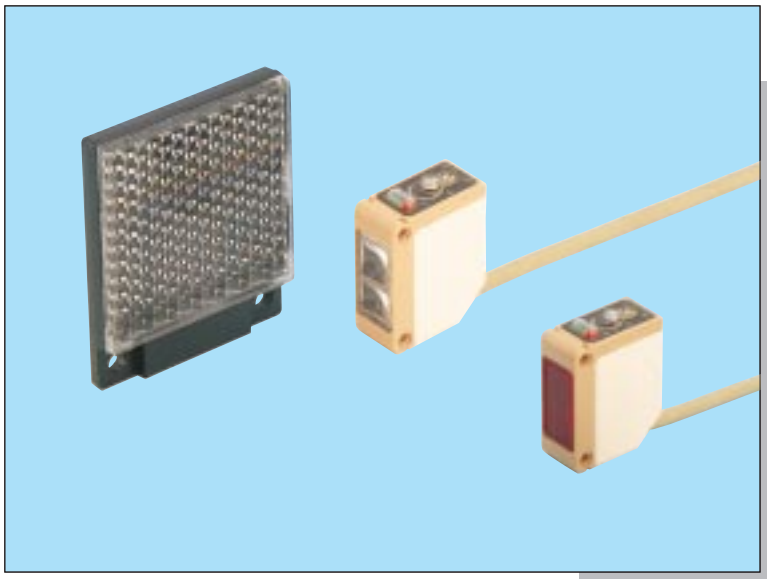
CX-RVM5/D100/ND300R

Amplifier Built-in Inverter Light Resistant Photoelectric Sensor



Reliable and Easy to Use

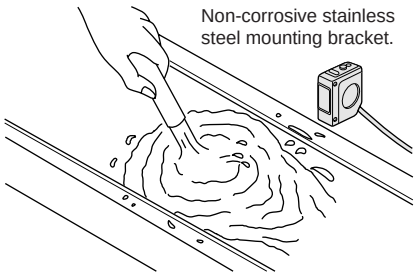
CE Marked
Conforming to EMC Directive

Insusceptible to Inverter Fluorescent Light

It incorporates an **inverter fluorescent light resistant circuit** to prevent a malfunction when the sensor is exposed to inverter light (NPN output type sensors only).

Waterproof

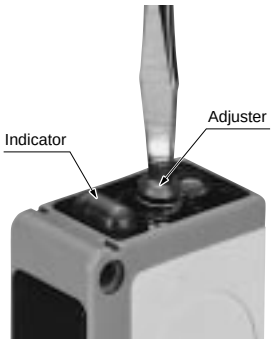
The environmental reliability has been significantly increased. Besides having IP67 waterproof construction, it is strong against vibration as its inside is fully filled with resin.



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

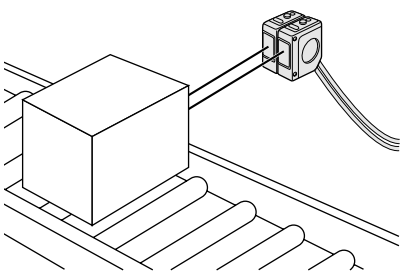
2-turn Adjuster with Indicator

The optimum sensitivity can be set easily.



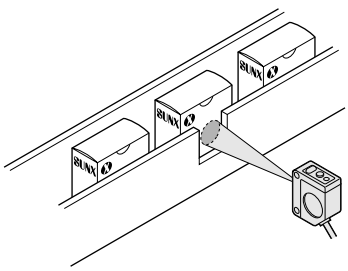
Two Sensors Mountable Together

With its 'automatic interference prevention function', close mounting of two sensors is possible.



Reliably Detecting Objects at Target Point

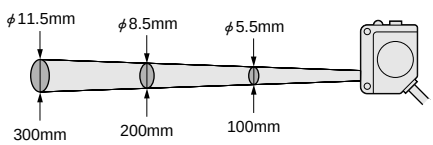
CX-ND300R is a narrow-view type sensor which can sense reliably without being affected by the surroundings.



Visible Projected Point

Since it employs a visible red LED beam, the sensing point can be confirmed and setting is easy.

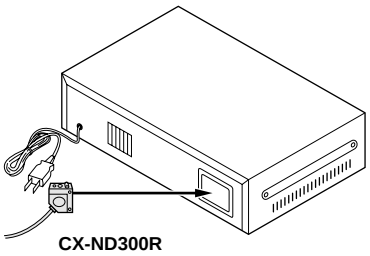
[Sensing distance and spot diameter]



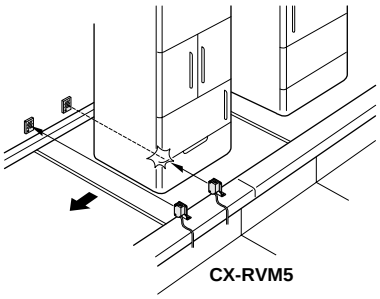
CX-RVM5/D100/ND300R

APPLICATIONS

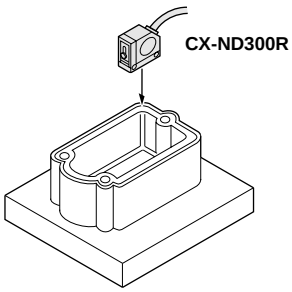
Detecting label



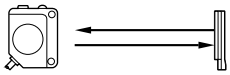
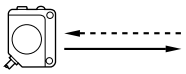
Detecting large home appliances



