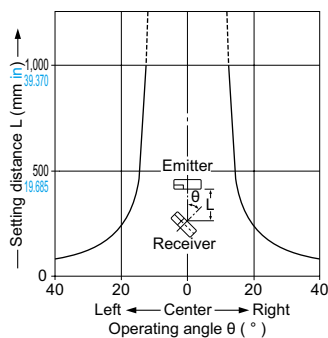
EX-19 □

Thru-beam type

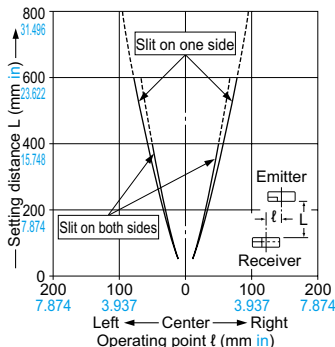
Parallel deviation



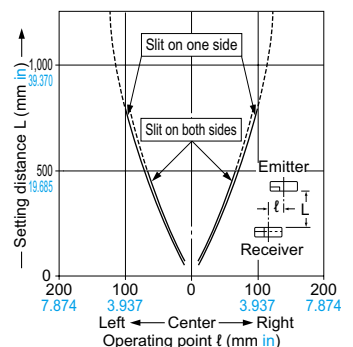
Angular deviation



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



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



- FIBER SENSORS
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- RX-LS200
- RX
- CY
- PX-2
- RT-610
- Power Supply Built-in
- NX5
- VF
- Amplifier-separated
- SU-7 / SH
- SS-A5 / SH
- Other Products

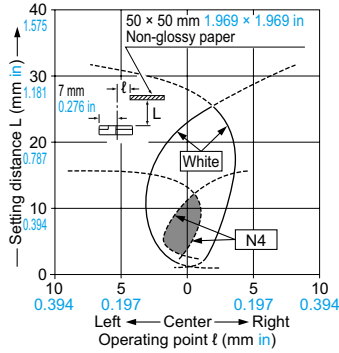
**SENSING CHARACTERISTICS (TYPICAL)**

EX-14

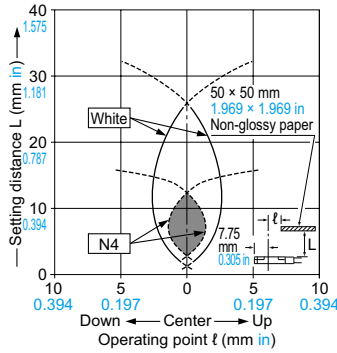
Convergent reflective type

**Sensing fields**

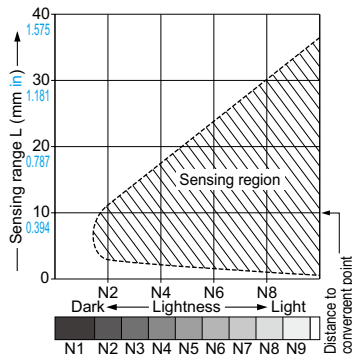
Horizontal (left and right) direction



Vertical (up and down) direction



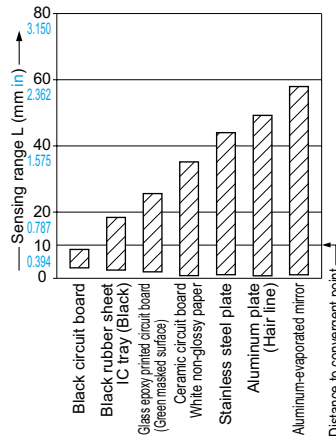
**Correlation between lightness and sensing range**



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 x 50 mm 1.969 x 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 p.986~ for general precautions.

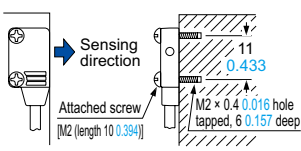


- Never use this product as a sensing device for personnel protection.
- In case of using sensing devices for personnel protection, use products that meet laws and standards, such as OSHA, ANSI or IEC etc., for personnel protection applicable in each region or country.

