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PHOTOELECTRIC SENSORS

EQ-20

EQ-30

EX-40

RX

RX-LS200

CY

EX

PX-2

RT-610

Amplifier Built-in Type

EX SERIES

Amplifier Built-in Miniature-size Photoelectric Sensor
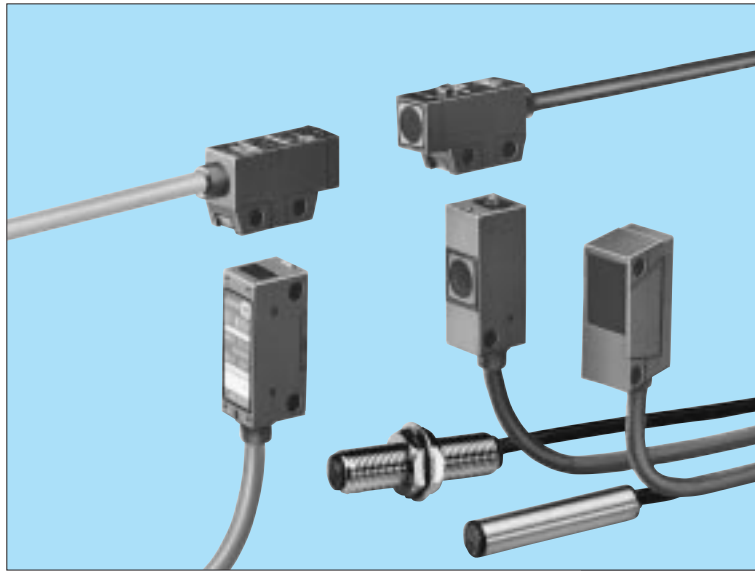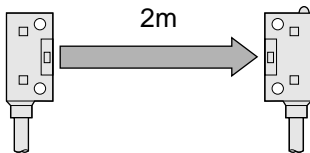
Amplifier Built-in Micro-size Type

$C\epsilon$ **Marked**

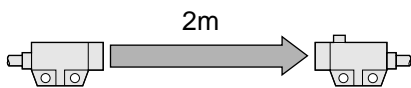**Conforming to EMC Directive (Excluding EX-D30S/D30M)**

Remarkable Sensing Performance
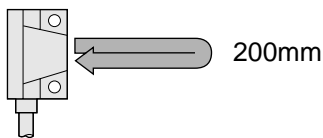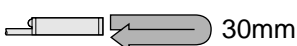
Sufficient sensing range despite its micro-size.
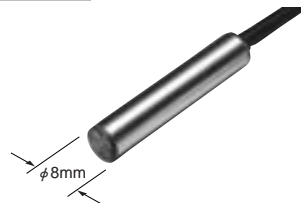
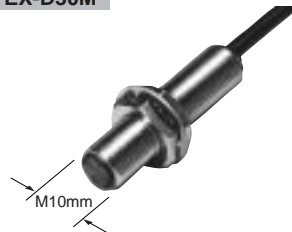**EX-M2E**

2m

EX-M2

2m

EX-D200E

200mm

EX-D30S, EX-D30M

30mm

Micro-size

A micro-size, high performance, amplifier built-in sensor with strong noise resistance has been realized.

EX-D30S

ϕ8mm

EX-D30M

M10mm

EX-M2E

12mm   10mm

26mm
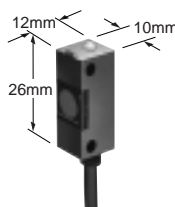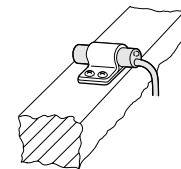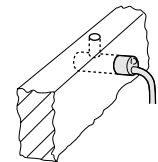
High-speed Response Time

High-speed response time of 1/1,000 sec. makes it possible to reliably detect a moving object.
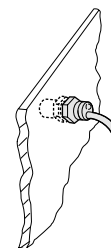
Versatile Mounting   Cylindrical type

The cylindrical type sensor allows versatile mounting.