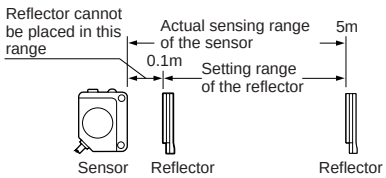
Checking gasket position



ORDER GUIDE

Type	Appearance	Sensing range	Model No.	Emitting element	Sensing output
Retroreflective		0.1 to 5m (Note)	**CX-RVM5**	Infrared LED	NPN open-collector transistor
			CX-RVM5-PN		PNP open-collector transistor
Diffuse reflective		100mm	**CX-D100**		NPN open-collector transistor
			CX-D100-PN		PNP open-collector transistor
Narrow-view diffuse reflective		70 to 300mm	**CX-ND300R**	Red LED	NPN open-collector transistor
			CX-ND300R-PN		PNP open-collector transistor

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 0.1m away.

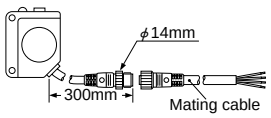


5m cable length type

5m cable length models are available (Standard: 2m).
When ordering this type, add suffix '**-C5**' to the model No.
(e.g.) **CX-ND300R-C5** (NPN output type)
CX-ND300R-PN-C5 (PNP output type)

Pigtailed type

Pigtailed sensors are available.
(Standard type is attached with a 2m long cable.
No pigtail option for the 5m cable length type.)
When ordering this type, add suffix '**-J**' to the model No.
(e.g.) **CX-ND300R-J** (NPN output type)
CX-ND300R-PN-J (PNP output type)
Please order the suitable mating cable separately.



• Mating cable

Model No.	Cable length
CN-24-C2	2m
CN-24-C5	5m

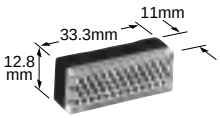
CX-RVM5/D100/ND300R

OPTIONS

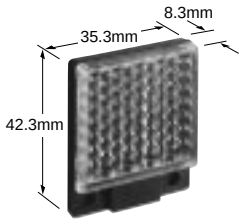
Designation	Model No.	Description	
Reflector (For retro-reflective type sensor only)	**RF-210**	• Sensing range: 0.1 to 1.5m • Min. sensing object: ϕ30mm	
	RF-220	• Sensing range: 0.1 to 3m • Min. sensing object: ϕ35mm	
Reflector mounting bracket	**MS-RF21-1**	Protective mounting bracket for **RF-210** It protects the reflector from damage and maintains alignment.	
	MS-RF22	For **RF-220**	
	MS-RF23	For **RF-230**	
Reflective tape (For retroreflective type sensor only)	**RF-11**	• 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 0.8m
	RF-12		• Sensing range: 0.1 to 1.2m
Sensor mounting bracket	**MS-CX-2**	Foot biangled mounting bracket Flat mounting saves height. It can also be used for mounting **RF-210**.	
	MS-CX-3	Back angled mounting bracket	
	MS-CX-4	Protective mounting bracket It protects the sensor from damage and maintains alignment.	

Reflector

• **RF-210**

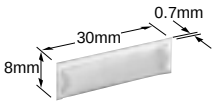


• **RF-220**

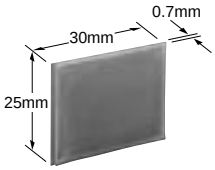


Reflective tape

• **RF-11**

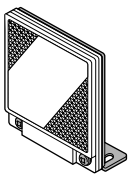


• **RF-12**



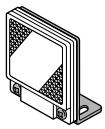
Reflector mounting bracket

• **MS-RF23**



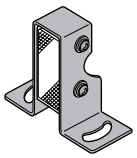
Two M4 (length 10mm) screws with washers are attached.

• **MS-RF22**



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

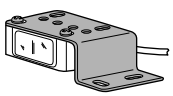
• **MS-RF21-1**



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

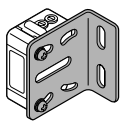
Sensor mounting bracket

• **MS-CX-2**



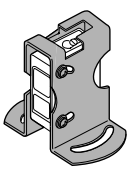
Two M3 (length 12mm) screws with washers are attached.

• **MS-CX-3**



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

• **MS-CX-4**



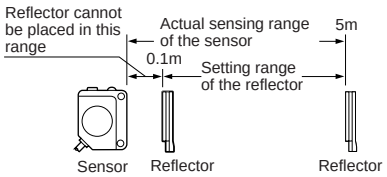
Two M3 (length 12mm) screws with washers are attached.

