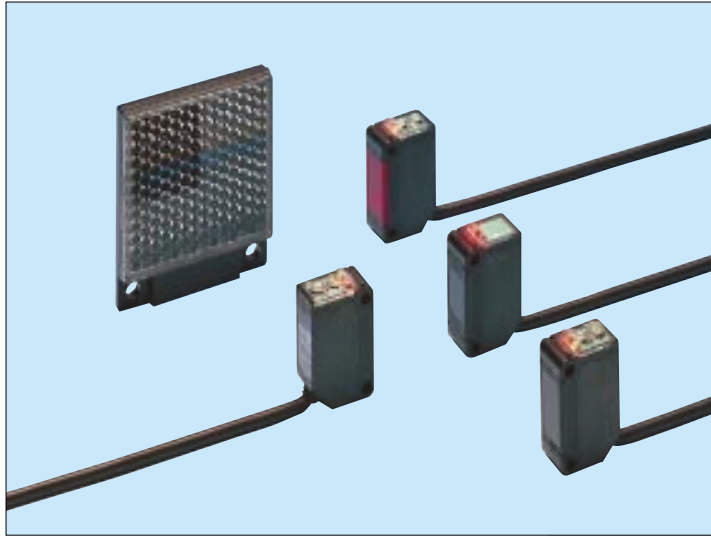


CX-20

SERIES

Amplifier Built-in Compact Photoelectric Sensor



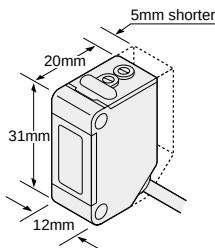
General Purpose Photoelectric Sensor with Full Basic Performance



Conforming to EMC Directive

Compact Size

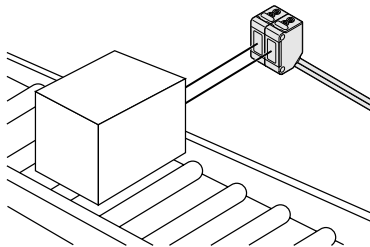
Just 20mm in depth, 5mm shorter than a conventional model.



Two Sensors Mountable Together

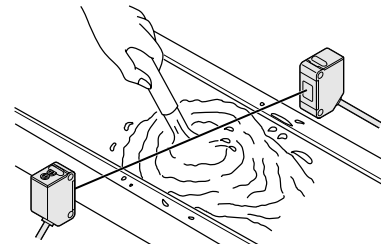
CX-29 (retroreflective type), **CX-22** and **CX-24** (diffuse reflective type) incorporate an automatic interference prevention function. Hence, two sensors can be mounted close together.

(**CX-21**, **CX-23**, **CX-28** or **CX-28IR**) do not have this function.



Waterproof

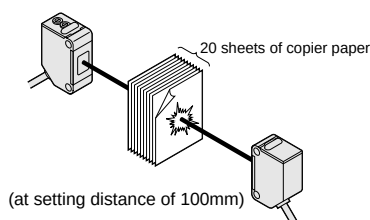
The sensor can be hosed down because of its IP67 construction and the non-corrosive stainless steel mounting bracket.



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

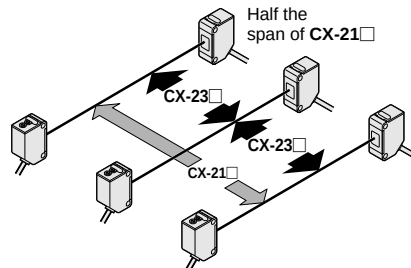
Strong Light Beam

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.



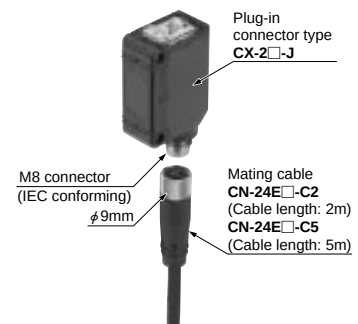
Insusceptible to Extraneous Light: CX-23

As the spread of the beam from the **CX-23** emitter is narrow, close mounting of sensors is possible.



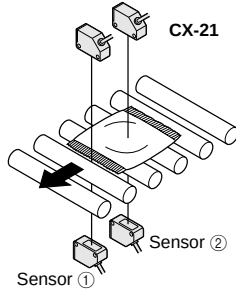
Plug-in Connector Type Is Available

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.

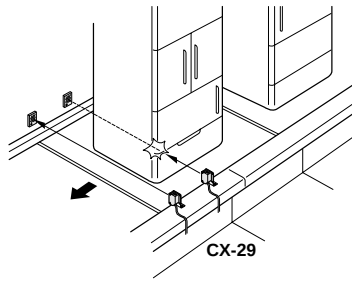


APPLICATIONS

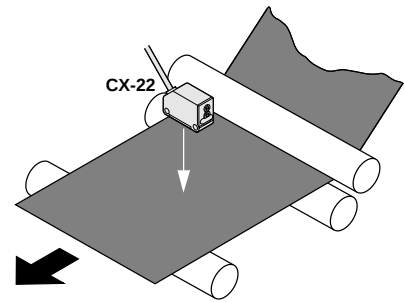
Detecting contents in paper pouch



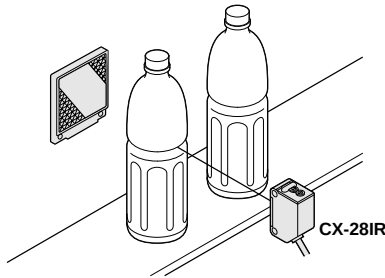
Detecting shiny refrigerators



Detecting rubber sheet



Detecting pet bottles



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

Sensing object	Sensing object size
Glass sheet	□50mm t=1.0mm
Cylindrical glass	φ50mm ℓ=50mm t=2.0mm
	φ100mm ℓ=50mm t=2.3mm
Acrylic board	□50mm t=1.5mm
Styrol (Floppy case)	□50mm t=1.2mm
Food wrapping film	□50mm t=10 μm
Cigarette case film	□50mm t=20 μm
Vinyl sack	□50mm t=30 μm
Pet bottle	φ55mm
	φ70mm
Glass bin	φ65mm

Reflector setting range: 300 to 500mm
(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

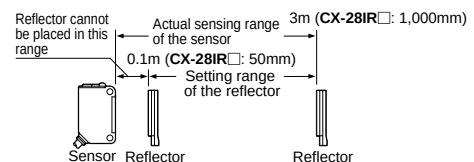
Note: The optimum condition is defined as the condition in which the sensitivity level is set such that the stability indicator just lights up when the object is absent.