Fixed by the attached mounting bracket

Fixed by a set screw through a hole

Fixed on an iron plate through a hole
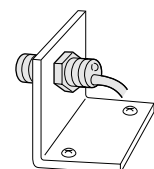
Mounting on a L bracket

APPLICATIONS

Counting of cans
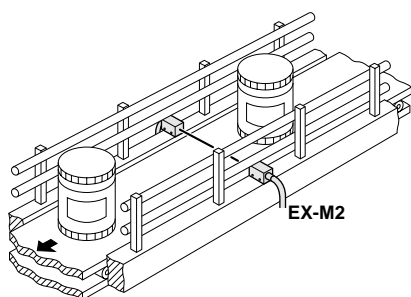
EX-M2

Confirming chuck operation

EX-D200E
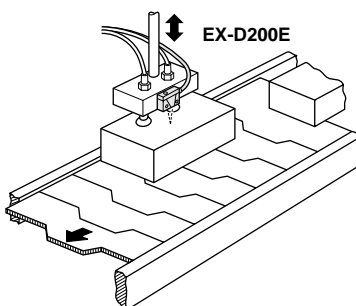
Sensing taped components

EX-D30S
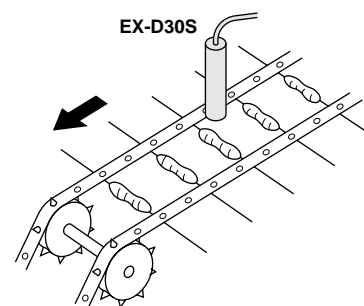
ORDER GUIDE

Type		Appearance	Sensing range	Model No.	Sensitivity adjuster	Output operation
Thru-beam	Side sensing		2m	**EX-M2E**	—	Selectable either Light-ON or Dark-ON by the control input
	Top sensing			**EX-M2**		
Diffuse reflective	Side sensing		200mm	**EX-D200E**	Incorporated	Light-ON
	Cylindrical	Non-threaded type	30mm	**EX-D30S**	—	
		Threaded type		**EX-D30M**		

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EX

OPTIONS

Designation	Model No.	Description	
Slit mask (For **EX-M2E** only)	**OS-EX-05✕3E** (Slit size 0.5✕3mm)	Slit on one side	• Sensing range: 0.5m • Min. sensing object: φ7mm
		Slit on both sides	• Sensing range: 0.1m • Min. sensing object: 0.5✕3mm
	OS-EX-1✕4E (Slit size 1✕4mm)	Slit on one side	• Sensing range: 1m • Min. sensing object: φ7mm
		Slit on both sides	• Sensing range: 0.4m • Min. sensing object: 1✕4mm
	OS-EX-2✕5E (Slit size 2✕5mm)	Slit on one side	• Sensing range: 1.5m • Min. sensing object: φ7mm
		Slit on both sides	• Sensing range: 1m • Min. sensing object: 2✕5mm
Slit mask (For **EX-M2** only)	**OS-EX-05✕2** (Slit size 0.5✕2mm)	Slit on one side	• Sensing range: 0.5m • Min. sensing object: φ7mm
		Slit on both sides	• Sensing range: 0.1m • Min. sensing object: 0.5✕2mm
	OS-EX-1✕3 (Slit size 1✕3mm)	Slit on one side	• Sensing range: 1m • Min. sensing object: φ7mm
		Slit on both sides	• Sensing range: 0.4m • Min. sensing object: 1✕3mm
	OS-EX-2✕4 (Slit size 2✕4mm)	Slit on one side	• Sensing range: 1.5m • Min. sensing object: φ7mm
		Slit on both sides	• Sensing range: 1m • Min. sensing object: 2✕4mm
Sensor mounting bracket	**MS-EX-3**	Exclusive mounting bracket for **EX-D30S**	
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.	

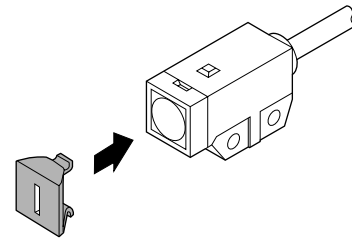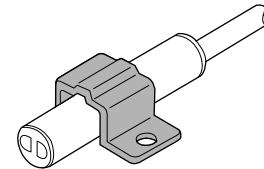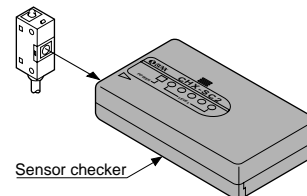Note: Refer to P. 378～ for details of the sensor checker **CHX-SC2**.

Slit mask
Fitted on the front lens with one-touch.