CX-RVM5/D100/ND300R

SPECIFICATIONS

Item \ Type	Retroreflective		Diffuse reflective		Narrow-view reflective	
	NPN output	PNP output	NPN output	PNP output	NPN output	PNP output
Model No.	**CX-RVM5**	**CX-RVM5-PN**	**CX-D100**	**CX-D100-PN**	**CX-ND300R**	**CX-ND300R-PN**
Sensing range	0.1 to 5m (Note 1)		100mm (Note 2)		70 to 300mm (Note 2)	
Sensing object	ϕ50mm or more opaque or translucent object (Note 1)		Opaque, translucent or transparent object		Opaque, translucent or transparent object (Min. sensing object: ϕ0.5mm copper wire)	
Hysteresis	———		15% or less of operation distance			
Repeatability (Perpendicular to sensing axis)	0.5mm or less					
Supply voltage	12 to 24V DC ± 10% Ripple P-P 10% or less					
Current consumption	40mA or less	50mA or less	40mA or less	50mA or less	40mA or less	50mA 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 (Note 3)					
Self-diagnosis output	<NPN output type> NPN open-collector transistor • Maximum sink current: 50mA • Applied voltage: 30V DC or less (between self-diagnosis output and 0V) • Residual voltage: 1V or less (at 50mA sink current) 0.4V or less (at 16mA sink current)		<PNP output type> PNP open-collector transistor • Maximum source current: 50mA • Applied voltage: 30V DC or less (between self-diagnosis output and +V) • Residual voltage: 1V or less (at 50mA source current) 0.4V or less (at 16mA source current)			
Output operation	ON during unstable sensing					
Short-circuit protection	———					
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)					
Sensitivity adjuster	2-turn adjuster with indicator					
Automatic interference prevention function	Incorporated (Two units can be mounted closely.)					
Environmental resistance: Pollution degree	3 (Industrial environment)					
Environmental resistance: Protection	IP67 (IEC)					
Environmental resistance: Ambient temperature	− 25 to + 60°C (No dew condensation or icing allowed) (Note 4), Storage: − 30 to + 70°C					
Environmental resistance: Ambient humidity	35 to 85% RH, Storage: 35 to 85% RH					
Environmental resistance: Ambient illuminance	Sunlight: 11,000 ℓx at the light-receiving face, Incandescent light: 3,500 ℓx at the light-receiving face					
Environmental resistance: EMC	Emission: EN50081-2, Immunity: EN50082-2					
Environmental resistance: Voltage withstandability	1,000V AC for one min. between all supply terminals connected together and enclosure					
Environmental resistance: Insulation resistance	20MΩ, or more, with 250V DC megger between all supply terminals connected together and enclosure					
Environmental resistance: Vibration resistance	10 to 500Hz frequency, 1.5mm amplitude (10G max.) in X, Y and Z directions for two hours each					
Environmental resistance: 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)	
Material	Enclosure: Heat-resistant ABS, Lens: Acrylic, Indicator cover: Polyalylate					
Cable	0.15mm^2 4-core oil, heat and cold resistant cabtyre cable, 2m long					
Cable extension	Extension up to total 100m is possible with 0.3mm^2, or more, cable.					
Weight	50g approx.					
Accessories	**MS-CX-1** (Sensor mounting bracket): 1 set **RF-230** (Reflector): 1No., Adjusting screwdriver: 1No.		**MS-CX-1** (Sensor mounting bracket): 1 set, Adjusting screwdriver: 1No.			

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.
2) The sensing range is specified for white non-glossy paper (200 × 200mm) as the object.
3) Not incorporated on the PNP output type.
4) In case the sensor is to be used at an ambient temperature of − 15°C, or less, please contact our office.

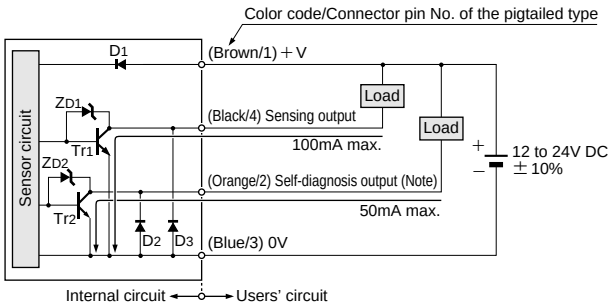


CX-RVM5/D100/ND300R

I/O CIRCUIT AND WIRING DIAGRAMS

NPN output type

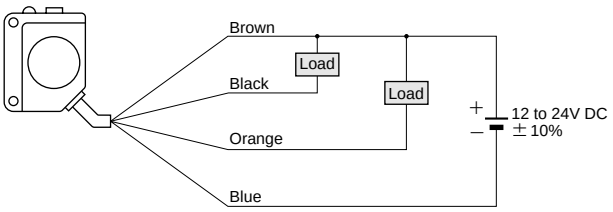
I/O circuit diagram



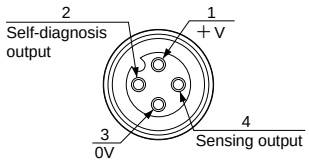
Note: When the mating cable is connected to the pigtailed type, the color of the self-diagnosis output wire is white.