ORDER GUIDE

Type	Appearance	Sensing range	Model No.	Sensing output	Emitting element
NPN output type	Thru-beam	10m	CX-21	NPN open-collector transistor	Infrared LED
		5m	CX-23		
	Retroreflective	0.1 to 3m (Note 1)	CX-29		Red LED
		50 to 1,000mm (Note 1)	CX-28IR		
	Diffuse reflective	800mm	CX-22		Infrared LED
		300mm	CX-24		
PNP output type	Thru-beam	10m	CX-21-PN	PNP open-collector transistor	Infrared LED
		5m	CX-23-PN		
	Retroreflective	0.1 to 3m (Note 1)	CX-29-PN		Red LED
		50 to 1,000mm (Note 1)	CX-28IR-PN		
	Diffuse reflective	800mm	CX-22-PN		Infrared LED
		300mm	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 1: 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 0.1m away (CX-28IR□: 50mm).



Fiber Sensors

FX-D1/A1/M1

FX-13

FX-11A

FZ-10

CX-20

Amplifier Built-in Type

CX-30

CX-RV/M5/D100/ND300R

EX-10

EX-20

CX-20

ORDER GUIDE

Red LED type for transparent object sensing

The red LED type for transparent object sensing, which features easy beam alignment, is available.
Model No.: **CX-28**, **CX-28-PN** (Sensing range: 50 to 500mm)

Plug-in connector type (Not available for the self-diagnosis output type)

Plug-in connector type is available. When ordering this type, add '-J' to the model No.

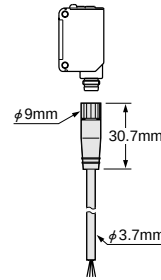
(e.g.) Plug-in connector type of **CX-21-PN** is '**CX-21-PN-J**'.

Plug-in connector type of **CX-29-Y** is '**CX-29-J-Y**'.

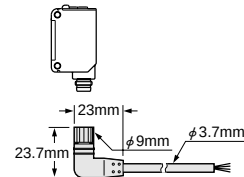
• Mating cable (2 Nos. are required for the thru-beam type.)

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

• CN-24E-C2, CN-24E-C5



• CN-24EL-C2, CN-24EL-C5



Self-diagnosis output type (Available with NPN output type only. However, not available for CX-23□, CX-28□, CX-28IR□, and plug-in connector type.)

The self-diagnosis output type is available. When ordering this type, add 'S' to the model No.
(e.g.) Self-diagnosis output type of **CX-21** is '**CX-21S**'.

Package without reflector

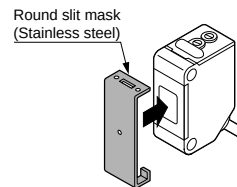
CX-29□, **CX-28□** and **CX-28IR□** are available without the reflector **RF-230**. When ordering this type, add suffix '-Y' to the model No.
(e.g.) Package without reflector of **CX-29** is '**CX-29-Y**'.

OPTIONS

Designation	Model No.	Description	
Round slit mask (For thru-beam type sensor only)	OS-CX-05 (Slit size $\phi 0.5$ mm)	Slit on one side	• Sensing range: 400mm [CX-21□] 300mm [CX-23□] • Min. sensing object: $\phi 12$ mm
		Slit on both sides	• Sensing range: 20mm [CX-21□ , CX-23□] • Min. sensing object: $\phi 0.5$ mm
	OS-CX-1 (Slit size $\phi 1$ mm)	Slit on one side	• Sensing range: 900mm [CX-21□] 600mm [CX-23□] • Min. sensing object: $\phi 12$ mm
		Slit on both sides	• Sensing range: 100mm [CX-21□ , CX-23□] • Min. sensing object: $\phi 1$ mm
	OS-CX-2 (Slit size $\phi 2$ mm)	Slit on one side	• Sensing range: 2m [CX-21□] 1.5m [CX-23□] • Min. sensing object: $\phi 12$ mm
		Slit on both sides	• Sensing range: 400mm [CX-21□ , CX-23□] • Min. sensing object: $\phi 2$ 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: 2m [CX-21□] 1.2m [CX-23□] • Min. sensing object: $\phi 12$ mm
		Slit on both sides	• Sensing range: 400mm [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: 3m [CX-21□] 2m [CX-23□] • Min. sensing object: $\phi 12$ mm
		Slit on both sides	• Sensing range: 1m [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: 5m [CX-21□] 3m [CX-23□] • Min. sensing object: $\phi 12$ mm
		Slit on both sides	• Sensing range: 2m [CX-21□ , CX-23□] • Min. sensing object: 2×6 mm

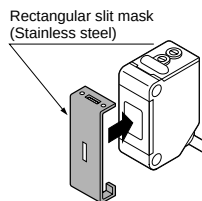
Round slit mask

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



Rectangular slit mask

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



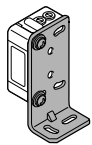
OPTIONS

Designation	Model No.	Description
Reflector (For retro-reflective type sensor only)	RF-210	- Sensing range: 0.1 to 1m [CX-29□] 50 to 250mm [CX-28IR□] - Min. sensing object: ϕ30mm
	RF-220	- Sensing range: 0.1 to 1.5m [CX-29□] 50 to 500mm [CX-28IR□] - Min. sensing object: ϕ35mm
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 $+50^{\circ}\text{C}$ - 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.
	RF-12	- Sensing range: 0.1 to 0.5m [CX-29□] - Sensing range: 0.1 to 0.7m [CX-29□] 0.15 to 0.4m [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-AJ	Basic assembly
	MS-AJ-A	Lateral arm assembly
	MS-AJ-M	Assembly for reflector
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.310~ for details of the universal sensor mounting stand.
 4) Refer to P.378~ for details of the sensor checker CHX-SC2.

