CX-20 SERIES

Compact Photoelectric Sensor Amplifier Built-in

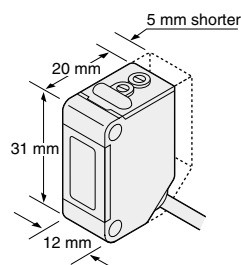Self-diagnosis PNP output type available Light intensity monitor Interference prevention
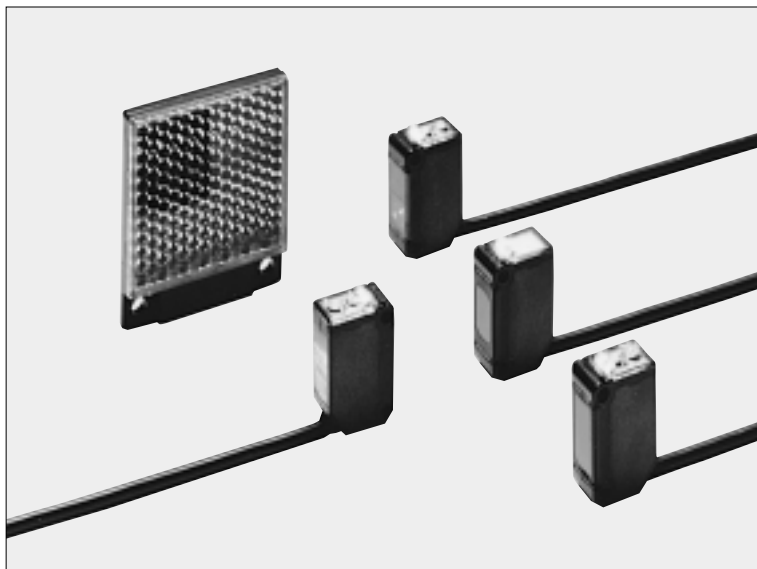
General purpose photoelectric sensor with full basic performance

CE Conforming to EMC Directive

UL UL Recognition

Compact size

Just 20 mm in depth, 5 mm shorter than a conventional model.

5 mm shorter
20 mm
31 mm
12 mm

Two sensors mountable together

CX-29□ (retroreflective type), CX-22□ and CX-24□ (diffuse reflective type) incorporate an automatic interference prevention function. Hence, two sensors can be mounted close together.
(CX-21□, CX-23□, CX-28□ or CX-28IR□ do not have this function.)
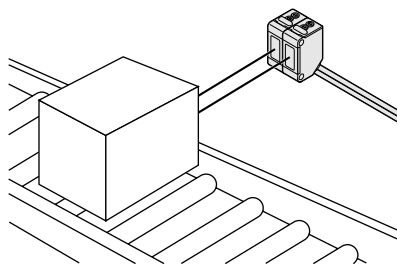
Waterproof

The sensor can be hosed down because of its IP67 construction and the non-corrosive stainless steel mounting bracket.
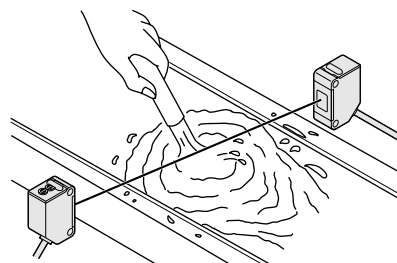
Note: However, take care that if it is exposed to water splashes during operation, it may detect a water drop itself.

Strong light beam

CX-21□ (thru-beam type) emits a strong light beam which can pass through 20 sheets of copier paper.
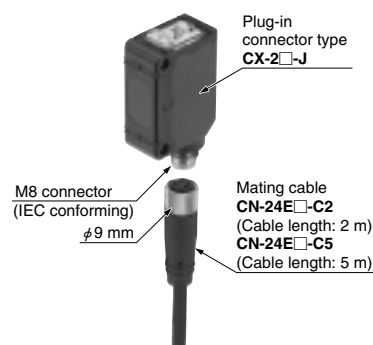The sensor incorporates an infrared LED that is strong against dust or dirt.

20 sheets of copier paper

(at setting distance of 100 mm)
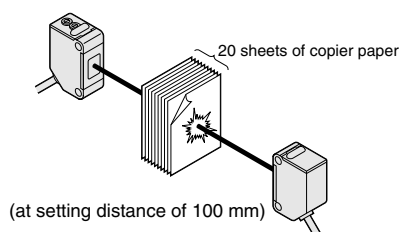
Insusceptible to extraneous light: CX-23□

As the spread of the beam from the CX-23□ emitter is narrow, close mounting of sensors is possible.
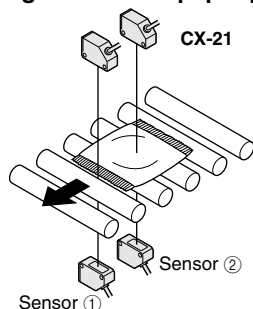
Half the span of CX-21□
CX-23□
CX-23□
CX-21□
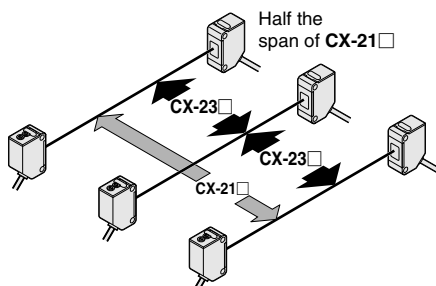
Plug-in connector type is available

Plug-in connector type sensor, which can be easily disconnected for replacement, is available. In case a problem occurs anyone can replace the sensor in a minute.
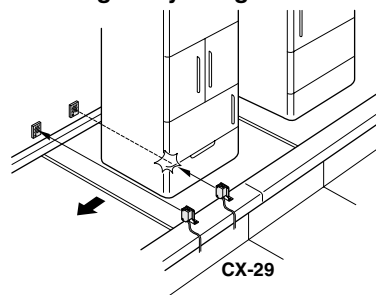
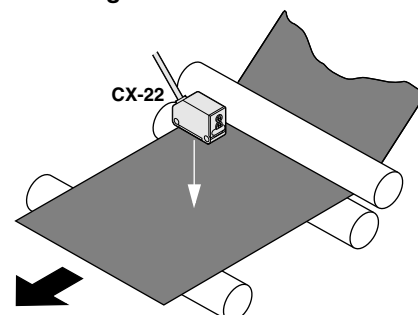Plug-in connector type CX-2□-J

M8 connector (IEC conforming)
⌀9 mm

Mating cable
CN-24E□-C2 (Cable length: 2 m)
CN-24E□-C5 (Cable length: 5 m)

APPLICATIONS

Detecting contents in paper pouch

CX-21

Sensor ②

Sensor ①

Detecting shiny refrigerators

CX-29

Detecting rubber sheet

CX-22

Detecting pet bottles
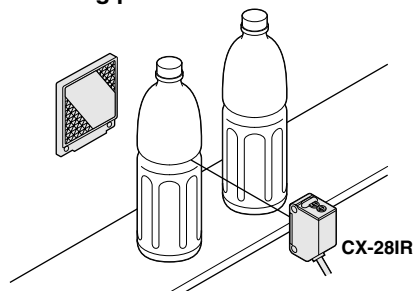
CX-28IR

Transparent objects detectable with CX-28IR□ (Typical examples)

Sensing object	Sensing object size	
Glass sheet	□50 mm	t = 1.0 mm
Cylindrical glass	φ50 mm ℓ = 50 mm	t = 2.0 mm
	φ100 mm ℓ = 50 mm	t = 2.3 mm
Acrylic board	□50 mm	t = 1.5 mm
Styrol (Floppy case)	□50 mm	t = 1.2 mm
Food wrapping film	□50 mm	t = 10 μm
Cigarette case film	□50 mm	t = 20 μm
Vinyl sack	□50 mm	t = 30 μm
Pet bottle	φ55 mm	
	φ70 mm	
Glass bin	φ65 mm	

Reflector setting range: 300 to 500 mm
(with the **RF-230** reflector at the optimum condition (Note))
Each object should pass across the beam at the center between the sensor and the reflector.
ℓ : Length of cylindrical glasses
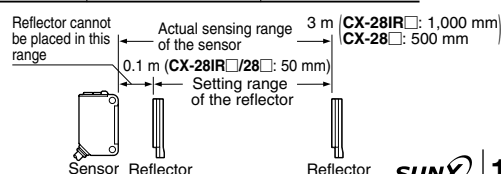t : Thickness of sensing object

Note: The optimum condition is defined as the condition in which the sensitivity level is set such that the stability indicator just lights up when the object is absent.

ORDER GUIDE

Type			Appearance	Sensing range	Model No.	Sensing output	Emitting element
NPN output type	Thru-beam	Narrow beam		10 m	**CX-21**	NPN open-collector transistor	Infrared LED
				5 m	**CX-23**		
	Retroreflective	With polarizing filters		0.1 to 3 m (Note)	**CX-29**		Red LED
		For transparent object sensing		50 to 1,000 mm (Note)	**CX-28IR**		Infrared LED
				50 to 500 mm (Note)	**CX-28**		Red LED
	Diffuse reflective	Long sensing range		800 mm	**CX-22**		Infrared LED
		Short sensing range		300 mm	**CX-24**		
PNP output type	Thru-beam	Narrow beam		10 m	**CX-21-PN**	PNP open-collector transistor	Infrared LED
				5m	**CX-23-PN**		
	Retroreflective	With polarizing filters		0.1 to 3 m (Note)	**CX-29-PN**		Red LED
		For transparent object sensing		50 to 1,000 mm (Note)	**CX-28IR-PN**		Infrared LED
				50 to 1,000 mm (Note)	**CX-28-PN**		Red LED
	Diffuse reflective	Long sensing range		800 mm	**CX-22-PN**		Infrared LED
		Short sensing range		300 mm	**CX-24-PN**		

NOTE: Mounting bracket is not supplied with the sensor. Please select from the range of optional sensor mounting brackets (five types).