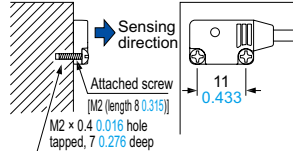
**Mounting**

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

**Side sensing**



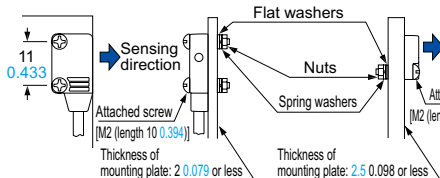
**Front sensing**



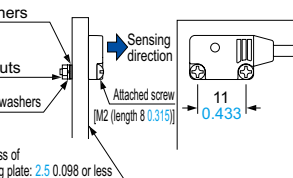
The tightening torque should be 0.2 N·m or less.

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

**Side sensing**



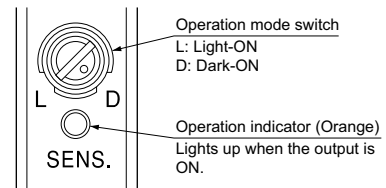
**Front sensing**



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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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

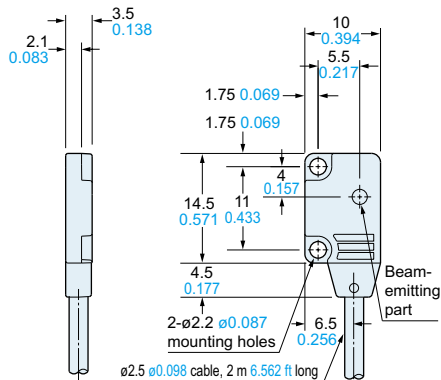
Other Products

**DIMENSIONS (Unit: mm in)**

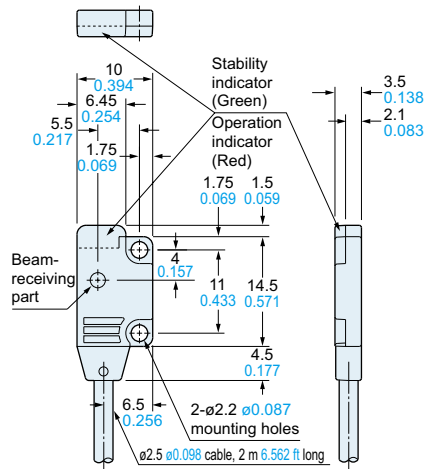
The CAD data in the dimensions can be downloaded from the SUNX website: <http://www.sunx.com>