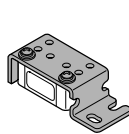
Sensor mounting bracket

• MS-CX2-1



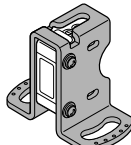
Two M3 (length 12mm) screws with washers are attached.

• MS-CX2-2



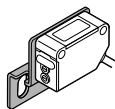
Two M3 (length 12mm) screws with washers are attached.

• MS-CX2-4



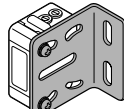
Two M3 (length 14mm) screws with washers are attached.

• MS-CX2-5



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

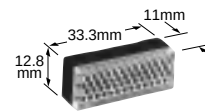
• MS-CX-3



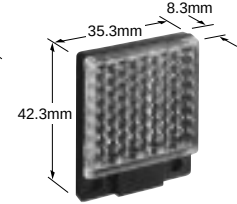
Two M3 (length 12mm) screws with washers are attached.

Reflector

• RF-210

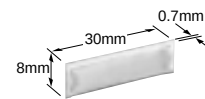


• RF-220

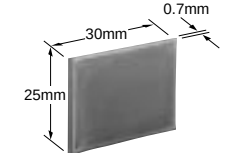


Reflective tape

• RF-11

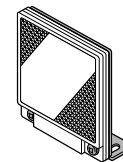


• RF-12



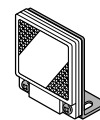
Reflector mounting bracket

• MS-RF23



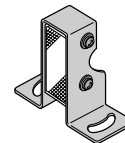
Two M4 (length 10mm) screws with washers are attached.

• MS-RF22



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

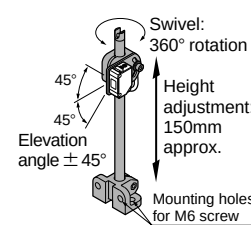
• MS-RF21-1



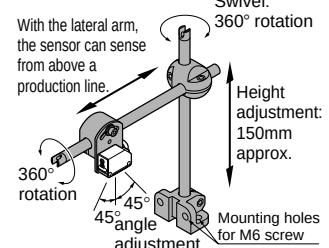
Two M3 (length 12mm) screws with washers are attached.

Universal sensor mounting stand

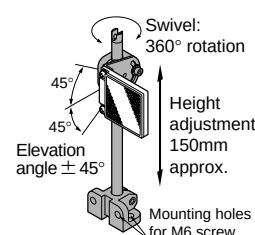
• MS-AJ



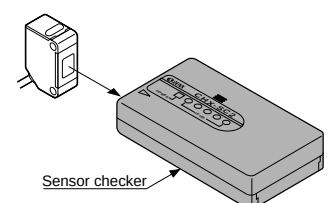
• MS-AJ-A



• MS-AJ-M



Sensor checker

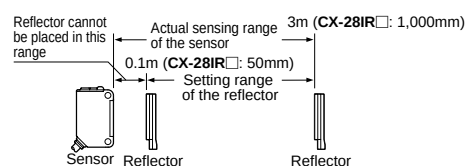


CX-20

SPECIFICATIONS

Type		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			10m	5m	0.1 to 3m (Note 1)	50 to 1,000mm (Note 1)	800mm (Note 2)	300mm (Note 2)
Sensing object			φ 12mm or more opaque object (Note 3)		φ 50mm or more opaque, translucent or specular object (Note 1)	φ 50mm 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)			0.5mm or less	0.05mm or less	0.5mm or less		1mm or less	
Supply voltage			12 to 24V DC ± 10% Ripple P-P 10% or less					
Current consumption	NPN output type		Emitter: 35mA or less Receiver: 25mA or less		30mA or less		35mA or less	
	PNP output type		Emitter: 35mA or less Receiver: 30mA or less		35mA or less		40mA or less	
Sensing output			<NPN output type> NPN open-collector transistor • Maximum sink current: 100mA • Applied voltage: 30V DC or less (between sensing output and 0V) • Residual voltage: 1.5V or less (at 100mA sink current) 0.4V or less (at 16mA sink current)				<PNP output type> PNP open-collector transistor • Maximum source current: 100mA • Applied voltage: 30V DC or less (between sensing output and + V) • Residual voltage: 1.5V or less (at 100mA source current) 0.4V or less (at 16mA source current)	
	Utilization category		DC-12 or DC-13					
	Output operation		Switchable either Light-ON or Dark-ON					
	Short-circuit protection		Incorporated					
Response time			1ms 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 closely.)		Incorporated (Two units of sensors can be mounted closely.)	
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: 10,000ℓx at the light-receiving face, Incandescent light: 3,000ℓx 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					
	Insulation resistance		20MΩ, or more, with 250V DC megger between all supply terminals connected together and enclosure					
	Vibration resistance		10 to 500Hz frequency, 1.5mm amplitude in X, Y and Z directions for two hours each					
	Shock resistance		500m/s ² acceleration (50G 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			0.2mm ² 3-core (thru-beam type emitter: 2-core) oil resistant cabtyre cable, 2m long					
Cable extension			Extension up to total 100m is possible with 0.3mm ² , or more, cable (thru-beam type: both emitter and receiver).					
Weight			Emitter: 45g approx., Receiver: 50g approx.		50g approx.			
Accessories			Adjusting screwdriver: 1 No.		RF-230 (Reflector): 1 No. Adjusting screwdriver: 1 No.		Adjusting screwdriver: 1 No.	