• For **EX-M2E**
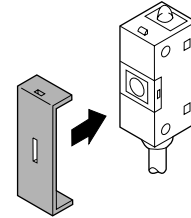
• For **EX-M2**

Sensor mounting bracket

Sensor checker

Sensor checker

SUNX

SPECIFICATIONS

Type	Thru-beam		Diffuse reflective		
	Side sensing	Top sensing	Side sensing	Non-threaded type	Threaded type
Item / Model No.	**EX-M2E**	**EX-M2**	**EX-D200E**	**EX-D30S**	**EX-D30M**
Sensing range	2m		200mm (Note 1)	30mm ± 15% (Note 1)	
Sensing object	ϕ7mm or more opaque object (Note 2)		Opaque, translucent or transparent object	Opaque, translucent or transparent object (Min. sensing object: ϕ0.7mm copper wire at a setting distance of 5mm)	
Hysteresis			15% or less of operation distance	10% or less of operation distance	
Repeatability (perpendicular to sensing axis)	0.1mm or less	0.04mm or less			
Supply voltage	12 to 24V DC ± 10% Ripple P-P 10% or less				
Current consumption	Emitter: 20mA or less, Receiver: 20mA or less		30mA or less	35mA or less	
Output	NPN open-collector transistor • Maximum sink current: 100mA • Applied voltage: 30V DC or less (between output and 0V) • Residual voltage: 1V or less (at 100mA sink current) 0.4V or less (at 16mA sink current)				
Utilization category	DC-12 or DC-13				
Output operation	Selectable either Light-ON or Dark-ON by the control input			Light-ON	
Short-circuit protection	Incorporated				
Response time	1ms or less			Under light received condition: 1ms or less Under light interrupted condition: 1.5ms or less	
Operation indicator	Red LED (lights up when the output is ON)				
Sensitivity adjuster			Continuously variable adjuster		
Pollution degree	3 (Industrial environment)				
Protection	IP65 (IEC)			IP66 (IEC)	
Ambient temperature	−10 to +60℃ (No dew condensation or icing allowed), Storage: −30 to +70℃ (**EX-D30S** and **EX-D30M**: −10 to +60℃)				
Ambient humidity	35 to 85% RH, Storage: 35 to 85% RH				
Ambient illuminance	Sunlight: 11,000 ℓx at the light-receiving face, Incandescent light: 3,500 ℓx at the light-receiving face				
EMC	Emission: EN50081-2, Immunity: EN50082-2				
Voltage withstandability	1,000V AC for one min. between all supply terminals connected together and enclosure			600V AC for one min. between all supply terminals connected together and enclosure	
Insulation resistance	20MΩ, or more, with 250V DC megger between all supply terminals connected together and enclosure			50MΩ, or more, with 500V DC megger between all supply terminals connected together and enclosure	
Vibration resistance	10 to 55Hz frequency, 1.5mm amplitude in X, Y and Z directions for two hours each				
Shock resistance	100m/s² acceleration (10G approx.) in X, Y and Z directions for three times each				
Emitting element	Infrared LED (modulated)				
Material	Enclosure: PBT (glass fiber reinforced) Lens: Polycarbonate			Enclosure: Stainless steel Resin part: Polycarbonate	Enclosure: Brass (Nickel plated) Resin part: Polycarbonate
Cable	0.14mm² 4-core (thru-beam type emitter: 2-core) oil, heat and cold resistant cabtyre cable, 3m long			0.18mm² 3-core cabtyre cable, 3m long	
Cable extension	Extension up to total 100m is possible with 0.3mm², or more, cable (thru-beam type: both emitter and receiver).				
Weight	Emitter: 60g approx. Receiver: 60g approx.	Emitter: 60g approx. Receiver: 65g approx.	65g approx.	65g approx.	70g approx. (including the nut and the washer)
Accessories	**MS-EX-1E** (Sensor mounting bracket): 2 sets	**MS-EX-1** (Sensor mounting bracket): 2 sets	**MS-EX-1E** (Sensor mounting bracket): 1 set Adjusting screwdriver: 1 No. Adjuster cap: 1 No.	**MS-SS8** (Sensor mounting bracket): 1 No.	Nut: 2 Nos. Toothed lock washer: 1 No.