Note: The sensing range of the retroreflective type sensor is specified for the **RF-230** reflector. Further, the sensing range is the possible setting range for the reflector. The sensor can detect an object less than 0.1 m away (**CX-28IR□/28□**: 50 mm).

Reflector cannot be placed in this range
Actual sensing range of the sensor
3 m (**CX-28IR□**: 1,000 mm / **CX-28□**: 500 mm)
0.1 m (**CX-28IR□/28□**: 50 mm)
Setting range of the reflector
Sensor   Reflector   Reflector

CX-20

ORDER GUIDE

5 m cable length type, Plug-in connector type, Self-diagnosis output type

5 m cable length type, the red LED type for transparent object sensing, which features easy beam alignment, plug-in connector type and the self-diagnosis output type are available.

Type			Standard	5 m cable length type	Plug-in connector type (Note)	Self-diagnosis output type
NPN output type	Thru-beam		**CX-21**	**CX-21-C5**	**CX-21-J**	**CX-21S**
		Narrow beam	**CX-23**	**CX-23-C5**	**CX-23-J**	———
	Retroreflective	With polarizing filters	**CX-29**	**CX-29-C5**	**CX-29-J**	**CX-29S**
		For transparent object sensing (Infrared LED)	**CX-28IR**	**CX-28IR-C5**	**CX-28IR-J**	———
		For transparent object sensing (Red LED)	**CX-28**	**CX-28-C5**	**CX-28-J**	———
	Diffuse reflective	Long sensing range	**CX-22**	**CX-22-C5**	**CX-22-J**	**CX-22S**
		Short sensing range	**CX-24**	**CX-24-C5**	**CX-24-J**	**CX-24S**
PNP output type	Thru-beam		**CX-21-PN**	———	**CX-21-PN-J**	———
		Narrow beam	**CX-23-PN**	———	**CX-23-PN-J**	———
	Retroreflective	With polarizing filters	**CX-29-PN**	———	**CX-29-PN-J**	———
		For transparent object sensing (Infrared LED)	**CX-28IR-PN**	———	**CX-28IR-PN-J**	———
		For transparent object sensing (Red LED)	**CX-28-PN**	———	**CX-28-PN-J**	———
	Diffuse reflective	Long sensing range	**CX-22-PN**	———	**CX-22-PN-J**	———
		Short sensing range	**CX-24-PN**	———	**CX-24-PN-J**	———

Note: Please order the suitable mating cable separately for plug-in connector type.

Package without reflector
CX-29☐, **CX-28☐** and **CX-28IR☐** are available without the reflector **RF-230**.

Type			Package without reflector	5 m cable length type	Plug-in connector type (Note)	Self-diagnosis output type
NPN output type	Retroreflective	With polarizing filters	**CX-29-Y**	**CX-29-Y-C5**	**CX-29-J-Y**	**CX-29S-Y**
		For transparent object sensing (Infrared LED)	**CX-28IR-Y**	**CX-28IR-Y-C5**	**CX-28IR-J-Y**	———
		For transparent object sensing (Red LED)	**CX-28-Y**	**CX-28-Y-C5**	**CX-28-J-Y**	———
PNP output type	Retroreflective	With polarizing filters	**CX-29-PN-Y**	———	**CX-29-PN-J-Y**	———
		For transparent object sensing (Infrared LED)	**CX-28IR-PN-Y**	———	**CX-28IR-PN-J-Y**	———
		For transparent object sensing (Red LED)	**CX-28-PN-Y**	———	**CX-28-PN-J-Y**	———

Note: Please order the suitable mating cable separately for plug-in connector type.

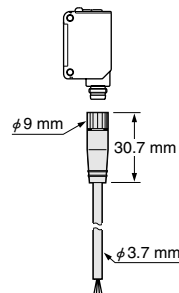### • Mating cable (2 cables are required for the thru-beam type.)

Type	Model No.	Description	
Straight	**CN-24E-C2**	Length: 2 m	0.2 mm² 4-core cabtyre cable with connector on one end Cable outer diameter: ⌀3.7 mm
	CN-24E-C5	Length: 5 m	
Elbow	**CN-24EL-C2**	Length: 2 m	
	CN-24EL-C5	Length: 5 m	

• CN-24E-C2, CN-24E-C5

⌀9 mm
30.7 mm
⌀3.7 mm

• CN-24EL-C2, CN-24EL-C5

23 mm
23.7 mm
⌀9 mm
⌀3.7 mm

Accessory
• RF-230 (Reflector)
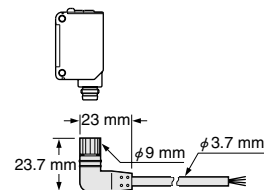
OPTIONS

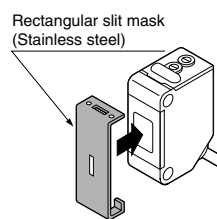| Designation	Model No.	Description	
Round slit mask (For thru-beam type sensor only)	**OS-CX-05** (Slit size φ0.5 mm)	Slit on one side	• Sensing range: 400 mm [**CX-21□**] 300 mm [**CX-23□**] • Min. sensing object: φ12 mm
		Slit on both sides	• Sensing range: 20 mm [**CX-21□**, **CX-23□**] • Min. sensing object: φ0.5 mm
	OS-CX-1 (Slit size φ1 mm)	Slit on one side	• Sensing range: 900 mm [**CX-21□**] 600 mm [**CX-23□**] • Min. sensing object: φ12 mm
		Slit on both sides	• Sensing range: 100 mm [**CX-21□**, **CX-23□**] • Min. sensing object: φ1 mm
	OS-CX-2 (Slit size φ2 mm)	Slit on one side	• Sensing range: 2 m [**CX-21□**] 1.5 m [**CX-23□**] • Min. sensing object: φ12 mm
		Slit on both sides	• Sensing range: 400 mm [**CX-21□**, **CX-23□**] • Min. sensing object: φ2 mm
Rectangular slit mask (For thru-beam type sensor only)	**OS-CX-05✕6** (Slit size 0.5✕6 mm)	Slit on one side	• Sensing range: 2 m [**CX-21□**] 1.2 m [**CX-23□**] • Min. sensing object: φ12 mm
		Slit on both sides	• Sensing range: 400 mm [**CX-21□**, **CX-23□**] • Min. sensing object: 0.5✕6 mm
	OS-CX-1✕6 (Slit size 1✕6 mm)	Slit on one side	• Sensing range: 3 m [**CX-21□**] 2 m [**CX-23□**] • Min. sensing object: φ12 mm
		Slit on both sides	• Sensing range: 1 m [**CX-21□**, **CX-23□**] • Min. sensing object: 1✕6 mm
	OS-CX-2✕6 (Slit size 2✕6 mm)	Slit on one side	• Sensing range: 5 m [**CX-21□**] 3 m [**CX-23□**] • Min. sensing object: φ12 mm
		Slit on both sides	• Sensing range: 2 m [**CX-21□**, **CX-23□**] • Min. sensing object: 2✕6 mm

Round slit mask
• OS-CX-05
• OS-CX-1
• OS-CX-2

Fitted on the front face of the sensor with one-touch.

Round slit mask (Stainless steel)
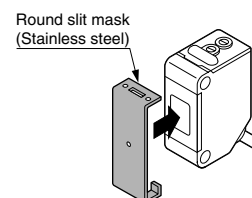
Rectangular slit mask
• **OS-CX-05✕6**
• **OS-CX-1✕6**
• **OS-CX-2✕6**

Fitted on the front face of the sensor with one-touch.

Rectangular slit mask (Stainless steel)

CX-20

OPTIONS

Designation	Model No.	Description
Reflector (For retro-reflective type sensor only)	RF-210	• Sensing range: 0.1 to 1 m [CX-29□] 50 to 250 mm [CX-28IR□] • Min. sensing object: ⌀30 mm
	RF-220	• Sensing range: 0.1 to 1.5 m [CX-29□] 50 to 500 mm [CX-28IR□] • Min. sensing object: ⌀35 mm
Reflector mounting bracket	MS-RF21-1	Protective mounting bracket for RF-210 It protects the reflector from damage and maintains alignment.
	MS-RF22	For RF-220
	MS-RF23	For RF-230
Reflective tape (For CX-29□ only)	RF-11 (Note 1)	• Ambient temperature: −25 to +50 °C • Ambient humidity: 35 to 85 % RH Notes: i) Keep the tape free from stress. If it is pressed too much, its capability may deteriorate. ii) Do not cut the tape. It will deteriorate the sensing performance.	• Sensing range: 0.1 to 0.5 m [CX-29□]
	RF-12		• Sensing range: 0.1 to 0.7 m [CX-29□] 0.15 to 0.4 m [CX-28IR□]
Sensor mounting bracket (Note 2)	MS-CX2-1	Foot angled mounting bracket It can also be used for mounting RF-210. (The thru-beam type sensor needs two brackets.)
	MS-CX2-2	Foot biangled mounting bracket Flat mounting saves height. It can also be used for mounting RF-210. (The thru-beam type sensor needs two brackets.)
	MS-CX2-4	Protective mounting bracket It protects the sensor from damage and maintains alignment. (The thru-beam type sensor needs two brackets.)
	MS-CX2-5	Back biangled mounting bracket Suitable for sensing from bottom of conveyors, etc. (The thru-beam type sensor needs two brackets.)
	MS-CX-3	Back angled mounting bracket (The thru-beam type sensor needs two brackets.)
Universal sensor mounting stand (Note 3)	MS-AJ1	Horizontal mounting type	Basic assembly
	MS-AJ2	Vertical mounting type	
	MS-AJ1-A	Horizontal mounting type	Lateral arm assembly
	MS-AJ2-A	Vertical mounting type	
	MS-AJ1-M	Horizontal mounting type	Assembly for reflector
	MS-AJ2-M	Vertical mounting type	
Sensor checker (Note 4)	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.