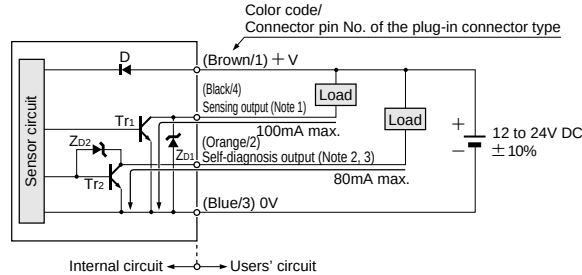
Notes: 1) The sensing range and the sensing object of the retroreflective type sensor are specified for the RF-230 reflector.
Further, the sensing range is the possible setting range for the reflector.
The sensor can detect an object less than 0.1m away (CX-28IR□: 50mm).
2) The sensing range of the diffuse reflective type sensor is specified for white non-glossy paper (200 × 200mm) as the object.
3) If slit masks (optional) are fitted, an object of ϕ 0.5mm (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.



I/O CIRCUIT AND WIRING DIAGRAMS

NPN output type

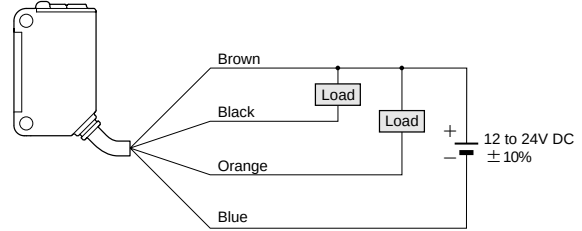
I/O circuit diagram



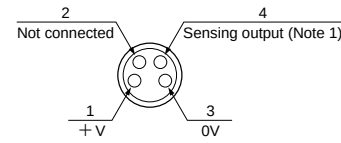
Notes: 1) The emitter of the thru-beam type sensor does not incorporate the sensing output.
2) Only CX-□S incorporates the self-diagnosis output.
3) The plug-in connector type sensor does not incorporate the self-diagnosis output. When connecting the mating cable, the white wire is not connected.

Symbols ... D: Reverse supply polarity protection diode
Zb1, Zb2: Surge absorption zener diode
Tr1, Tr2: NPN output transistor

Wiring diagram

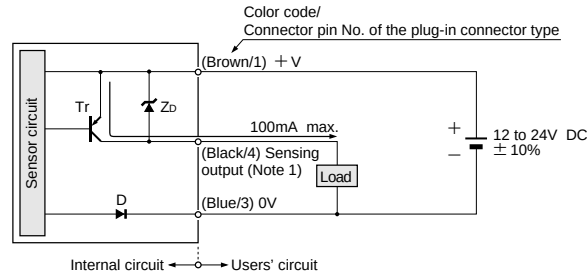


Connector pin position (Plug-in connector type)



PNP output type

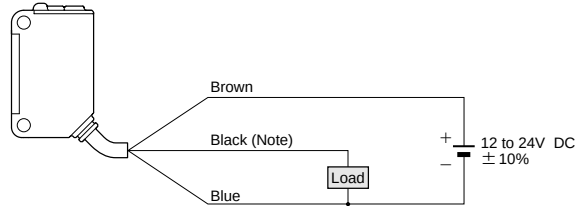
I/O circuit diagram



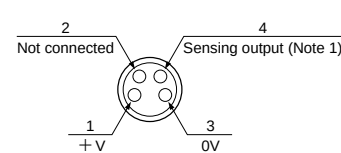
Notes: 1) The emitter of the thru-beam type sensor does not incorporate the sensing output.
2) When connecting the mating cable to the plug-in connector type sensor, the white wire is not connected.

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

Wiring diagram



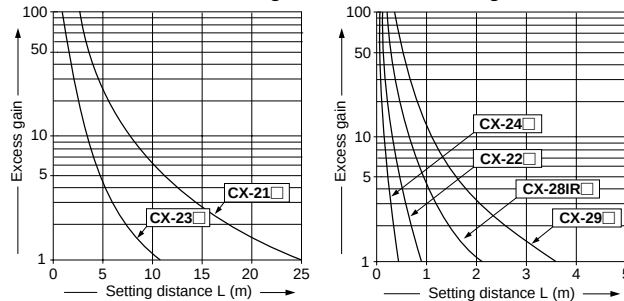
Connector pin position (Plug-in connector type)



SENSING CHARACTERISTICS (TYPICAL)

All models

Correlation between setting distance and excess gain



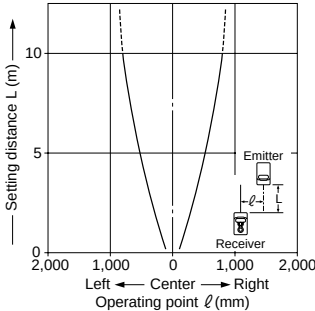
CX-20

SENSING CHARACTERISTICS (TYPICAL)

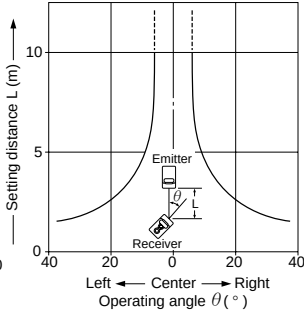
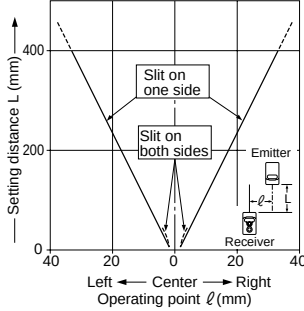
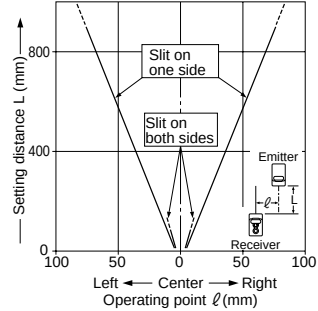
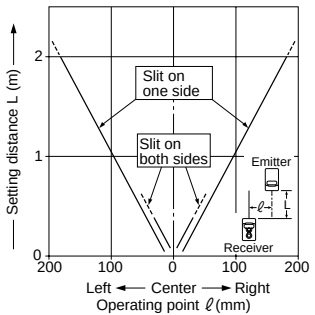
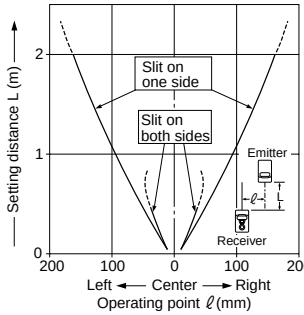
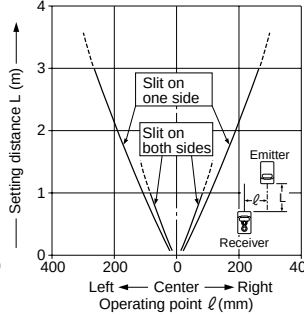
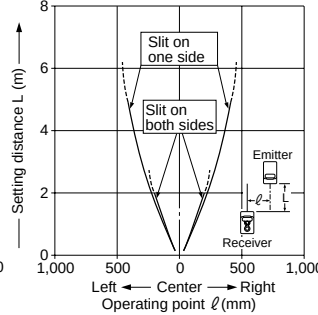
CX-21