EX-11A  EX-11B  EX-13A  EX-13B  EX-19A  EX-19B

Sensor



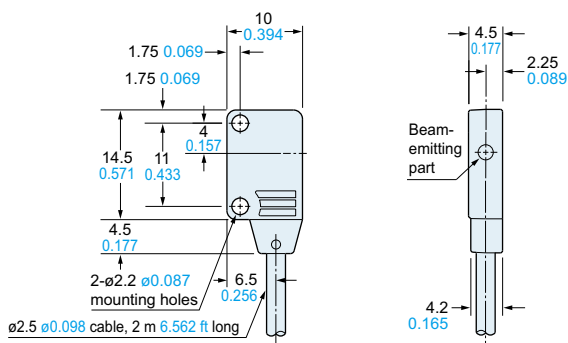
Emitter



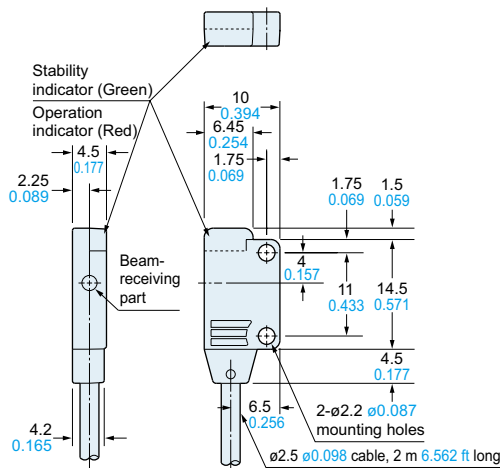
Receiver

EX-11EA  EX-11EB  EX-13EA  EX-13EB

Sensor



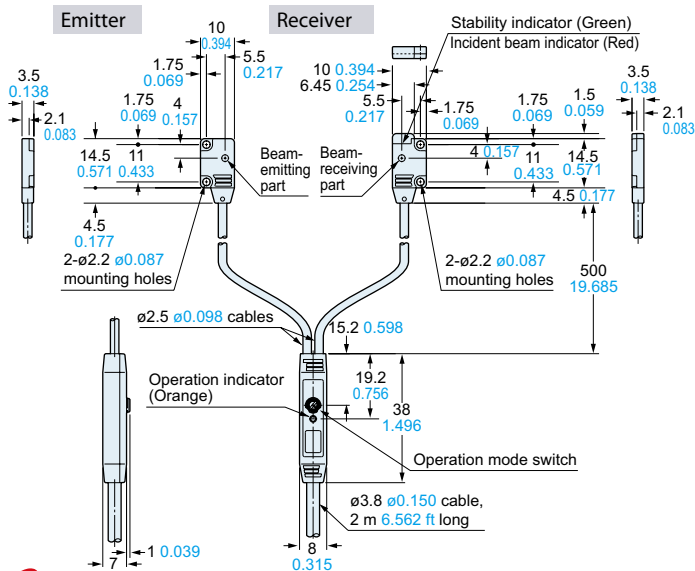
Emitter



Receiver

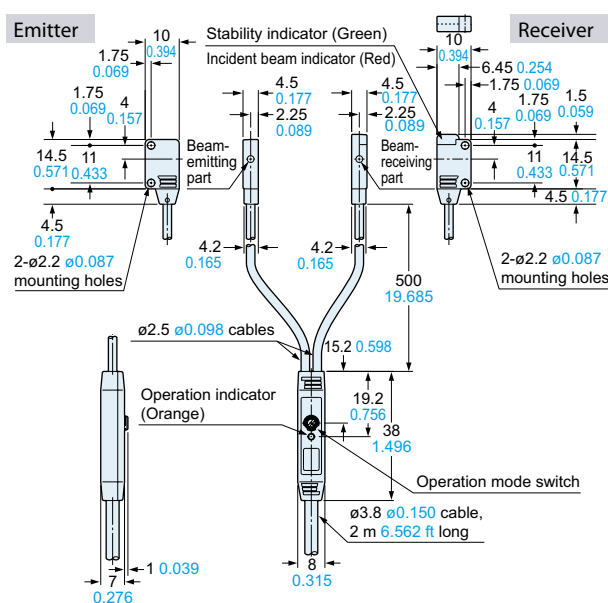
EX-15 EX-17(W)