Notes: 1) RF-11 cannot be used with CX-28IR□.
2) The plug-in connector type sensor does not allow use of some sensor mounting brackets because of the protrusion of the connector.
3) Refer to p.332～ for details of the universal sensor mounting stand.
4) Refer to p.414～ for details of the sensor checker CHX-SC2.

Reflector
• RF-210

33.3 mm
11 mm
12.8 mm

• RF-220

35.3 mm
8.3 mm
42.3 mm

Reflective tape
• RF-11

30 mm
0.7 mm
8 mm

• RF-12

30 mm
0.7 mm
25 mm

Reflector mounting bracket
• MS-RF23

Two M4 (length 10 mm) screws with washers are attached.

• MS-RF22

Two M3 (length 8 mm) screws with washers are attached.

• MS-RF21-1

Two M3 (length 12 mm) screws with washers are attached.

Sensor mounting bracket
• MS-CX2-1

Two M3 (length 12 mm) screws with washers are attached.
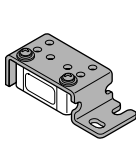
• MS-CX2-2
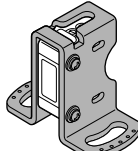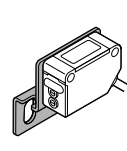

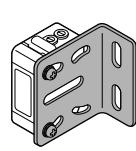Two M3 (length 12 mm) screws with washers are attached.

• MS-CX2-4

Two M3 (length 14 mm) screws with washers are attached.

• MS-CX2-5

Two M3 (length 12 mm) screws with washers are attached.

• MS-CX-3

Two M3 (length 12 mm) screws with washers are attached.

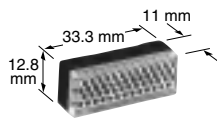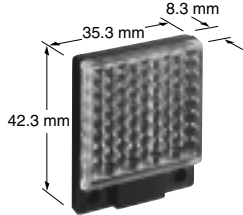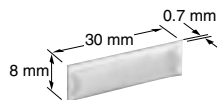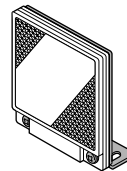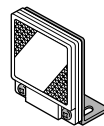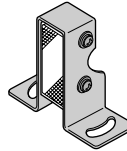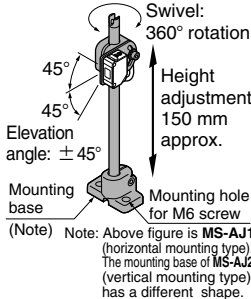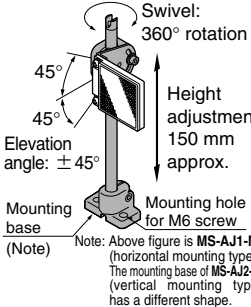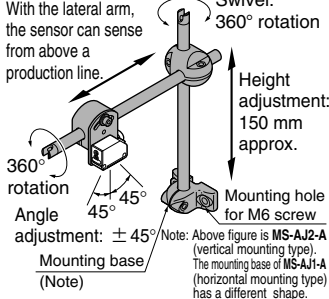### Universal sensor mounting stand
• MS-AJ1
• MS-AJ2

Swivel: 360° rotation
45°
45°
Elevation angle: ±45°
Height adjustment: 150 mm approx.
Mounting base (Note)
Mounting hole for M6 screw
Note: Above figure is MS-AJ1 (horizontal mounting type). The mounting base of MS-AJ2 (vertical mounting type) has a different shape.

• MS-AJ1-A
• MS-AJ2-A

With the lateral arm, the sensor can sense from above a production line.

Swivel: 360° rotation
360° rotation
45°
Angle adjustment: ±45°
45°
Height adjustment: 150 mm approx.
Mounting hole for M6 screw
Mounting base (Note)
Note: Above figure is MS-AJ2-A (vertical mounting type). The mounting base of MS-AJ1-A (horizontal mounting type) has a different shape.

• MS-AJ1-M
• MS-AJ2-M

Swivel: 360° rotation
45°
45°
Elevation angle: ±45°
Height adjustment: 150 mm approx.
Mounting base (Note)
Mounting hole for M6 screw
Note: Above figure is MS-AJ1-M (horizontal mounting type). The mounting base of MS-AJ2-M (vertical mounting type) has a different shape.

Sensor checker
• CHX-SC2

Sensor checker

SPECIFICATIONS

		Thru-beam		Retroreflective		Diffuse reflective	
			Narrow beam	With polarizing filters	For transparent object sensing	Long sensing range	Short sensing range
Item	Model No. NPN output type	**CX-21**	**CX-23**	**CX-29**	**CX-28IR**	**CX-22**	**CX-24**
	PNP output type	**CX-21-PN**	**CX-23-PN**	**CX-29-PN**	**CX-28IR-PN**	**CX-22-PN**	**CX-24-PN**
Sensing range		10 m	5 m	0.1 to 3 m (Note 1)	50 to 1,000 mm (Note 1)	800 mm (Note 2)	300 mm (Note 2)
Sensing object		ϕ 12 mm or more opaque object (Note 3)		ϕ 50 mm or more opaque, translucent or specular object (Note 1)	ϕ 50 mm or more opaque, translucent or transparent object (Note 1)	Opaque, translucent or transparent object	
Hysteresis		————————————				15 % or less of operation distance	
Repeatability (perpendicular to sensing axis)		0.5 mm or less	0.05 mm or less	0.5 mm or less		1 mm or less	
Supply voltage		12 to 24 V DC ± 10 % Ripple P-P 10 % or less					
Current consumption	NPN output type	Emitter: 35 mA or less Receiver: 25 mA or less		30 mA or less		35 mA or less	
	PNP output type	Emitter: 35 mA or less Receiver: 30 mA or less		35 mA or less		40 mA or less	
Sensing output		<NPN output type> NPN open-collector transistor • Maximum sink current: 100 mA • Applied voltage: 30 V DC or less (between sensing output and 0 V) • Residual voltage: 1.5 V or less (at 100 mA sink current) 0.4 V or less (at 16 mA sink current)			<PNP output type> PNP open-collector transistor • Maximum source current: 100 mA • Applied voltage: 30 V DC or less (between sensing output and + V) • Residual voltage: 1.5 V or less (at 100 mA source current) 0.4 V or less (at 16 mA source current)		
	Utilization category	DC-12 or DC-13					
	Output operation	Switchable either Light-ON or Dark-ON					
	Short-circuit protection	Incorporated					
Response time		1 ms or less					
Operation indicator		Red LED (lights up when the sensing output is ON)					
Stability indicator		Green LED (lights up under stable light received condition or stable dark condition)					
Power indicator		Red LED (lights up when the power is ON)		————————————			
Sensitivity adjuster		Continuously variable adjuster					
Automatic interference prevention function		————————————		Incorporated (Two units of sensors can be mounted close together.)	————————————	Incorporated (Two units of sensors can be mounted close together.)	
Environmental resistance	Pollution degree	3 (Industrial environment)					
	Protection	IP67 (IEC)					
	Ambient temperature	− 25 to + 55 °C (No dew condensation or icing allowed) (Note 4), Storage: − 30 to + 70 °C					
	Ambient humidity	35 to 85 % RH, Storage: 35 to 85 % RH					
	Ambient illuminance	Sunlight: 10,000 ℓx at the light-receiving face, Incandescent light: 3,000 ℓx at the light-receiving face					
	EMC	EN 50081-2, EN 50082-2, 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, 1.5 mm amplitude 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		Infrared LED (modulated)		Red LED (modulated)	Infrared LED (modulated)		
Material		Enclosure: Polycarbonate, Lens: Polycarbonate, Indicator cover: Polycarbonate, Front cover: Polycarbonate (**CX-29**□: Acrylic)					
Cable		0.2 mm² 3-core (thru-beam type emitter: 2-core) oil resistant cabtyre cable, 2 m long					
Cable extension		Extension up to total 100 m is possible with 0.3 mm², or more, cable (thru-beam type: both emitter and receiver).					
Weight		Emitter: 45 g approx., Receiver: 50 g approx.		50 g approx.			
Accessories		Adjusting screwdriver: 1 pc.		**RF-230** (Reflector): 1 pc. Adjusting screwdriver: 1 pc.		Adjusting screwdriver: 1 pc.	