Thru-beam type

Parallel deviation



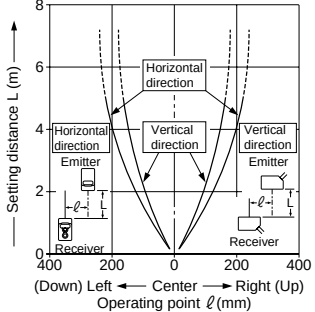
Angular deviation

Parallel deviation with round slit masks ($\phi 0.5\text{mm}$)Parallel deviation with round slit masks ($\phi 1\text{mm}$)Parallel deviation with round slit masks ($\phi 2\text{mm}$)Parallel deviation with rectangular slit masks ($0.5 \times 6\text{mm}$)Parallel deviation with rectangular slit masks ($1 \times 6\text{mm}$)Parallel deviation with rectangular slit masks ($2 \times 6\text{mm}$)

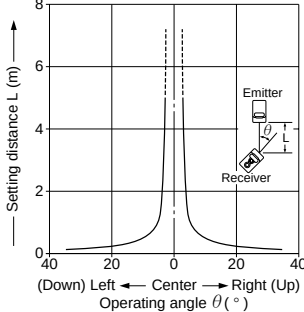
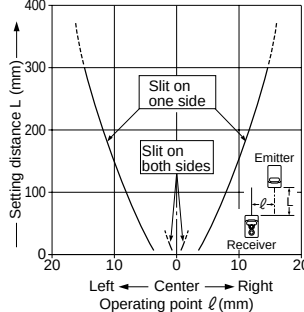
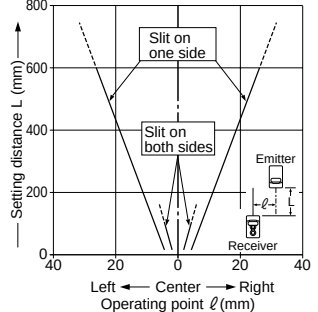
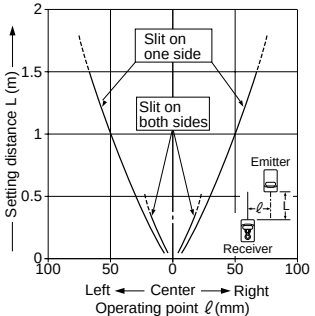
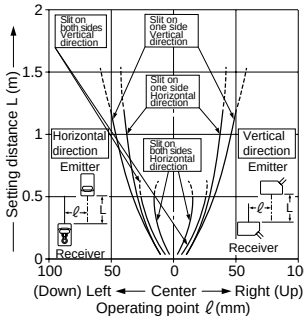
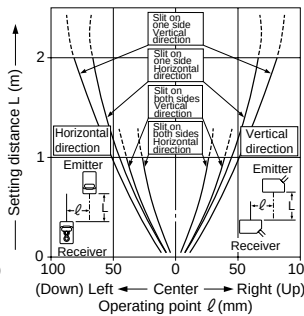
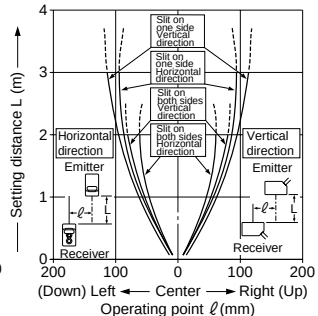
CX-23

Thru-beam type

Parallel deviation



Angular deviation

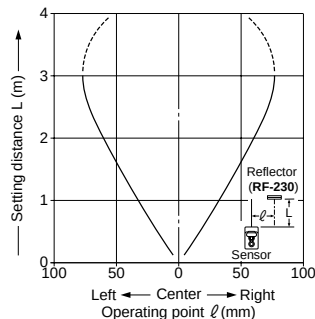
Parallel deviation with round slit masks ($\phi 0.5\text{mm}$)Parallel deviation with round slit masks ($\phi 1\text{mm}$)Parallel deviation with round slit masks ($\phi 2\text{mm}$)Parallel deviation with rectangular slit masks ($0.5 \times 6\text{mm}$)Parallel deviation with rectangular slit masks ($1 \times 6\text{mm}$)Parallel deviation with rectangular slit masks ($2 \times 6\text{mm}$)

SENSING CHARACTERISTICS (TYPICAL)