Notes: 1) The sensing range of the diffuse reflective type sensor is specified for white non-glossy paper (**EX-D200E**: 200 × 200mm, **EX-D30S** and **EX-D30M**: 30 × 30mm) as the object.
2) If slit masks (optional) are fitted, an object of 0.5 × 3mm in case of **EX-M2E** and 0.5 × 2mm in case of **EX-M2** can be detected.
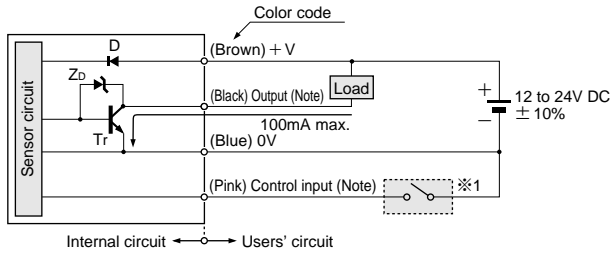
Amplifier Built-in Type

EQ-20 EQ-30 EX-40 RX RX-LS200 CY EX PX-2 RT-610

PHOTOELECTRIC SENSORS

EQ-20

EQ-30

EX-40

RX

RX-LS200

CY

EX

PX-2

RT-610

Amplifier Built-in Type

EX

I/O CIRCUIT AND WIRING DIAGRAMS

EX-M2E EX-M2
EX-D200E

I/O circuit diagram

Color code

Sensor circuit

D

Z_D

Tr

(Brown) + V

(Black) Output (Note) Load

100mA max.

(Blue) 0V

(Pink) Control input (Note) ※1

Internal circuit ←→ Users' circuit

+ − 12 to 24V DC ± 10%

Wiring diagram

Brown

Black Load

Blue

Pink ※1

+ − 12 to 24V DC ± 10%
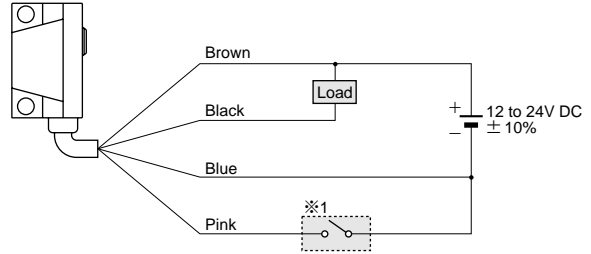
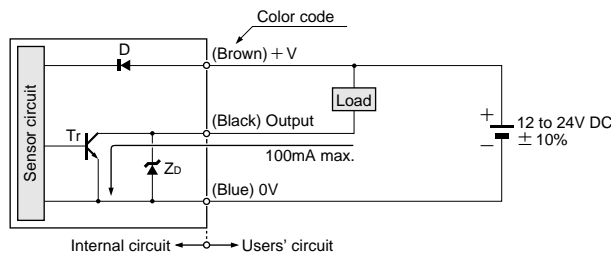Note: The emitter of the thru-beam type sensor does not incorporate the output and the control input.

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

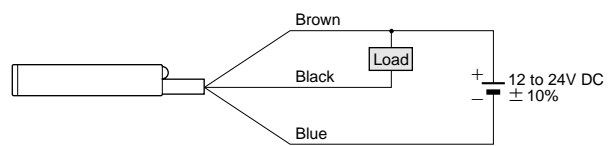### ※ **Selecting output operation by control input (pink)**

Connection Model No.	EX-M2E	EX-M2	EX-D200E
Connected to 0V	Light-ON	Light-ON	Dark-ON
Connected to + V	Dark-ON	———	———
Open circuit		Dark-ON	Light-ON

EX-D30S
EX-D30M

I/O circuit diagram

Color code

Sensor circuit

D

Tr

Z_D

(Brown) + V

Load

(Black) Output

100mA max.

(Blue) 0V

Internal circuit ←→ Users' circuit

+ − 12 to 24V DC ± 10%

Wiring diagram

Brown
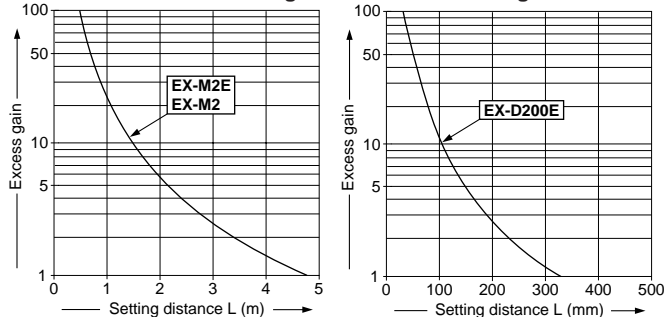
Black Load

Blue

+ − 12 to 24V DC ± 10%

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

SENSING CHARACTERISTICS (TYPICAL)

EX-M2E EX-M2
EX-D200E

Correlation between setting distance and excess gain

EX-M2E
EX-M2

Excess gain

Setting distance L (m)