Notes: 1) The sensing range and the sensing object of the retroreflective type sensor are specified for the **RF-230** reflector.
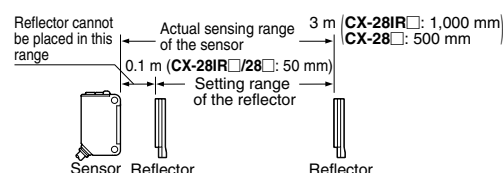Further, the sensing range is the possible setting range for the reflector.
The sensor can detect an object less than 0.1 m away (**CX-28IR**□: 50 mm).
2) The sensing range of the diffuse reflective type sensor is specified for white non-glossy paper (200 × 200 mm) as the object.
3) If slit masks (optional) are fitted, an object of ϕ 0.5 mm (using round slit mask) can be detected.
4) In case the sensor is to be used at an ambient temperature of − 15 °C, or less, please contact our office.
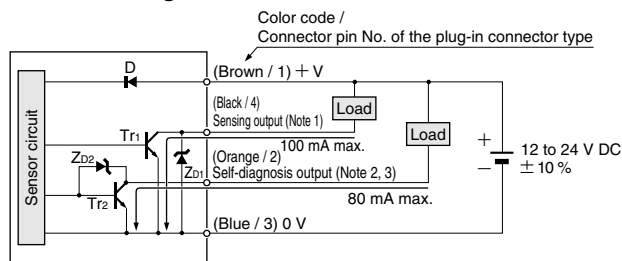
Reflector cannot be placed in this range
Actual sensing range of the sensor
3 m (**CX-28IR**□: 1,000 mm **CX-28**□: 500 mm)
0.1 m (**CX-28IR**□/28□: 50 mm)
Setting range of the reflector
Sensor Reflector   Reflector

CX-20

I/O CIRCUIT AND WIRING DIAGRAMS

NPN output type

I/O circuit diagram

Color code /
Connector pin No. of the plug-in connector type

(Brown / 1) + V

(Black / 4)
Sensing output (Note 1)
100 mA max.

(Orange / 2)
Self-diagnosis output (Note 2, 3)
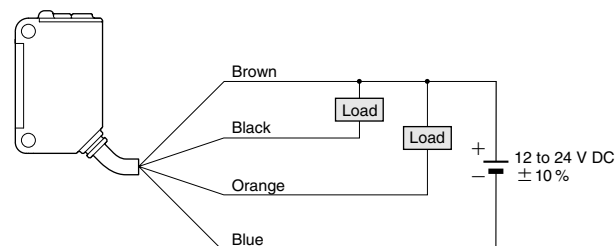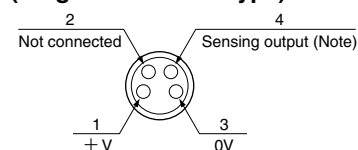80 mA max.

(Blue / 3) 0 V

12 to 24 V DC
± 10 %

Internal circuit ← → Users' circuit

Notes: 1) The emitter of the thru-beam type sensor does not incorporate the sensing output.
2) Only **CX-2□S** incorporates the self-diagnosis output.
3) The plug-in connector type sensor does not incorporate the self-diagnosis output. When connecting the mating cable, the white wire is not connected.

Symbols ... D: Reverse supply polarity protection diode
Z_{D1}, Z_{D2}: Surge absorption zener diode
Tr_1, Tr_2 : NPN output transistor

Wiring diagram

Brown
Load
Black
Load
Orange
Blue

12 to 24 V DC
± 10 %

**Connector pin position
(Plug-in connector type)**

2 — Not connected
4 — Sensing output (Note)
1 — + V
3 — 0V

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

PNP output type

I/O circuit diagram
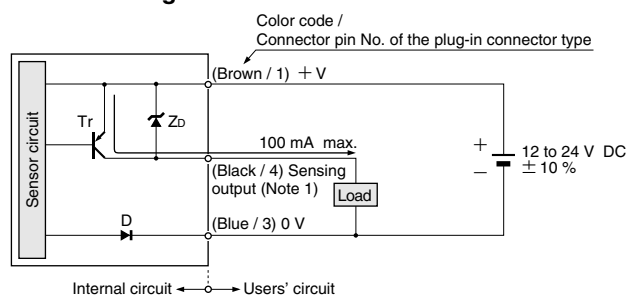
Color code /
Connector pin No. of the plug-in connector type

(Brown / 1) + V

Z_D
100 mA max.

(Black / 4) Sensing output (Note 1)
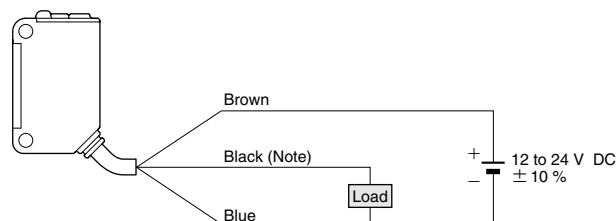Load

(Blue / 3) 0 V

12 to 24 V DC
± 10 %

Internal circuit ← → Users' circuit

Notes: 1) The emitter of the thru-beam type sensor does not incorporate the sensing output.
2) When connecting the mating cable to the plug-in connector type sensor, the white wire is not connected.

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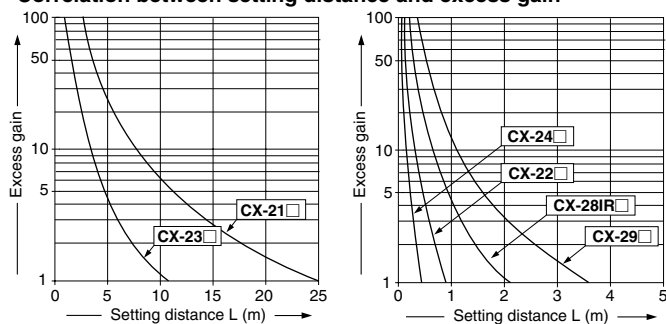Tr : PNP output transistor

Wiring diagram

Brown
Black (Note)
Load
Blue

12 to 24 V DC
± 10 %

**Connector pin position
(Plug-in connector type)**

2 — Not connected
4 — Sensing output (Note)
1 — + V
3 — 0V
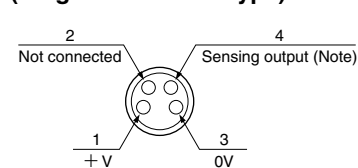
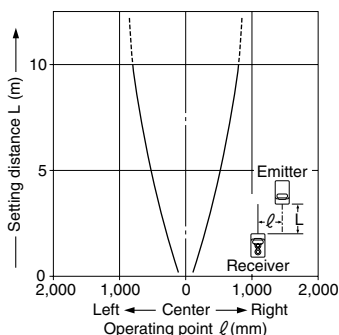Note: The emitter of the thru-beam type sensor does not incorporate the sensing output.

SENSING CHARACTERISTICS (TYPICAL)

All models

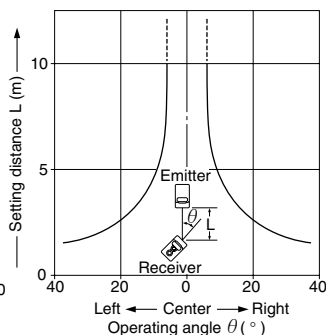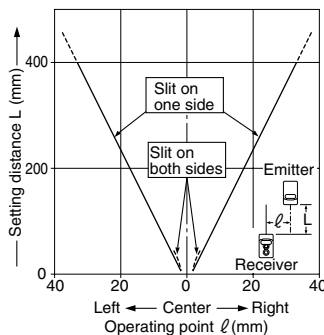**Correlation between setting distance and excess gain**

Excess gain vs. Setting distance L (m)

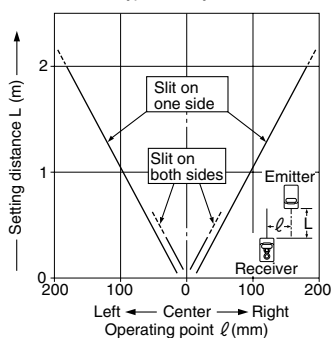CX-21□
CX-23□

CX-24□
CX-22□
CX-28IR□
CX-29□

SENSING CHARACTERISTICS (TYPICAL)

CX-21□ Thru-beam type

Parallel deviation

Setting distance L (m)
Left ◄— Center —► Right
Operating point ℓ (mm)
Emitter
Receiver

Angular deviation

Setting distance L (m)
Left ◄— Center —► Right
Operating angle θ (°)
Emitter
Receiver

Parallel deviation with round slit masks (φ0.5 mm)

Setting distance L (mm)
Slit on one side
Slit on both sides
Left ◄— Center —► Right
Operating point ℓ (mm)
Emitter
Receiver

Parallel deviation with round slit masks (φ1 mm)

Setting distance L (mm)
Slit on one side
Slit on both sides
Left ◄— Center —► Right
Operating point ℓ (mm)
Emitter
Receiver

Parallel deviation with round slit masks (φ2 mm)

Setting distance L (m)
Slit on one side
Slit on both sides
Left ◄— Center —► Right
Operating point ℓ (mm)
Emitter
Receiver

Parallel deviation with rectangular slit masks (0.5 × 6 mm)

Setting distance L (m)
Slit on one side
Slit on both sides
Left ◄— Center —► Right
Operating point ℓ (mm)
Emitter
Receiver

Parallel deviation with rectangular slit masks (1 × 6 mm)

Setting distance L (m)
Slit on one side
Slit on both sides
Left ◄— Center —► Right
Operating point ℓ (mm)
Emitter
Receiver

Parallel deviation with rectangular slit masks (2 × 6 mm)

Setting distance L (m)
Slit on one side
Slit on both sides
Left ◄— Center —► Right
Operating point ℓ (mm)
Emitter
Receiver

CX-23□ Thru-beam type

Parallel deviation

Setting distance L (m)
Horizontal direction
Vertical direction
Emitter
Receiver
(Down) Left ◄— Center —► Right (Up)
Operating point ℓ (mm)