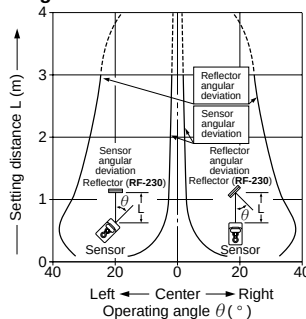
CX-29

Retroreflective type

Parallel deviation



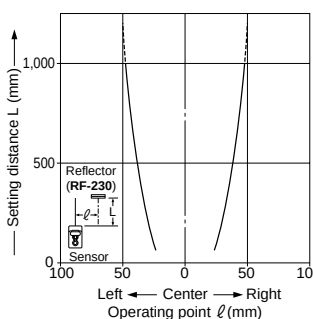
Angular deviation



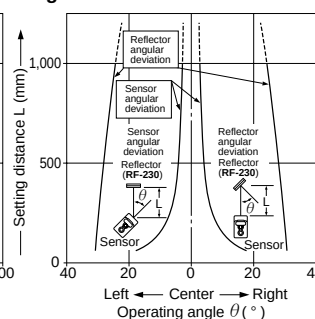
CX-28IR

Retroreflective type

Parallel deviation



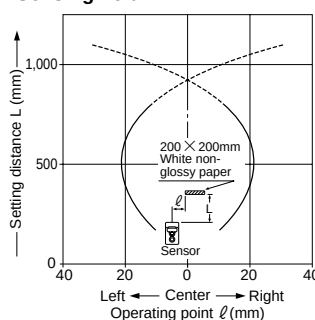
Angular deviation



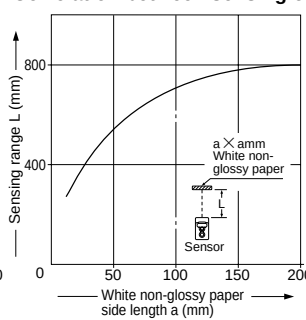
CX-22

Diffuse reflective type

Sensing field



Correlation between sensing object size and sensing range



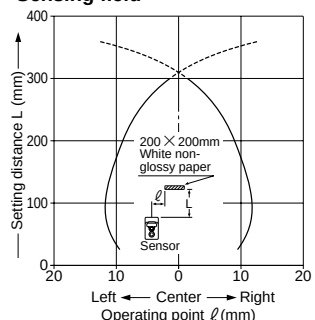
As the sensing object size becomes smaller than the standard size (white non-glossy paper 200 × 200mm), the sensing range shortens, as shown in the left graph.

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

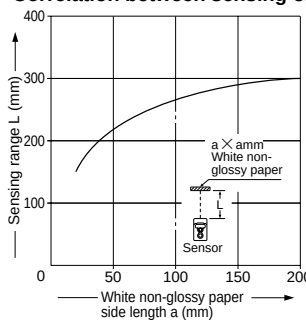
CX-24

Diffuse reflective type

Sensing field



Correlation between sensing object size and sensing range



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 is just detectable at a distance of 300mm.)

PRECAUTIONS FOR PROPER USE

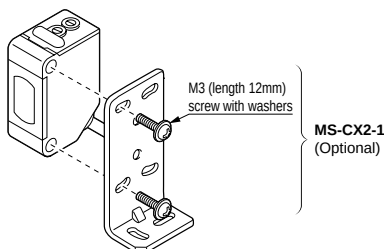
Refer to P.820~ for general precautions.



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 0.5N·m or less.



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.

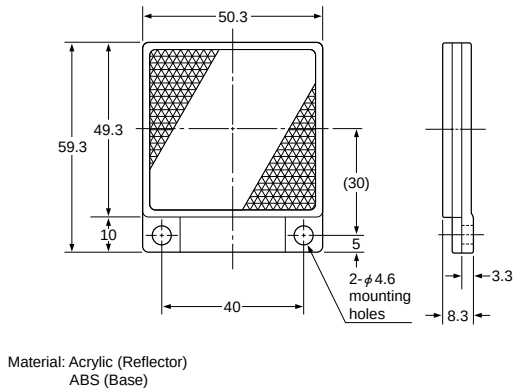
Others

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

DIMENSIONS (Unit: mm)

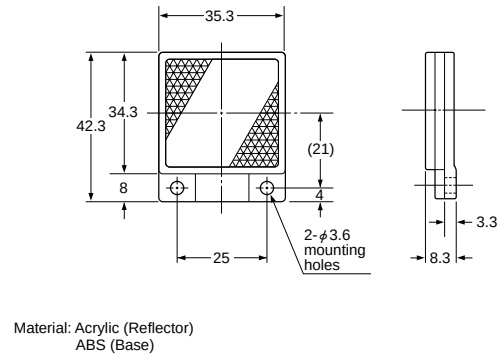
RF-230

Reflector (Accessory for the retroreflective type sensor)



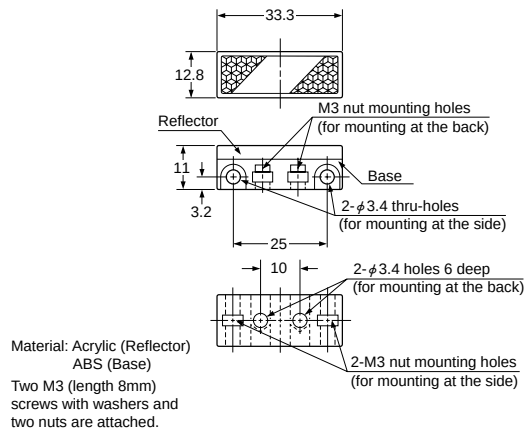
RF-220

Reflector (Optional)



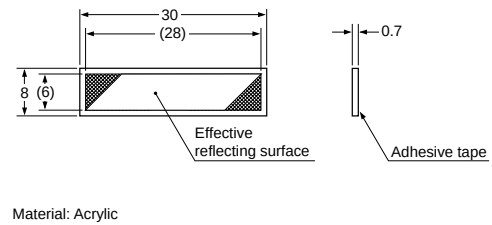
RF-210

Reflector (Optional)



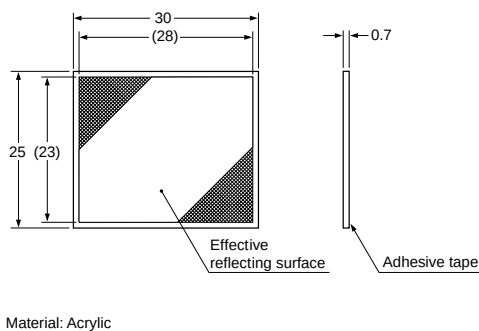
RF-11

Reflective tape (Optional)