EX-D200E

Excess gain
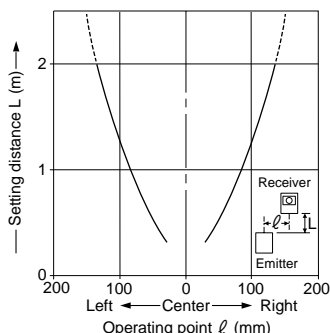
Setting distance L (mm)

SUNX

SENSING CHARACTERISTICS (TYPICAL)

EX-M2E   Thru-beam type

Parallel deviation

Setting distance L (m)
Operating point ℓ (mm)
Left ← Center → Right
Receiver / Emitter

Angular deviation

Setting distance L (m)
Operating angle θ (°)
Left ← Center → Right
Receiver / Emitter

Parallel deviation with slit masks (0.5 × 3mm)

Setting distance L (mm)
Operating point ℓ (mm)
Left ← Center → Right
Slit on one side
Slit on both sides
Receiver / Emitter

Parallel deviation with slit masks (1 × 4mm)

Setting distance L (m)
Operating point ℓ (mm)
Left ← Center → Right
Slit on one side
Slit on both sides
Receiver / Emitter

Parallel deviation with slit masks (2 × 5mm)

Setting distance L (m)
Operating point ℓ (mm)
Left ← Center → Right
Slit on one side
Slit on both sides
Receiver / Emitter

EX-M2   Thru-beam type

Parallel deviation

Setting distance L (m)
Operating point ℓ (mm)
Left ← Center → Right
Receiver / Emitter

Angular deviation

Setting distance L (m)
Operating angle θ (°)
Left ← Center → Right
Receiver angular deviation
Emitter angular deviation
Receiver / Emitter

Parallel deviation with slit masks (0.5 × 2mm)

Setting distance L (mm)
Operating point ℓ (mm)
Left ← Center → Right
Slit on one side
Slit on both sides
Receiver / Emitter

Parallel deviation with slit masks (1 × 3mm)

Setting distance L (m)
Operating point ℓ (mm)
Left ← Center → Right
Slit on one side
Slit on both sides
Receiver / Emitter

Parallel deviation with slit masks (2 × 4mm)

Setting distance L (m)
Operating point ℓ (mm)
Left ← Center → Right
Slit on one side
Slit on both sides
Receiver / Emitter

EQ-20
EQ-30
EX-40
RX
RX-LS200
CY
EX
PX-2
RT-610
Amplifier Built-in Type

SUNX

EX

SENSING CHARACTERISTICS (TYPICAL)

EX-D200E　Diffuse reflective type
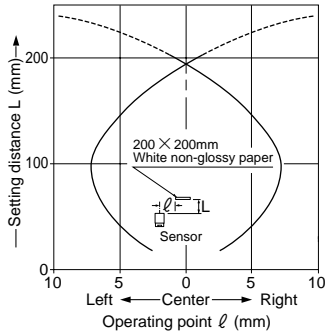
Sensing field

Setting distance L (mm)

200×200mm White non-glossy paper

Sensor

Left ◄── Center ──► Right
Operating point ℓ (mm)

Correlation between sensing object size and sensing range

Sensing range L (mm)

a×amm White non-glossy paper

Sensor

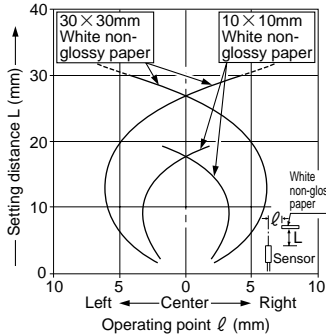White non-glossy paper side length a (mm)
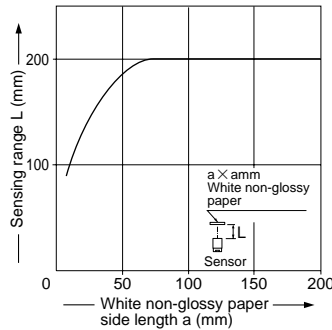
As the sensing object size becomes smaller than the standard size (white non-glossy paper 200×200mm), the sensing range shortens, as shown in the left graph.

(For plotting the left graph, the sensitivity has been set such that a 200×200mm white non-glossy paper object is just detectable at a distance of 200mm.)