Angular deviation

Setting distance L (m)
Emitter
Receiver
(Down) Left ◄— Center —► Right (Up)
Operating angle θ (°)

Parallel deviation with round slit masks (φ0.5 mm)

Setting distance L (mm)
Slit on one side
Slit on both sides
Left ◄— Center —► Right
Operating point ℓ (mm)
Emitter
Receiver

Parallel deviation with round slit masks (φ1 mm)

Setting distance L (mm)
Slit on one side
Slit on both sides
Left ◄— Center —► Right
Operating point ℓ (mm)
Emitter
Receiver

Parallel deviation with round slit masks (φ2 mm)

Setting distance L (m)
Slit on one side
Slit on both sides
Left ◄— Center —► Right
Operating point ℓ (mm)
Emitter
Receiver

Parallel deviation with rectangular slit masks (0.5 × 6 mm)

Setting distance L (m)
Slit on both sides Vertical direction
Slit on one side Vertical direction
Slit on one side Horizontal direction
Horizontal direction
Slit on both sides Horizontal direction
Vertical direction
Emitter
Receiver
(Down) Left ◄— Center —► Right (Up)
Operating point ℓ (mm)

Parallel deviation with rectangular slit masks (1 × 6 mm)

Setting distance L (m)
Slit on one side Vertical direction
Slit on one side Horizontal direction
Slit on both sides Vertical direction
Slit on both sides Horizontal direction
Horizontal direction
Vertical direction
Emitter
Receiver
(Down) Left ◄— Center —► Right (Up)
Operating point ℓ (mm)

Parallel deviation with rectangular slit masks (2 × 6 mm)

Setting distance L (m)
Slit on one side Vertical direction
Slit on one side Horizontal direction
Slit on both sides Vertical direction
Slit on both sides Horizontal direction
Horizontal direction
Vertical direction
Emitter
Receiver
(Down) Left ◄— Center —► Right (Up)
Operating point ℓ (mm)

CX-20

SENSING CHARACTERISTICS (TYPICAL)

CX-29□ Retroreflective type

Parallel deviation

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

Reflector (**RF-230**)
Sensor

Angular deviation

Setting distance L (m)

Reflector angular deviation
Sensor angular deviation
Reflector (**RF-230**)
Reflector angular deviation
Sensor
Sensor
Left ← Center → Right
Operating angle θ (°)

CX-28IR□ Retroreflective type

Parallel deviation

Setting distance L (mm)
Reflector (**RF-230**)
Sensor
Left ← Center → Right
Operating point ℓ (mm)

Angular deviation

Setting distance L (mm)

Reflector angular deviation
Sensor angular deviation
Sensor angular deviation
Reflector (**RF-230**)
Reflector angular deviation
Reflector (**RF-230**)
Sensor
Sensor
Left ← Center → Right
Operating angle θ (°)

CX-22□ Diffuse reflective type

Sensing field

Setting distance L (mm)
200 × 200 mm 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 × a mm 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 × 200 mm), the sensing range shortens, as shown in the left graph.

⎛ For plotting the left graph, the sensitivity has been set such that a 200 × 200 mm white non-glossy paper is just detectable at a distance of 800 mm. ⎞

CX-24□ Diffuse reflective type
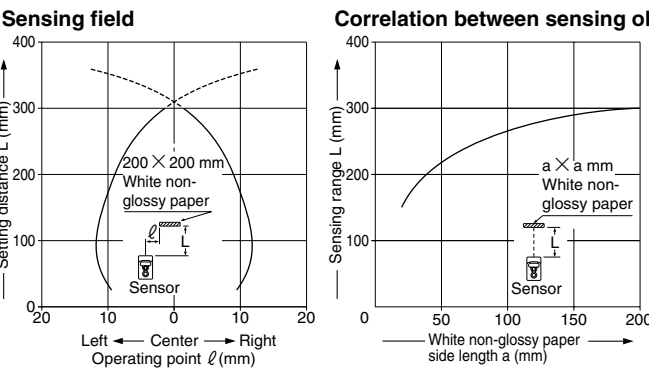
Sensing field

Setting distance L (mm)
200 × 200 mm 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 × a mm 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 × 200 mm), the sensing range shortens, as shown in the left graph.

⎛ For plotting the left graph, the sensitivity has been set such that a 200 × 200 mm white non-glossy paper is just detectable at a distance of 300 mm. ⎞
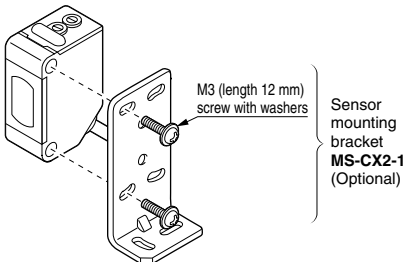
PRECAUTIONS FOR PROPER USE

⚠ 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.
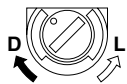
Mounting
• The tightening torque should be 0.5 N·m or less.

M3 (length 12 mm) screw with washers
Sensor mounting bracket **MS-CX2-1** (Optional)

Operation mode switch
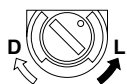
Light-ON mode is obtained when the switch is turned fully counterclockwise.

Dark-ON mode is obtained when the switch is turned fully clockwise.

Others
• Do not use during the initial transient time (50 ms) after the power supply is switched on.
• When connecting the mating cable to the plug-in connector type sensor, the tightening torque should be 0.4 N·m or less.

PRECAUTIONS FOR PROPER USE

Retroreflective type sensor with polarizing filters

• If a shiny object is covered or wrapped with a transparent film, such as those described below, the retroreflective type sensor with polarizing filters may not be able to detect it.
In that case, follow the steps given below.

Example of sensing objects

- Can wrapped by clear film
- Aluminum sheet covered by plastic film
- Gold or silver color (specular) label or wrapping paper

Steps

- Tilt the sensor with respect to the sensing object while fitting.
- Reduce the sensitivity.
- Increase the distance between the sensor and the sensing object.

Self-diagnosis function (Self-diagnosis output type only)

• The sensor diagnoses the incident light intensity, and if it is reduced due to dirt or dust, or beam misalignment, an output is generated.
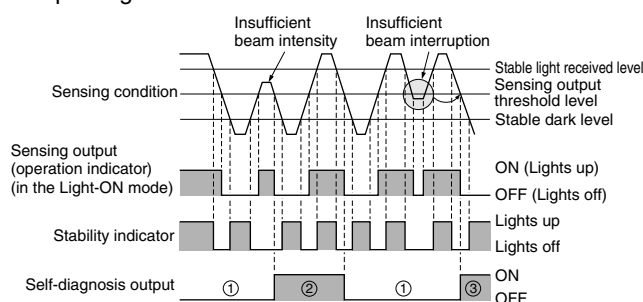
① The self-diagnosis output transistor stays in the 'OFF' state during stable sensing.
② When the sensing output changes, if the incident light intensity does not reach the stable light received level or the stable dark level, the self-diagnosis output becomes ON.
Further, the self-diagnosis output changes state when the sensing output changes from Light to Dark state. (It is not affected by the operation mode switch.)
③ In case of insufficient beam interruption, there will be a time lag before the self-diagnosis output turns ON.

Retroreflective type sensor for sensing transparent objects

• Optimum sensing is possible when the position of the transparent sensing object is set at the center of the sensor and the reflector.
If the sensing position is set near the sensor or the reflector, the sensing may be unstable. In this case, set the sensing position at the center of the sensor and the reflector.

Sensor   Reflector
Transparent sensing object
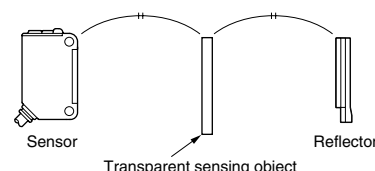
• When the sensor detects an uneven plastic receptacle or glass bin, the received light intensity may differ with the sensing position or direction. Adjust the sensitivity after confirming the stable sensing condition by turning the sensing object, etc.
• If the object is a transparent cylinder, feed it in a position as shown in Figure A. The sensor may fail to detect an object fed in a position as shown in Figure B.
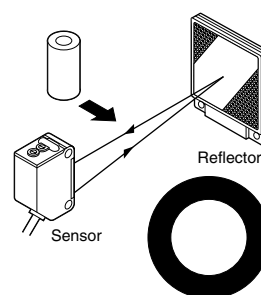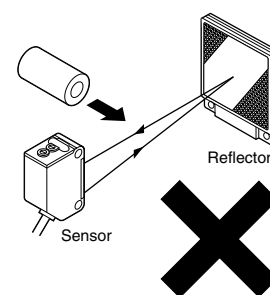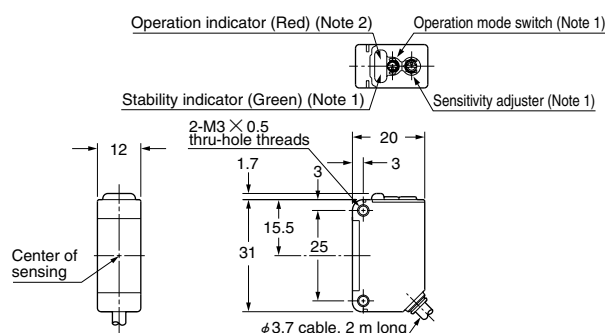

Fig. A   Fig. B

DIMENSIONS (Unit: mm)

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

CX-2☐ Sensor

Notes: 1) Not incorporated on the emitter of the thru-beam type sensor.
2) It is the power indicator (red) on the emitter of the thru-beam type sensor.
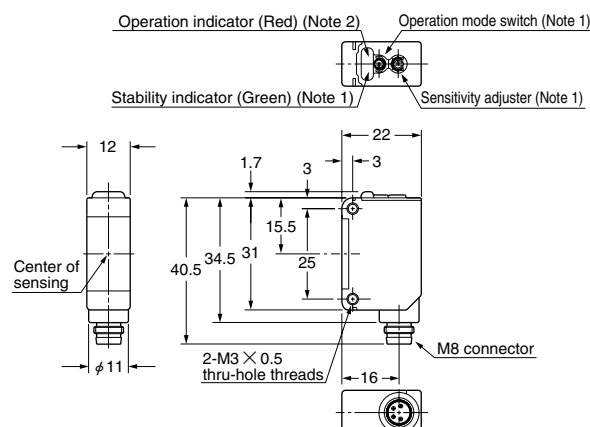
CX-2☐-J Sensor

Notes: 1) Not incorporated on the emitter of the thru-beam type sensor.
2) It is the power indicator (red) on the emitter of the thru-beam type sensor.