Symbols ... D_1: Reverse supply polarity protection diode
D_2, D_3: Surge absorption diode
Z_{D1}, Z_{D2}: Surge absorption zener diode
Tr_1, Tr_2: NPN output transistor

Wiring diagram

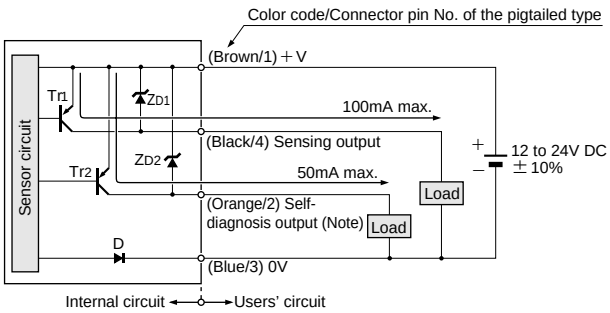


Connector pin position (Pigtailed type)



PNP output type

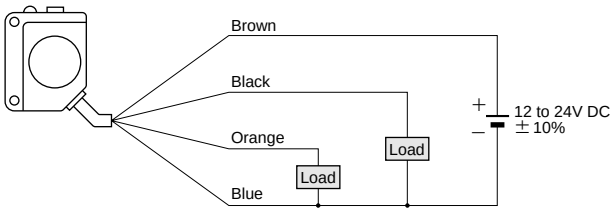
I/O circuit diagram



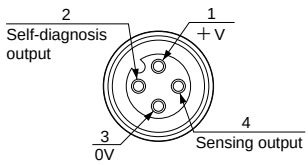
Note: When the mating cable is connected to the pigtailed type, the color of the self-diagnosis output wire is white.

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

Wiring diagram



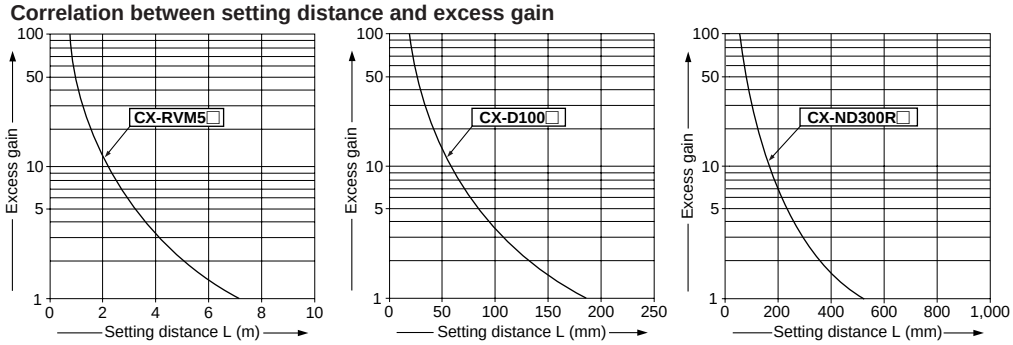
Connector pin position (Pigtailed type)



SENSING CHARACTERISTICS (TYPICAL)

All models

Correlation between setting distance and excess gain

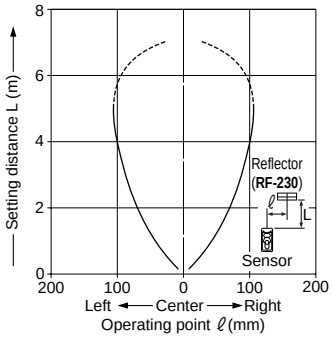


CX-RVM5/D100/ND300R

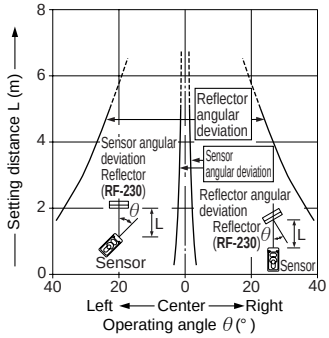
SENSING CHARACTERISTICS (TYPICAL)

CX-RVM5□ Retroreflective type

Parallel deviation

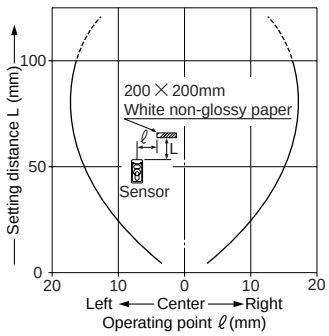


Angular deviation

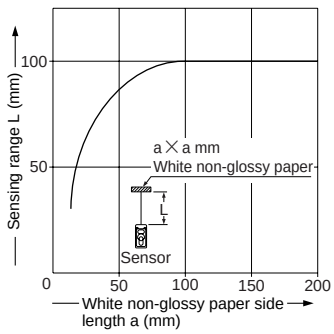


CX-D100□ Diffuse reflective type

Sensing field



Correlation between sensing object size and sensing range

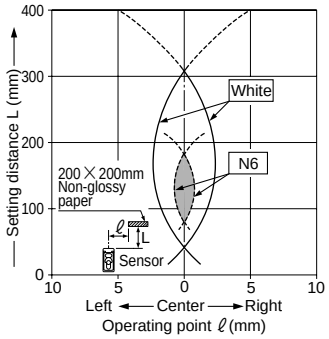


As the sensing object size becomes smaller than the standard size (white non-glossy paper 200 × 200mm), the sensing range shortens, as shown in the left graph.