Sensor



EX-15E EX-17E

Sensor

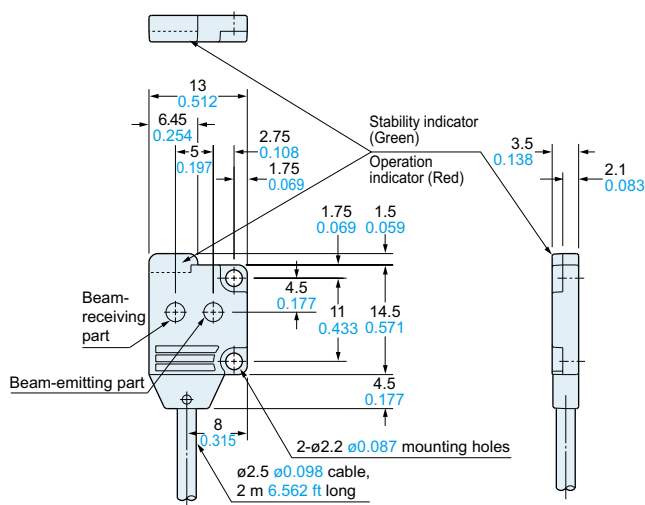


**DIMENSIONS (Unit: mm in)**

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

EX-14A EX-14B

Sensor

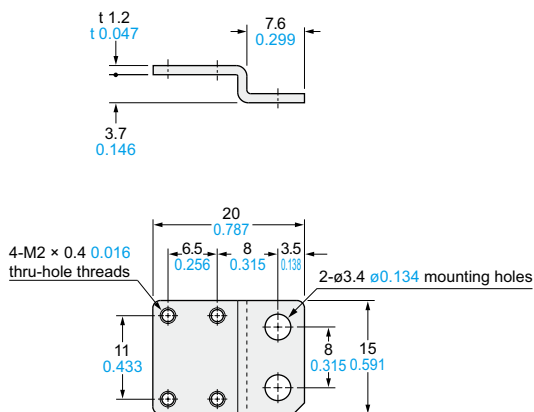


MS-EX10-1

Sensor mounting bracket (Optional)

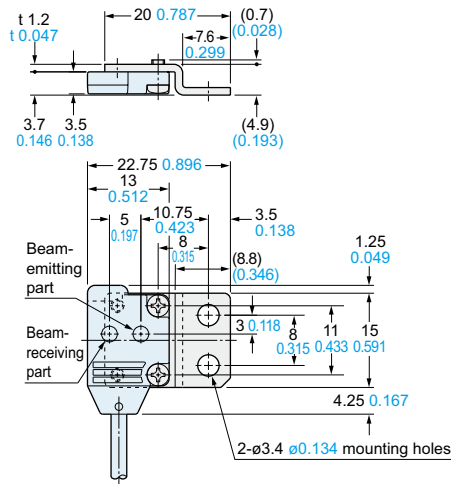
**Assembly dimensions**

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.

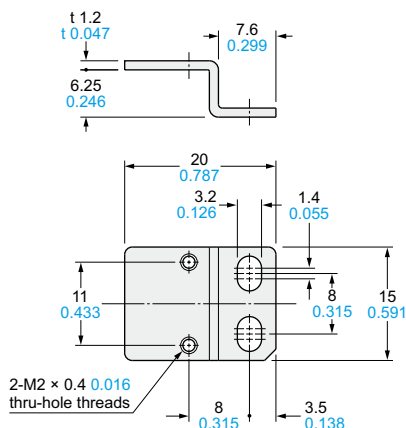


MS-EX10-2

Sensor mounting bracket (Optional)