CX-20

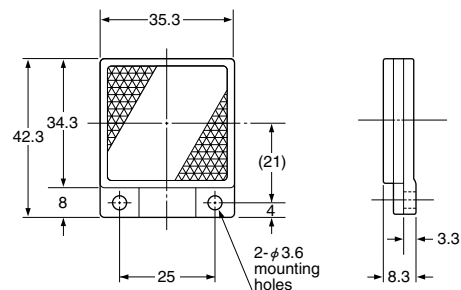**DIMENSIONS (Unit: mm)** The CAD data in the dimensions can be downloaded from the SUNX website: http://www.sunx.co.jp/

RF-230 Reflector (Accessory for the retroreflective type sensor)

50.3
49.3
59.3
(30)
10
5
40
2-φ4.6 mounting holes
3.3
8.3
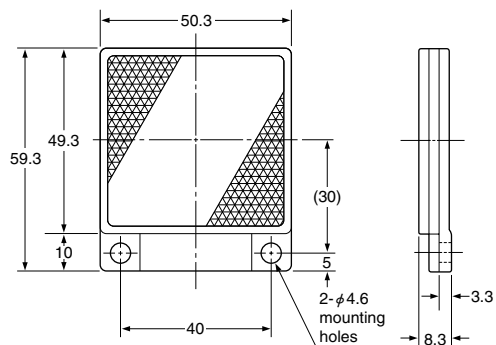
Material: Acrylic (Reflector)
ABS (Base)

RF-220 Reflector (Optional)

35.3
34.3
42.3
(21)
8
4
25
2-φ3.6 mounting holes
3.3
8.3

Material: Acrylic (Reflector)
ABS (Base)

RF-210 Reflector (Optional)

33.3
12.8
Reflector
M3 nut mounting holes
(for mounting at the back)
11
Base
3.2
2-φ3.4 thru-holes
(for mounting at the side)
25
10
2-φ3.4 holes, 6 deep
(for mounting at the back)
2-M3 nut mounting holes
(for mounting at the side)
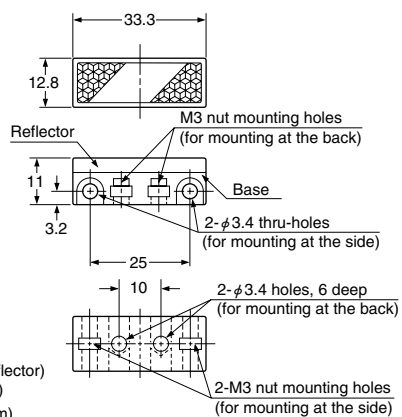
Material: Acrylic (Reflector)
ABS (Base)
Two M3 (length 8 mm)
screws with washers and
two nuts are attached.

RF-11 Reflective tape (Optional)

30
(28)
8 (6)
0.7
Effective
reflecting surface
Adhesive tape
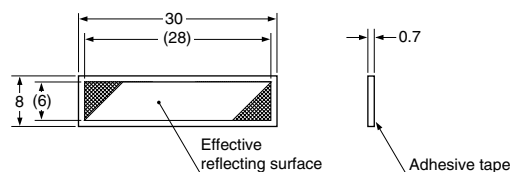
Material: Acrylic

RF-12 Reflective tape (Optional)

30
(28)
0.7
25 (23)
Effective
reflecting surface
Adhesive tape
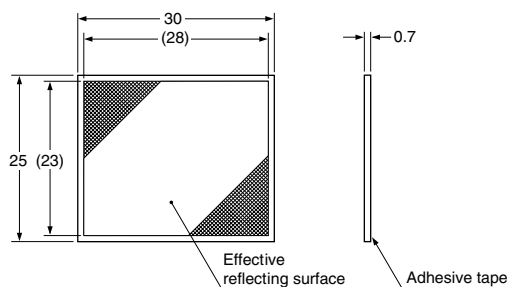
Material: Acrylic

DIMENSIONS (Unit: mm)

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

MS-CX2-1   Sensor mounting bracket (Optional)
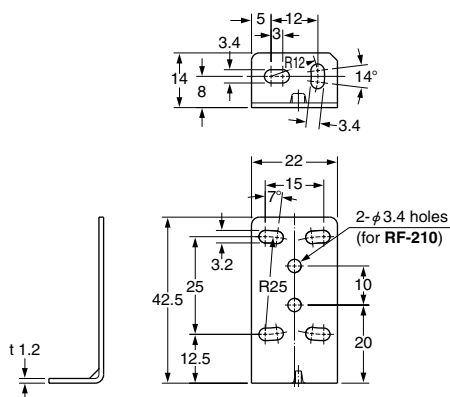
Assembly dimensions
Mounting drawing with **CX-2□**

Material: Stainless steel (SUS304)
Two M3 (length 12 mm) screws
with washers are attached.
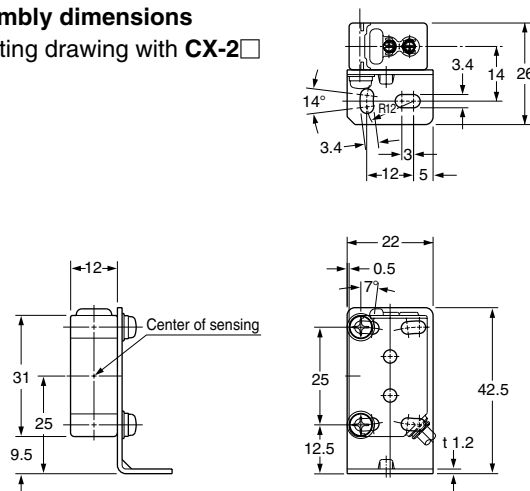
MS-CX2-2   Sensor mounting bracket (Optional)
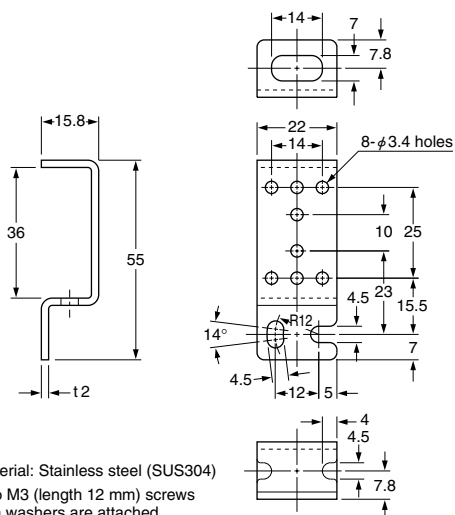
Assembly dimensions
Mounting drawing with **CX-2□**

Material: Stainless steel (SUS304)
Two M3 (length 12 mm) screws
with washers are attached.
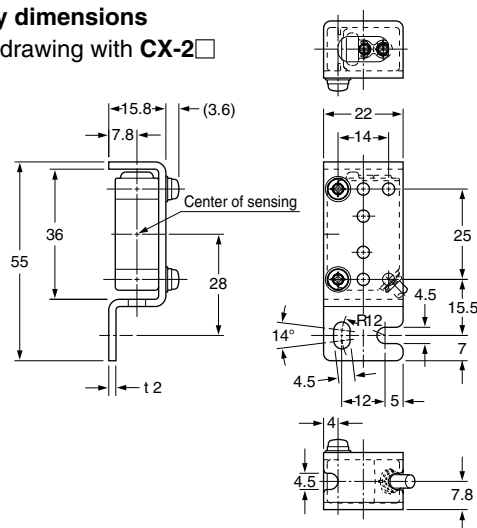
MS-CX2-4   Sensor mounting bracket (Optional)

Assembly dimensions
Mounting drawing
with **CX-2□**
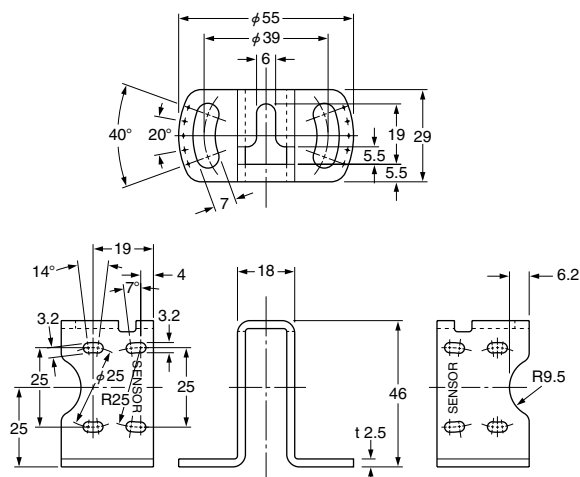
Material: Stainless steel (SUS304)
Two M3 (length 14 mm) screws
with washers are attached.
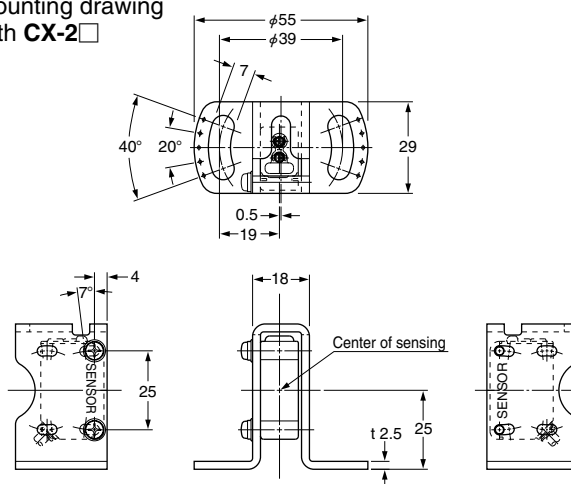
CX-20

DIMENSIONS (Unit: mm)   The CAD data in the dimensions can be downloaded from the SUNX website: http://www.sunx.co.jp/

MS-CX2-5   Sensor mounting bracket (Optional)

Material: Stainless steel (SUS304)
Two M3 (length 12 mm) screws
with washers are attached.