RF-12

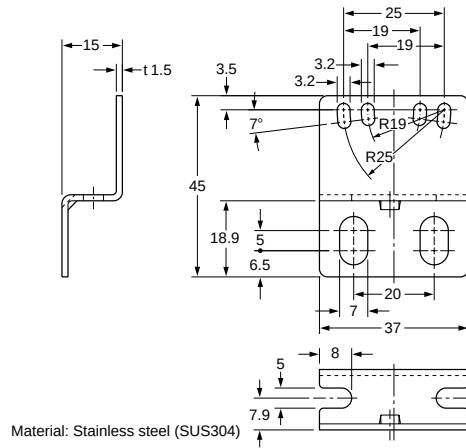
Reflective tape (Optional)



Fiber Sensors	FX-D1/A1/M1
	FX-13
	FX-11A
Amplifier Built-in Type	FZ-10
	CX-20
	CX-30
EX-10	CX-RV/M5/D100/ND300R
	EX-20

DIMENSIONS (Unit: mm)

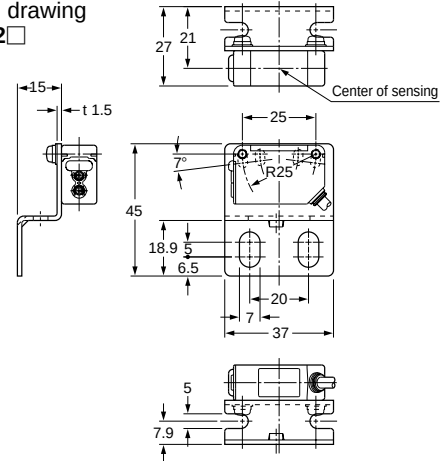
MS-CX2-5 Sensor mounting bracket (Optional)



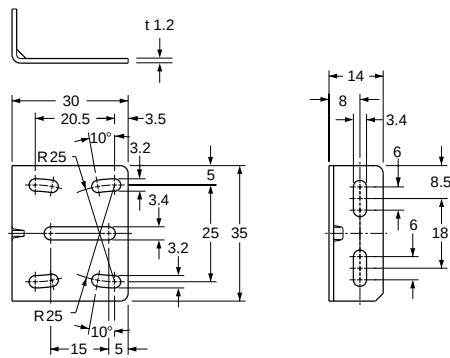
Material: Stainless steel (SUS304)
Two M3 (length 12mm) screws with washers are attached.

Assembly dimensions

Mounting drawing with CX-2□



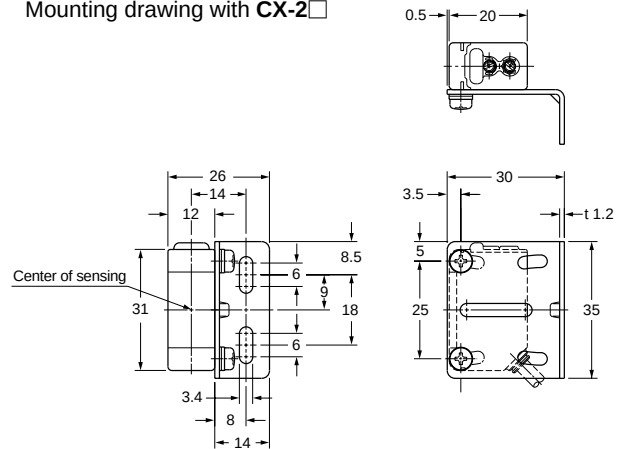
MS-CX-3 Sensor mounting bracket (Optional)



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

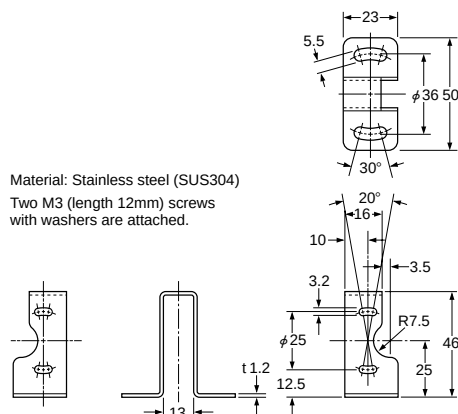
Assembly dimensions

Mounting drawing with CX-2□

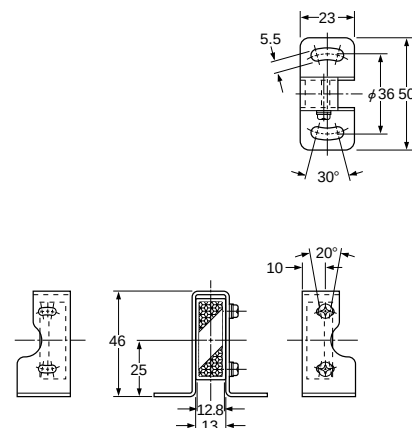


MS-RF21-1 Reflector mounting bracket for RF-210 (Optional)

Assembly dimensions



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

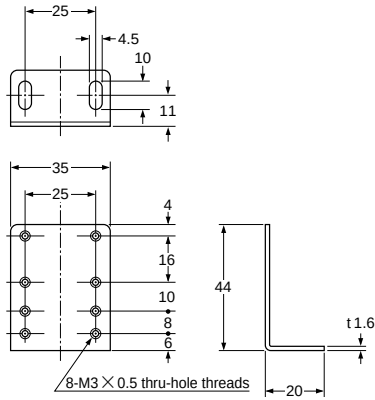


CX-20

DIMENSIONS (Unit: mm)

MS-RF22

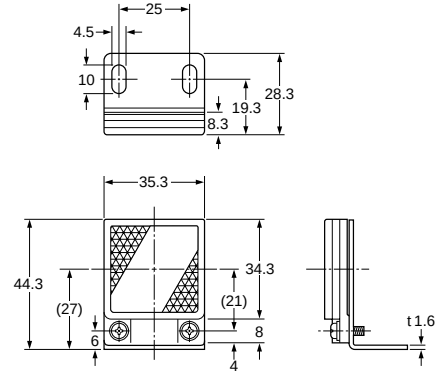
Reflector mounting bracket for **RF-220** (Optional)



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

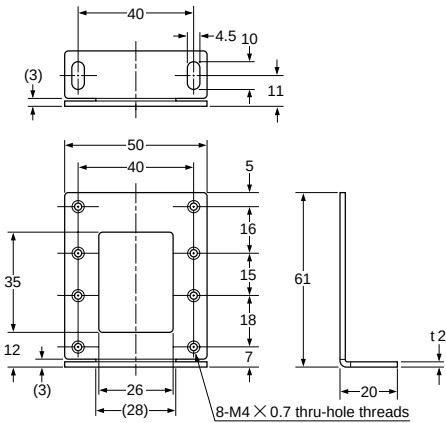
Two M3 (length 8mm) screws with washers are attached.