EX-D30S
EX-D30M　Diffuse reflective type

Sensing field

Setting distance L (mm)

30×30mm White non-glossy paper　10×10mm White non-glossy paper

White non-glossy paper

Sensor

Left ◄── Center ──► Right
Operating point ℓ (mm)

Correlation between sensing object size and sensing range

Sensing range L (mm)

a×amm White non-glossy paper

Sensor

White non-glossy paper side length a (mm)
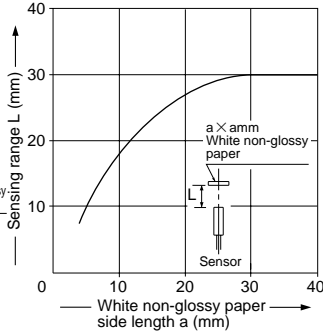
As the sensing object size becomes smaller than the standard size (white non-glossy paper 30×30mm), the sensing range shortens, as shown in the left graph.

PRECAUTIONS FOR PROPER USE

⚠ This product is not a safety sensor. Its use is not intended or designed to protect life and prevent body injury or property damage from dangerous parts of machinery. It is a normal object detection sensor.

Mounting
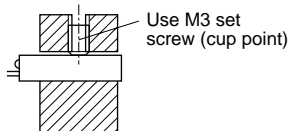• The tightening torque should not exceed the value given below.

EX-M2E: 0.58N·m

EX-M2, **EX-D200E**: 0.39N·m

M3 (length 16mm) screw with washers

Attached mounting bracket
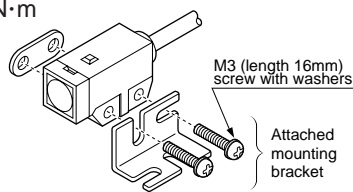
EX-D30S, EX-D30M

Mounting with a set screw

Use M3 set screw (cup point)

The tightening torque should be as follows.
EX-D30S: 0.24N·m
EX-D30M: 0.34N·m

Mounting with nuts

B　A
29mm　10mm
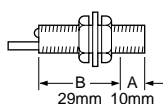
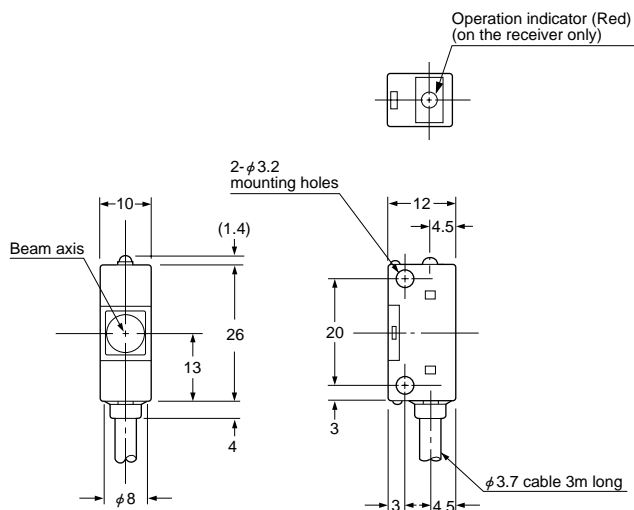| A part	B part
2.45N·m	8.33N·m

Others
• The output of **EX-D30S** and **EX-D30M** is not incorporated with a short-circuit protection circuit. Do not connect it directly to a power supply or a capacitive load.
• Do not use during the initial transient time (20ms) after the power supply is switched on.
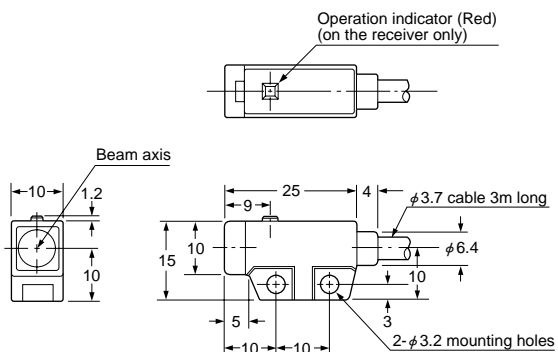• After the sensitivity is adjusted, fit the attached adjuster cap. (For **EX-D200E** only)
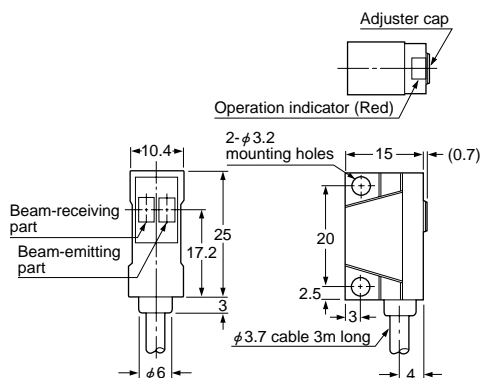
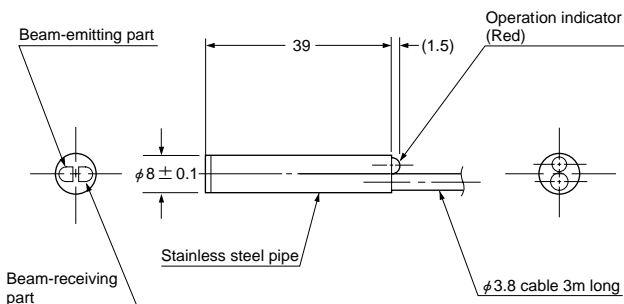