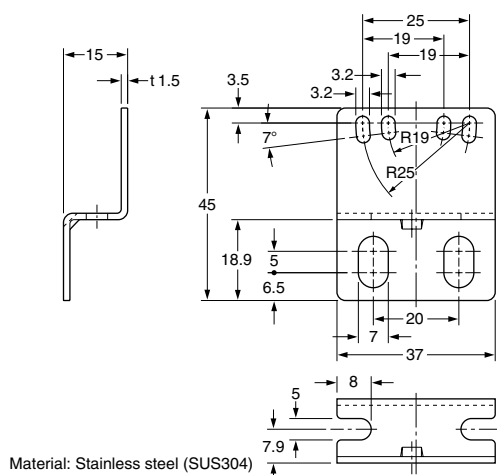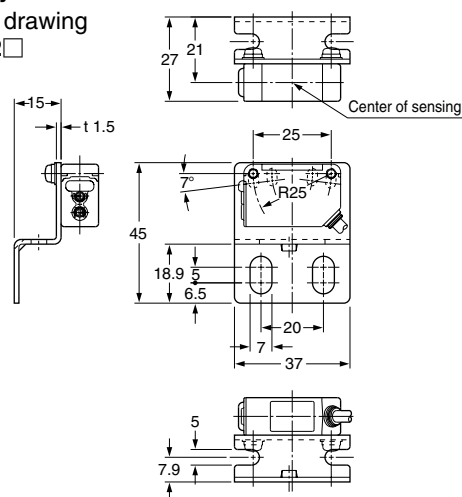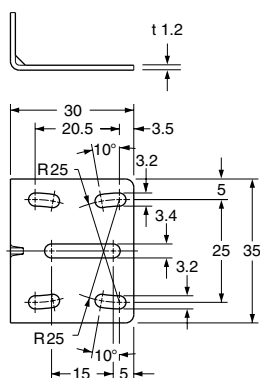**Assembly dimensions**
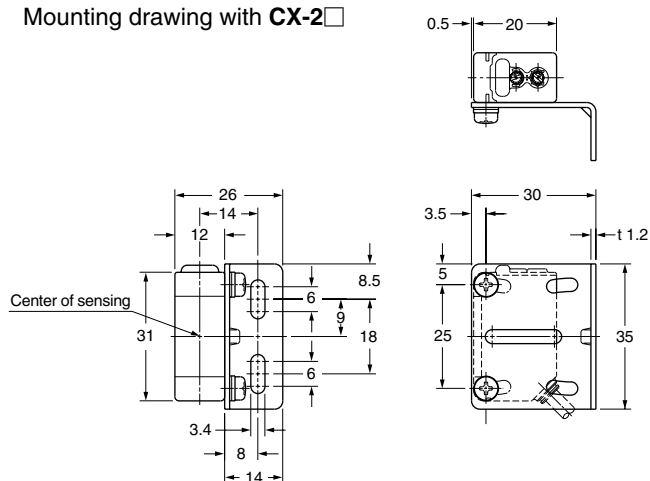Mounting drawing
with **CX-2□**

Center of sensing

MS-CX-3   Sensor mounting bracket (Optional)

Material: Stainless steel (SUS304)
Two M3 (length 12 mm) screws
with washers are attached.

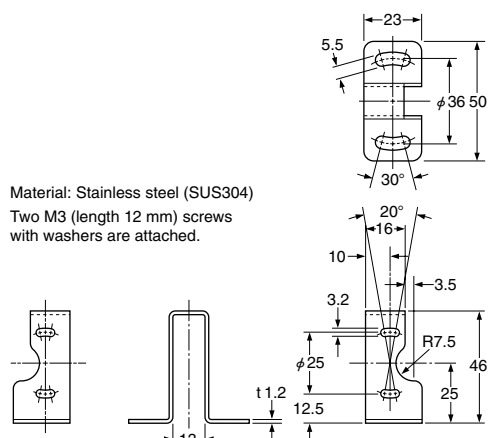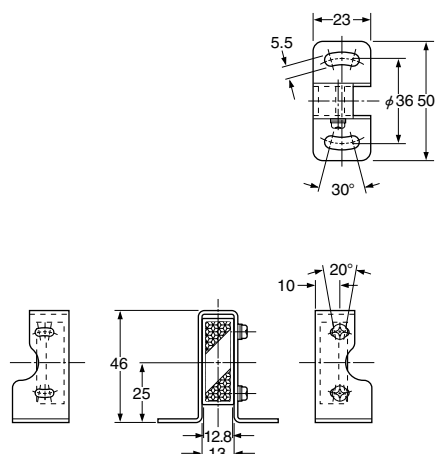**Assembly dimensions**
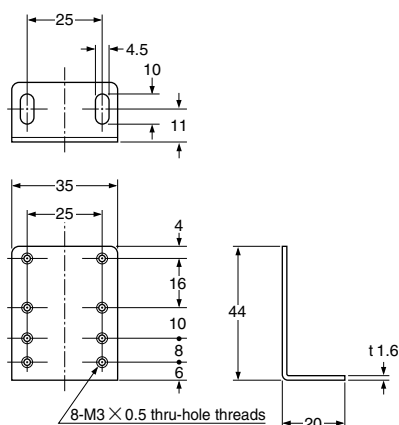Mounting drawing with **CX-2□**

Center of sensing

MS-RF21-1   Reflector mounting bracket for **RF-210** (Optional)
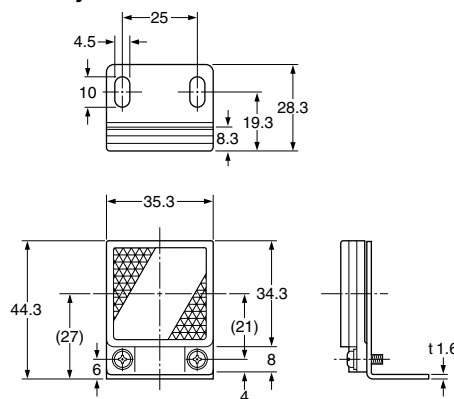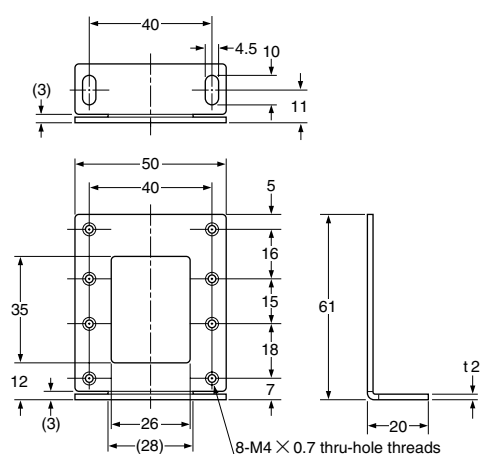
Assembly dimensions

Material: Stainless steel (SUS304)
Two M3 (length 12 mm) screws
with washers are attached.