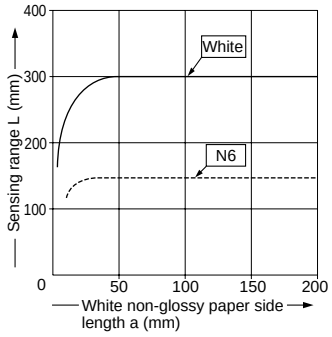
(For plotting the left graph, the sensitivity has been set such that a 200 × 200mm white non-glossy paper is just detectable at a distance of 100mm.)

CX-ND300R□ Narrow-view reflective type

Sensing field



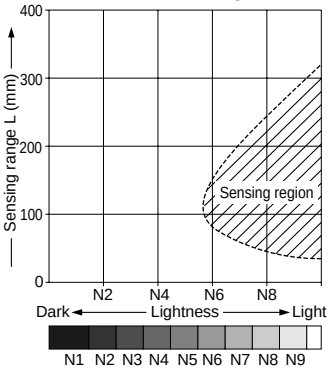
Correlation between sensing object size and sensing range



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

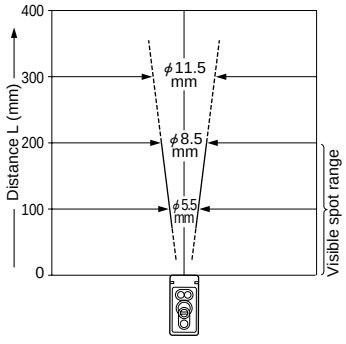
Correlation between lightness and sensing range



The sensing region is represented by oblique lines in the left figure. However, the sensitivity should be set with an enough margin because of slight variation in products.

(Lightness shown on the left may differ slightly from the actual object condition.)

Emitted beam



CX-RVM5/D100/ND300R

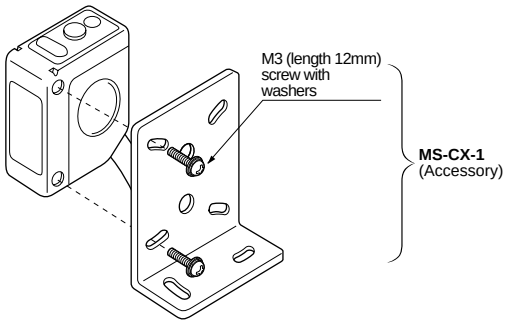
PRECAUTIONS FOR PROPER USE

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 0.49N·m or less.



Detectable combination of colors for CX-ND300R

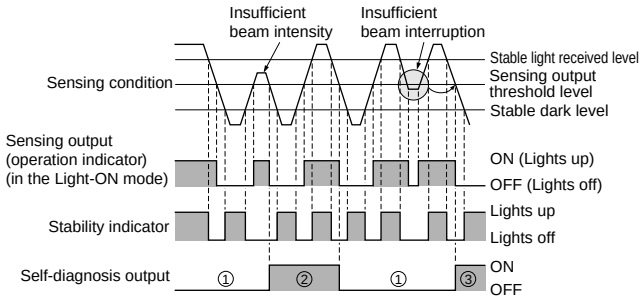
(Setting distance: 100mm)

Mark / Background	White	Yellow	Orange	Red	Green	Blue	Black
White		×	×	×	○	○	○
Yellow	×		×	×	○	○	○
Orange	×	×		×	○	○	○
Red	×	×	×		○	○	○
Green	○	○	○	○		×	×
Blue	○	○	○	○	×		×
Black	○	○	○	○	×	×	

○: Detectable ×: Not detectable

Self-diagnosis function

• 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.

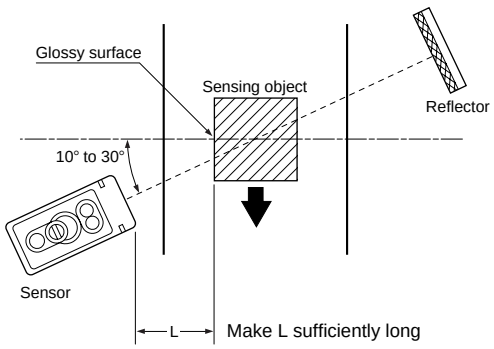
Wiring

• The self diagnosis output is not incorporated with a short-circuit protection circuit. Do not connect it directly to a power supply or a capacitive load.

Refroreflective type sensor (CX-RVM5□)

• Please take care of the following points when detecting materials having a gloss.

① Make L, shown in the diagram, sufficiently long.
② Install at an angle of 10 to 30 degrees to the sensing object.