⊗SUNX
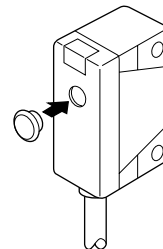
DIMENSIONS (Unit: mm)

EX-M2E   Sensor

Operation indicator (Red)
(on the receiver only)

Beam axis

2-φ3.2 mounting holes

10

(1.4)

26

13

4

φ8

12

4.5

20

3

3   4.5

φ3.7 cable 3m long

EX-M2   Sensor

Operation indicator (Red)
(on the receiver only)

Beam axis

10   1.2

15

10

10

5

10   10

25   4

9

φ3.7 cable 3m long

φ6.4

10

3

2-φ3.2 mounting holes

EX-D200E   Sensor

Adjuster cap

Operation indicator (Red)

2-φ3.2 mounting holes

Beam-receiving part

Beam-emitting part

10.4

25

17.2

3

φ6

15   (0.7)

20

2.5

3

4

φ3.7 cable 3m long

EX-D30S   Sensor

Beam-emitting part

Operation indicator (Red)

39   (1.5)

φ8 ± 0.1

Stainless steel pipe

Beam-receiving part

φ3.8 cable 3m long

※Mounting hole cut-out dimensions: φ9 ± 0.5mm

EX-D30M   Sensor

Beam-emitting part   Flat part

Operation indicator (Red)

φ18

14

39

3   (1.5)

M10 × 1 thread
[Brass (Nickel plated)]

Beam-receiving part

φ3.8 cable 3m long

※Mounting hole cut-out dimensions: φ11 ± 0.5mm

EQ-20

EQ-30

EX-40

RX

RX-LS200

CY

Amplifier Built-in Type

EX

PX-2

RT-610

SUNX

PHOTOELECTRIC SENSORS

EQ-20

EQ-30

EX-40

RX

RX-LS200

CY

EX

PX-2

RT-610

Amplifier Built-in Type

EX

DIMENSIONS (Unit: mm)

MS-EX-1E   Sensor mounting bracket (Accessory for **EX-M2E** and **EX-D200E**)
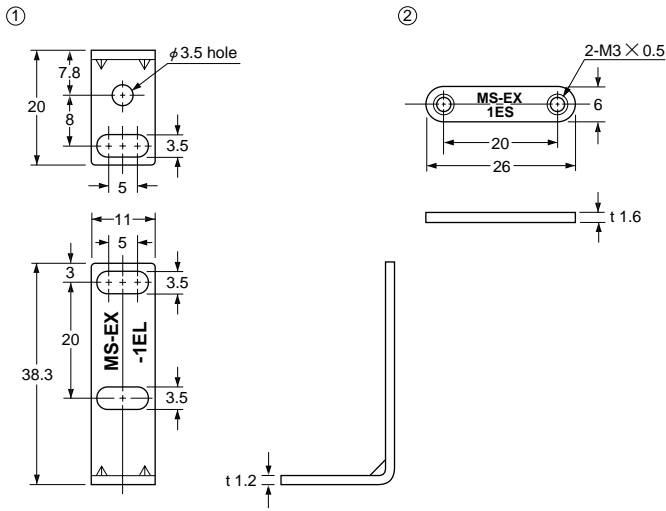
① ②