DIMENSIONS (Unit: mm)
The CAD data in the dimensions can be downloaded from the SUNX website: http://www.sunx.co.jp/

MS-RF22 Reflector mounting bracket for **RF-220** (Optional)

Assembly dimensions

25
4.5
10
11

35
25
4
16
10
8
6
44
t 1.6

8-M3 × 0.5 thru-hole threads
20

25
4.5
10
28.3
19.3
8.3

35.3
44.3
34.3
(27)
(21)
6
8
4
t 1.6

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

MS-RF23 Reflector mounting bracket for **RF-230** (Optional)

Assembly dimensions

40
4.5 10
(3)
11

50
40
5
16
15
18
7
61
35
12
t 2
(3)
26
(28)
8-M4 × 0.7 thru-hole threads
20

40
4.5
10
28.3
19.3
8.3

50.3
61.3
49.3
(37)
(30)
7
5
10
40
t 2

Material: Cold rolled carbon steel (SPCC)
(Uni-chrome plated)
Two M4 (length 10 mm) screws with washers are attached.
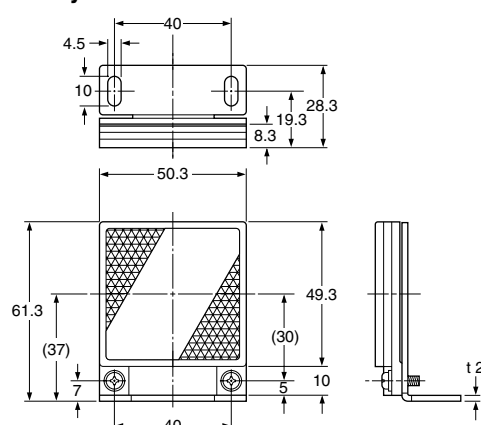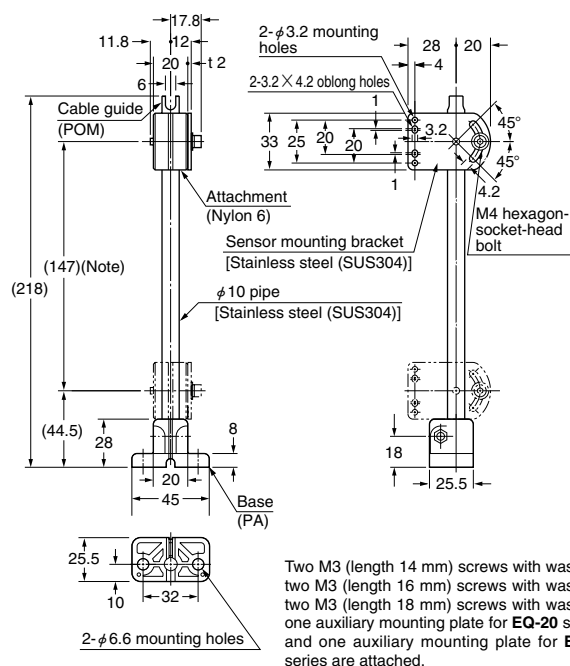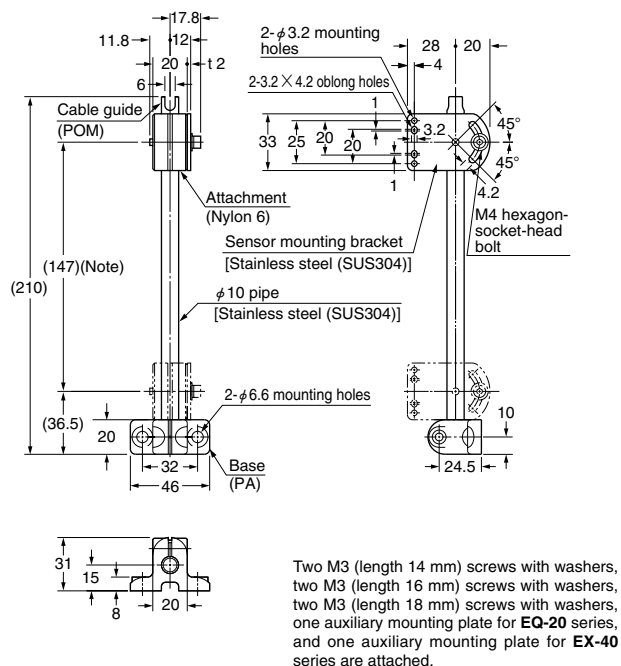
CX-20

DIMENSIONS (Unit: mm)

MS-AJ1 Basic assembly (Optional)

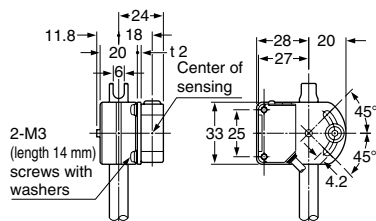Note: The dimensions in the brackets indicate the adjustable range of the movable part.

Two M3 (length 14 mm) screws with washers, two M3 (length 16 mm) screws with washers, two M3 (length 18 mm) screws with washers, one auxiliary mounting plate for **EQ-20** series, and one auxiliary mounting plate for **EX-40** series are attached.

MS-AJ2 Basic assembly (Optional)

Note: The dimensions in the brackets indicate the adjustable range of the movable part.

Two M3 (length 14 mm) screws with washers, two M3 (length 16 mm) screws with washers, two M3 (length 18 mm) screws with washers, one auxiliary mounting plate for **EQ-20** series, and one auxiliary mounting plate for **EX-40** series are attached.

Assembly dimensions with CX-20 series
(Mounting part only)

Assembly dimensions with RF-210 (Reflector)
(Mounting part only)
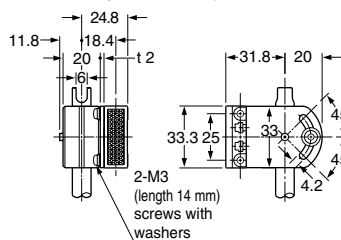
DIMENSIONS (Unit: mm)

MS-AJ1-M   Assembly for reflector (Optional)

M4 hexagon-socket-head bolt

2-M4
2-M3

Attachment
(Nylon 6)

φ10 pipe
[Stainless steel (SUS304)]

Base
(PA)

2-φ6.6 mounting holes

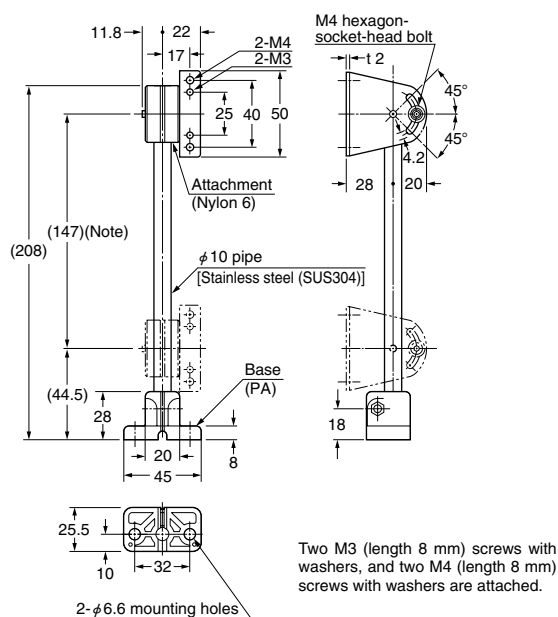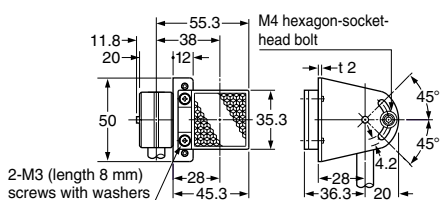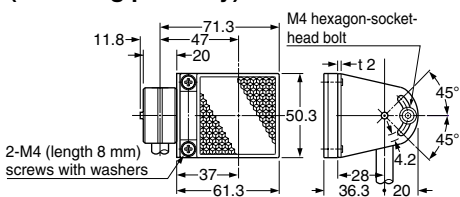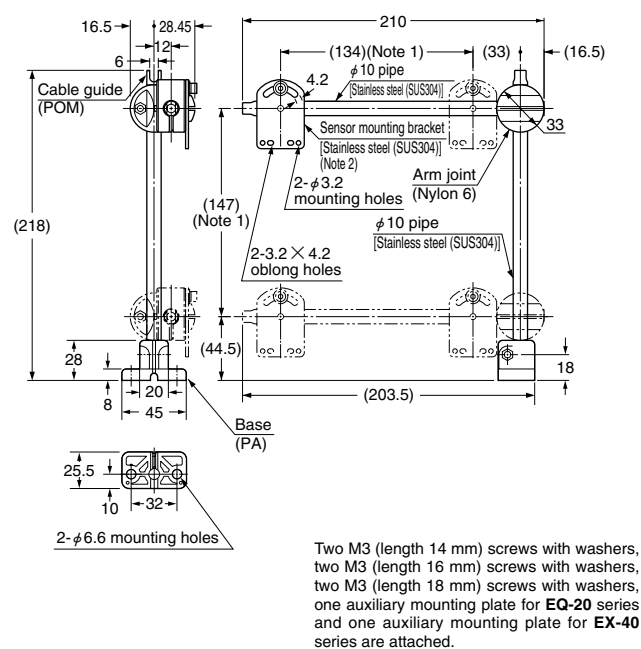Two M3 (length 8 mm) screws with washers, and two M4 (length 8 mm) screws with washers are attached.

Note: The dimensions in the brackets indicate the adjustable range of the movable part.
Vertical mounting type is also available.

Assembly dimensions with RF-220 (Reflector)
(Mounting part only)

M4 hexagon-socket-head bolt

2-M3 (length 8 mm)
screws with washers

Assembly dimensions with RF-230 (Reflector)
(Mounting part only)

M4 hexagon-socket-head bolt

2-M4 (length 8 mm)
screws with washers

MS-AJ1-A   Lateral arm assembly (Optional)

Cable guide
(POM)

φ10 pipe
[Stainless steel (SUS304)]

Sensor mounting bracket
[Stainless steel (SUS304)]
(Note 2)

Arm joint
(Nylon 6)

2-φ3.2
mounting holes

φ10 pipe
[Stainless steel (SUS304)]

2-3.2 × 4.2
oblong holes

Base
(PA)

2-φ6.6 mounting holes

Two M3 (length 14 mm) screws with washers, two M3 (length 16 mm) screws with washers, two M3 (length 18 mm) screws with washers, one auxiliary mounting plate for **EQ-20** series and one auxiliary mounting plate for **EX-40** series are attached.

Notes: 1) The dimensions in the brackets indicate the adjustable range of the movable part.
2) Refer to **MS-AJ1** (basic assembly) for the assembly diagram with the sensor mounting bracket, sensor or reflector.
Vertical mounting type is also available.