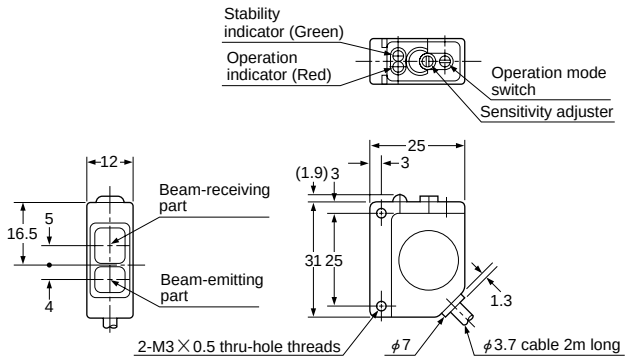


Others

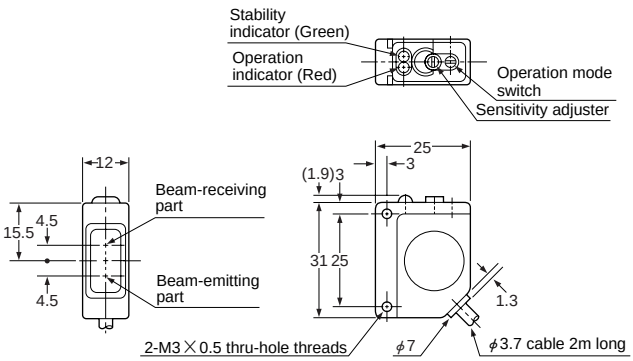
• Do not use during the initial transient time (50ms) after the power supply is switched on.

DIMENSIONS (Unit: mm)

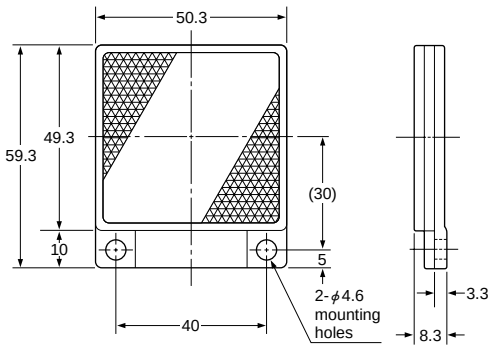
CX-RVM5□ CX-ND300R□ Sensor



CX-D100□ Sensor

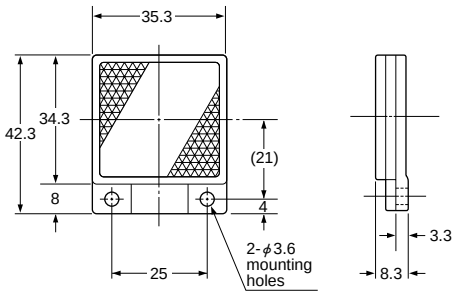


RF-230 Reflector (Accessory for the retroreflective type sensor)



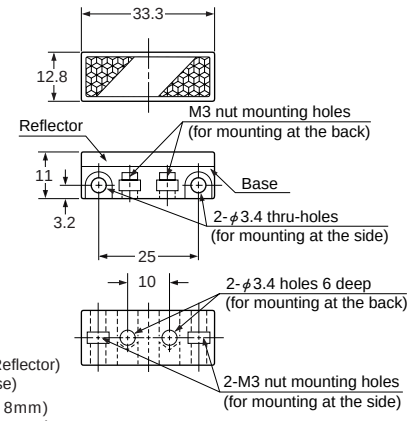
Material: Acrylic (Reflector)
ABS (Base)

RF-220 Reflector (Optional)



Material: Acrylic (Reflector)
ABS (Base)

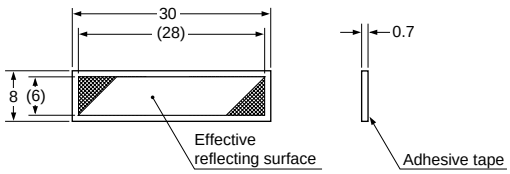
RF-210 Reflector (Optional)



Material: Acrylic (Reflector)
ABS (Base)

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

RF-11 Reflective tape (Optional)

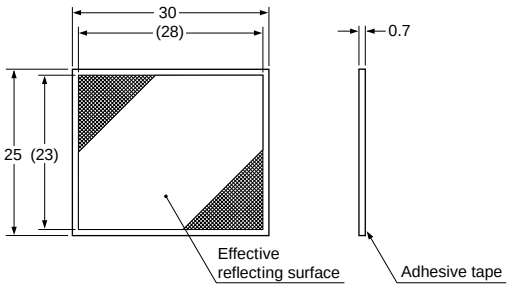


Material: Acrylic

CX-RVM5/D100/ND300R

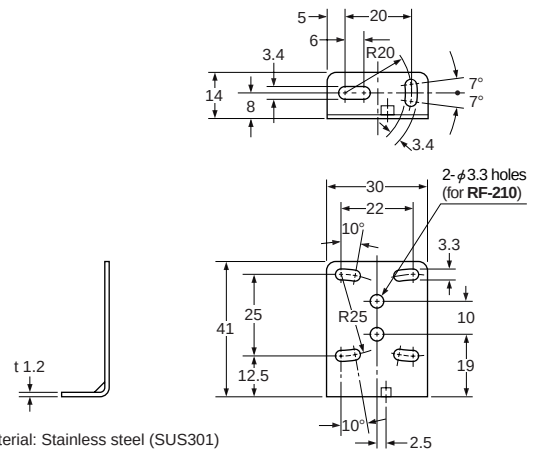
DIMENSIONS (Unit: mm)