ϕ3.5 hole

7.8
20
8
3.5
5

2-M3 × 0.5
MS-EX 1ES
6
20
26
t 1.6

11
5
3
3.5
MS-EX -1EL
20
38.3
3.5
t 1.2

Assembly dimensions
Mounting drawing with **EX-D200E**
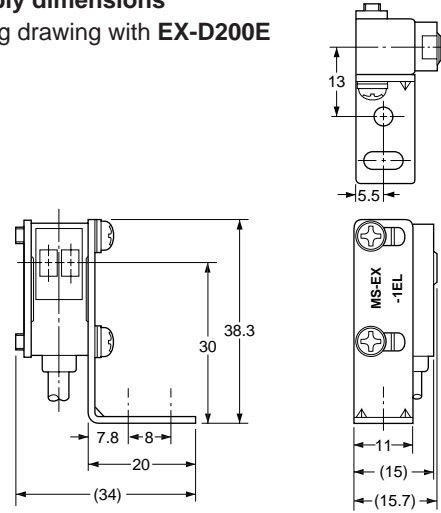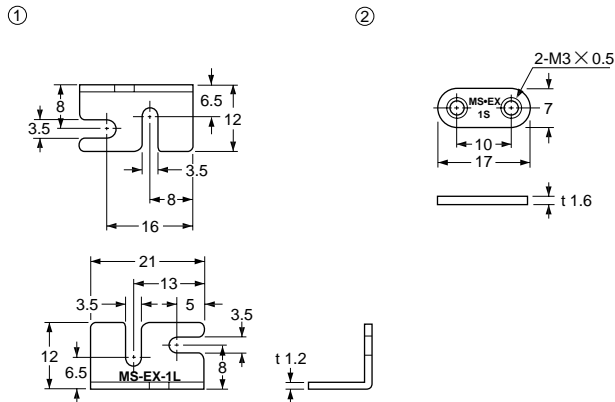
13
5.5

MS-EX -1EL

38.3
30
7.8 8
20
(34)

11
(15)
(15.7)

Material: Cold rolled carbon steel (SPCC)
(Uni-chrome plated)
Two M3 (length 16mm) screws with washers are attached.

MS-EX-1   Sensor mounting bracket (Accessory for **EX-M2**)
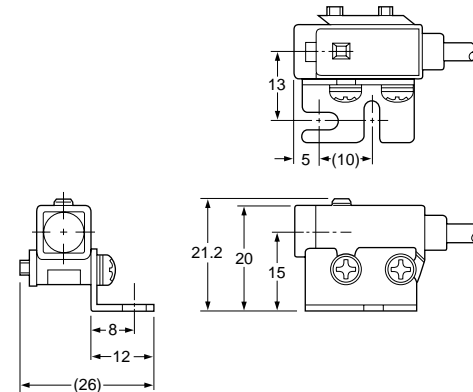
① ②

8
6.5
3.5
12
3.5
8
16

2-M3 × 0.5
MS•EX• 1S
7
10
17
t 1.6

21
13
3.5
5
3.5
12
6.5   MS-EX-1L   8
t 1.2

Assembly dimensions

13
5 (10)

21.2 20
15

8
12
(26)
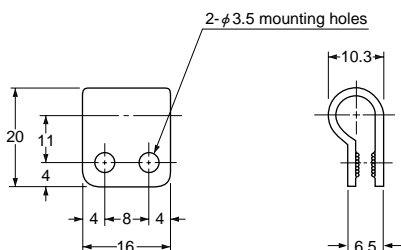
Material: Cold rolled carbon steel (SPCC)
(Uni-chrome plated)
Two M3 (length 16mm) screws with washers are attached.

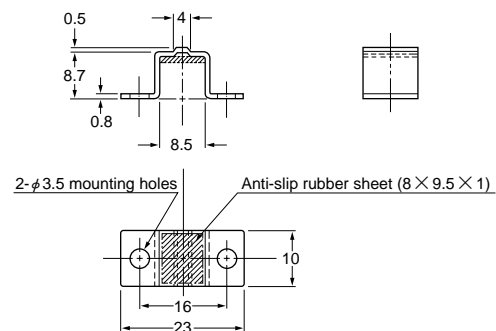### MS-SS8   Sensor mounting bracket (Accessory for **EX-D30S**)

2-ϕ3.5 mounting holes

10.3

20
11
4
4 8 4
16

6.5

Material: Nylon 66

MS-EX-3   Sensor mounting bracket for **EX-D30S** (Optional)

0.5   4
8.7
0.8
8.5

2-ϕ3.5 mounting holes   Anti-slip rubber sheet (8 × 9.5 × 1)

10
16
23

Material: Brass (Nickel plated)