Assembly dimensions



MS-RF23

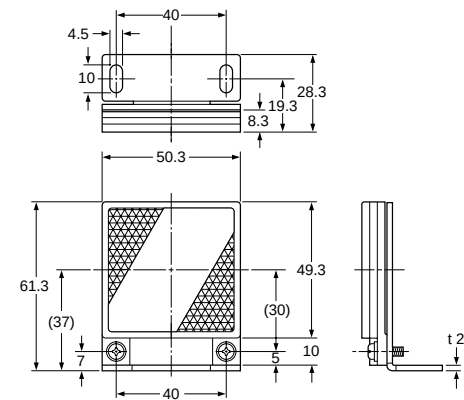
Reflector mounting bracket for **RF-230** (Optional)



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

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

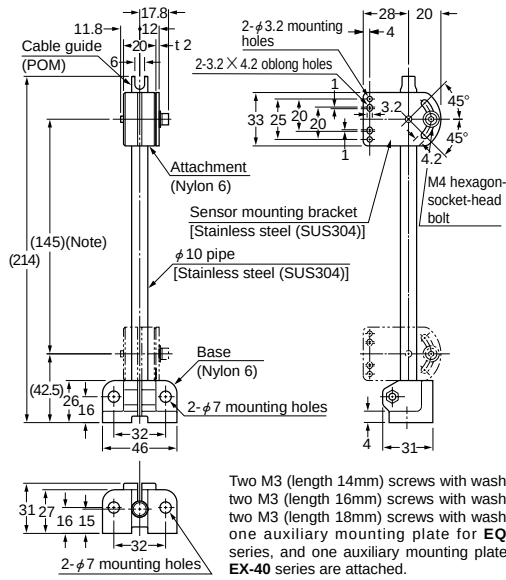
Assembly dimensions



DIMENSIONS (Unit: mm)

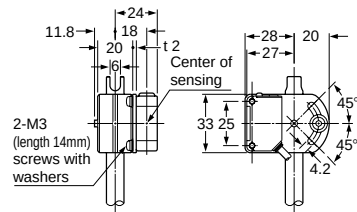
MS-AJ

Basic assembly (Optional)

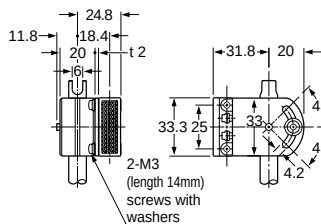


Note: The dimensions in the brackets indicate the adjustable range of the movable part.

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

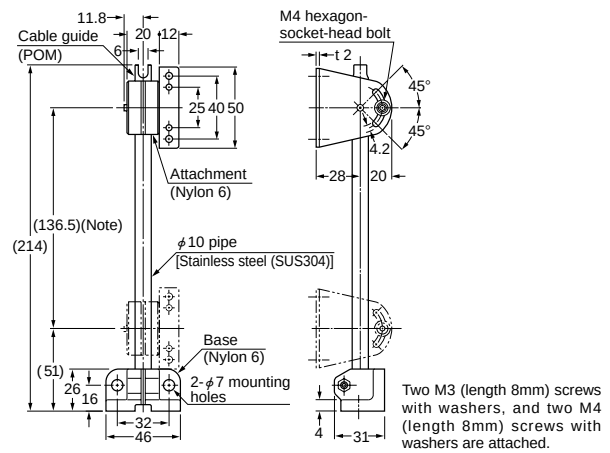


Assembly dimensions with RF-210 (Reflector) (Mounting part only)



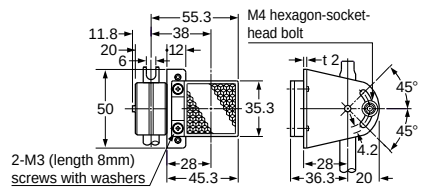
MS-AJ-M

Assembly for reflector (Optional)

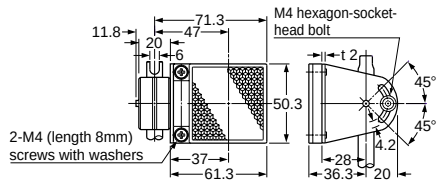


Note: The dimensions in the brackets indicate the adjustable range of the movable part.

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

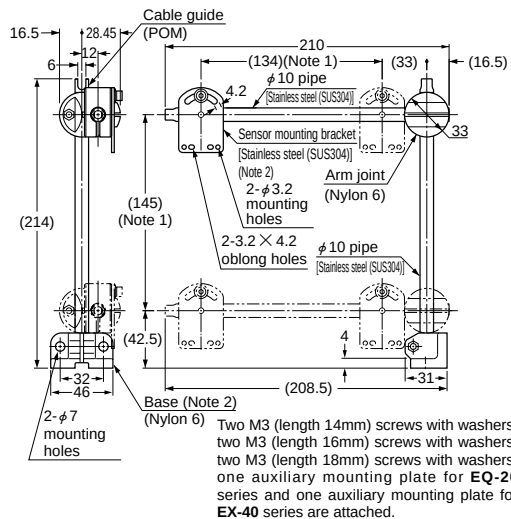


Assembly dimensions with RF-230 (Reflector) (Mounting part only)



MS-AJ-A

Lateral arm assembly (Optional)



Notes: 1) The dimensions in the brackets indicate the adjustable range of the movable part.

2) Refer to MS-AJ (basic assembly) for the assembly diagram with the base, sensor mounting bracket, sensor or reflector.