RF-12 Reflective tape (Optional)



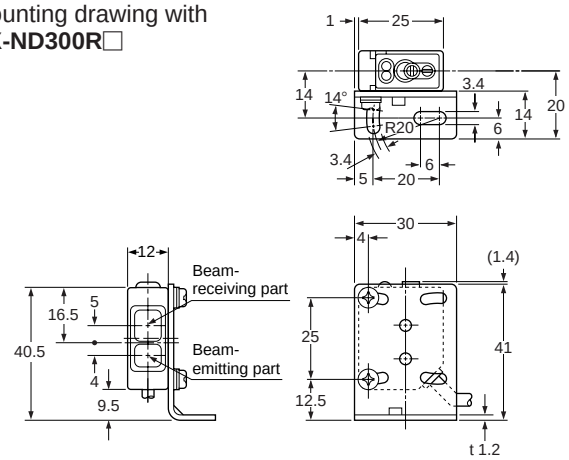
Material: Acrylic

MS-CX-1 Sensor mounting bracket (Accessory)

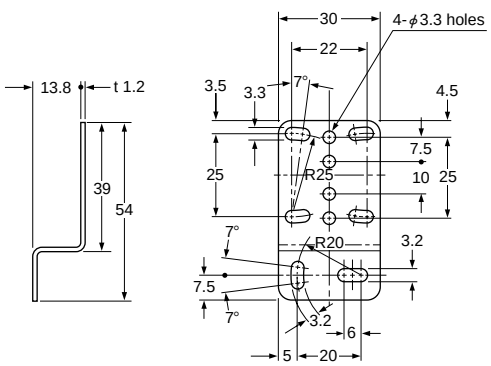


Material: Stainless steel (SUS301)
Two M3 (length 12mm) screws with washers are attached.

Assembly dimensions
Mounting drawing with **CX-ND300R□**

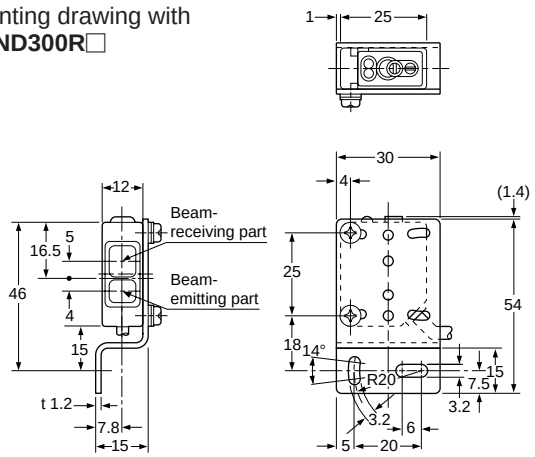


MS-CX-2 Sensor mounting bracket (Optional)



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

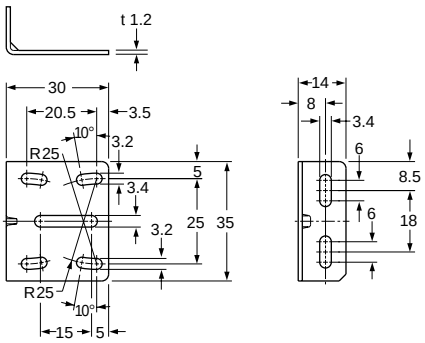
Assembly dimensions
Mounting drawing with **CX-ND300R□**



CX-RVM5/D100/ND300R

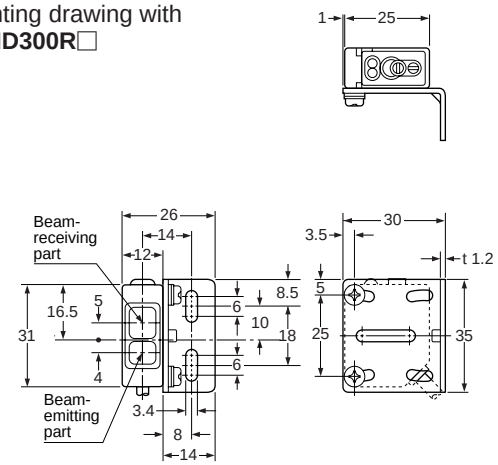
DIMENSIONS (Unit: mm)

MS-CX-3 Sensor mounting bracket (Optional)



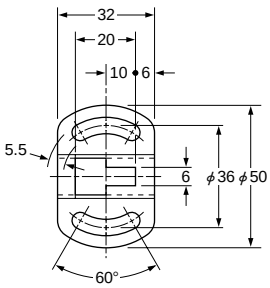
Material: Stainless steel (SUS304)
Two M3 (length 12mm) screws with washers are attached.