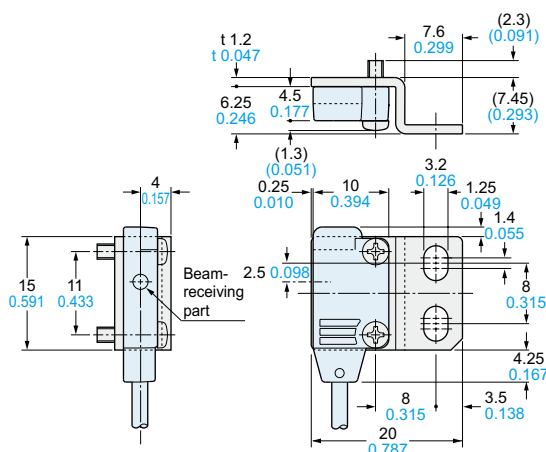
**Assembly dimensions**

Mounting drawing with EX-11 and EX-13



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-20

EX-30

EX-40

EQ-30

EQ-500

MQ-W

RX-L5200

RX

CY

PX-2

RT-610

Power Supply Built-in

NX5

VF

Amplifier-separated

SU-7 / SH

SS-A5 / SH

Other Products

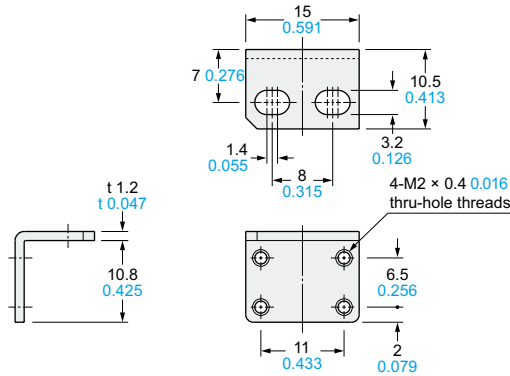
**DIMENSIONS (Unit: mm in)**

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

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<b>EQ-30</b>
<b>EQ-500</b>
<b>MQ-W</b>
<b>RX-LS200</b>
<b>RX</b>
<b>CY</b>
<b>PX-2</b>
<b>RT-610</b>
Power Supply Built-in
<b>NX5</b>
<b>VF</b>
Amplifier-separated
<b>SU-7 / SH</b>
<b>SS-A5 / SH</b>
Other Products

**MS-EX10-3**

Sensor mounting bracket (Optional)

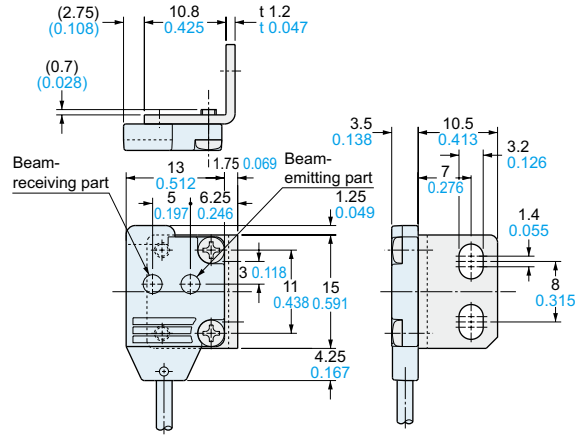


Material: Cold rolled carbon steel (SPCC)  
(Uni-chrome plated)

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.

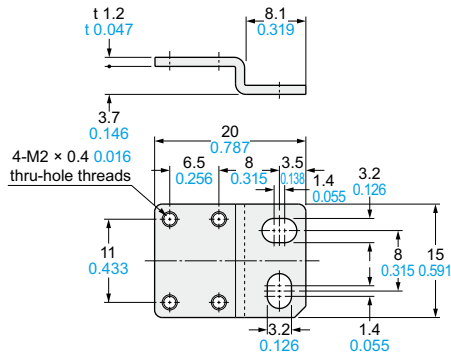
**Assembly dimensions**

Mounting drawing with EX-14



**MS-EX10-11**

Sensor mounting bracket (Optional)

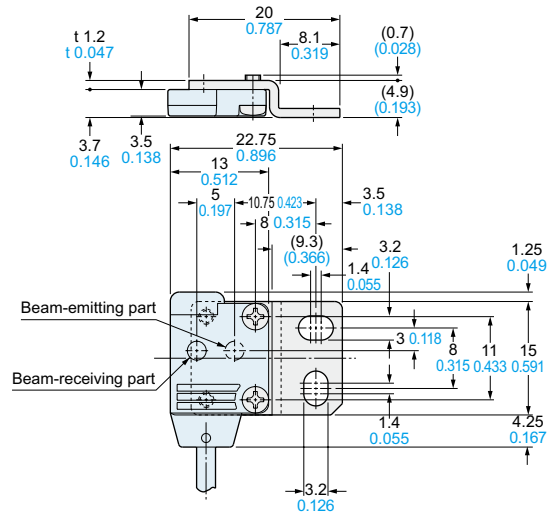


Material: Stainless steel (SUS304)

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

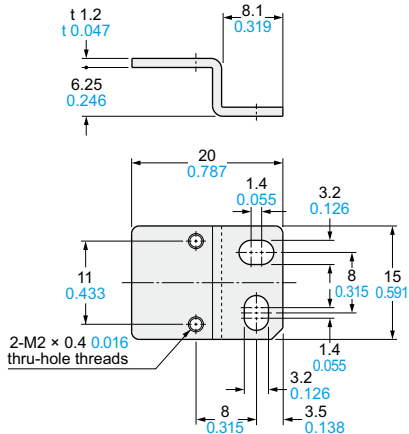
**Assembly dimensions**

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