Assembly dimensions
Mounting drawing with **CX-ND300R□**

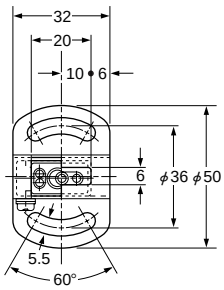


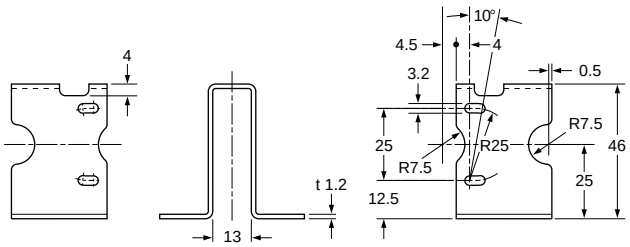
MS-CX-4 Sensor mounting bracket (Optional)

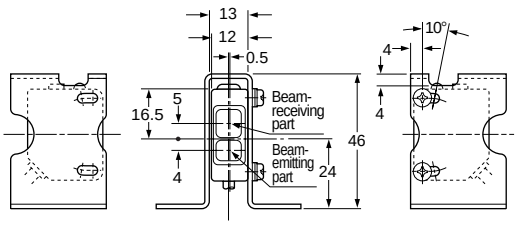
Material: Stainless steel (SUS304)
Two M3 (length 12mm) screws with washers are attached.



Assembly dimensions
Mounting drawing with **CX-ND300R□**

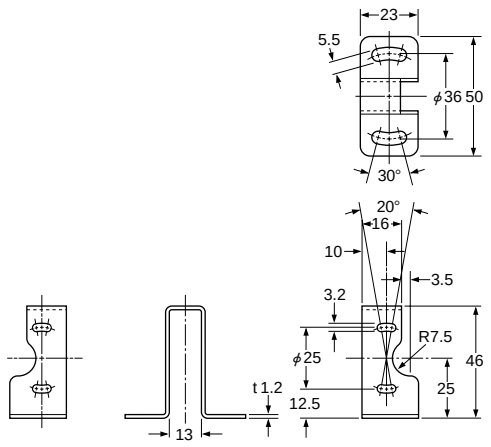


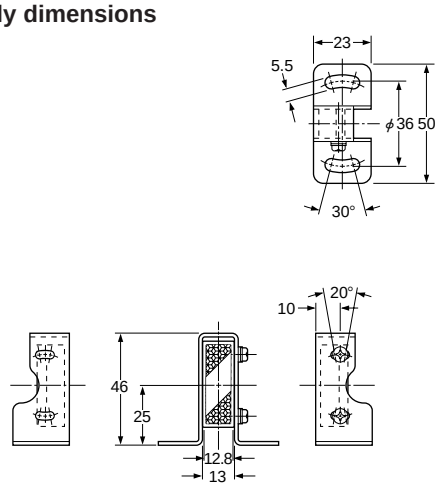




MS-RF21-1 Reflector mounting bracket for **RF-210** (Optional)

Assembly dimensions





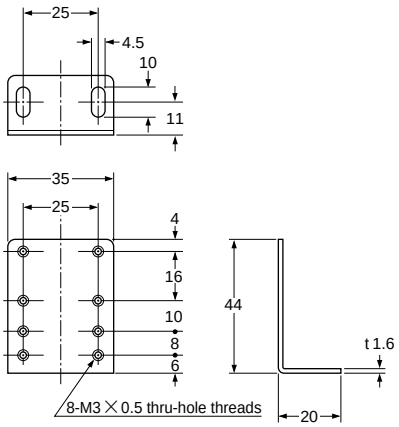
Material: Stainless steel (SUS304)
Two M3 (length 12mm) screws with washers are attached.

CX-RVM5/D100/ND300R

DIMENSIONS (Unit: mm)

MS-RF22

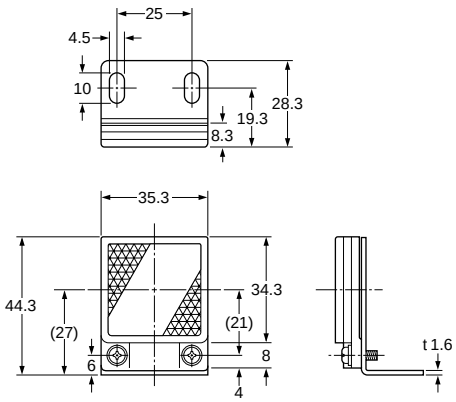
Reflector mounting bracket for **RF-220** (Optional)



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

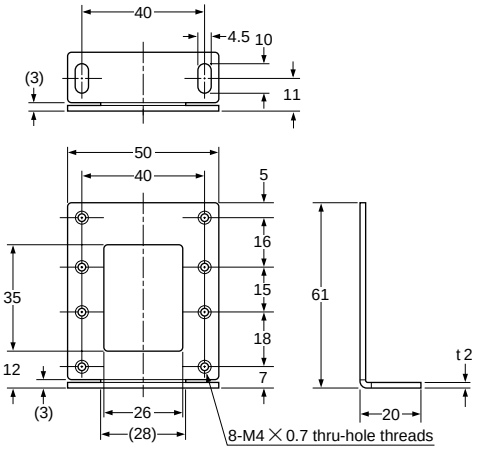
Two M3 (length 8mm) screws with washers are attached.

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