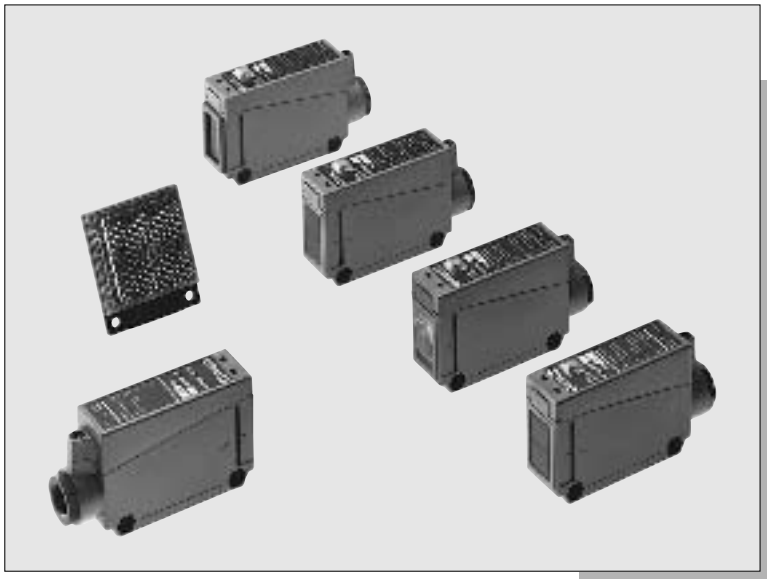
VF SERIES

Terminal Connection Type Multi-voltage Photoelectric Sensor



Easy to Use Terminal Connection Type

CE Marked
Conforming to Low Voltage and EMC Directives

New Convenient Construction

The slanting step-wise terminal enables quick and easy connection.

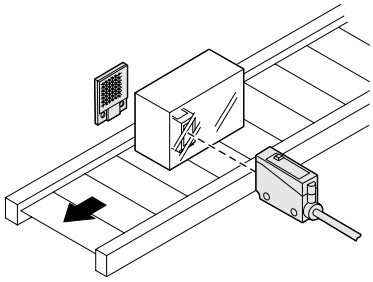


Multi-voltage

The **VF** series can operate at 24 to 240V AC or 12 to 240V DC, which makes it suitable for supply voltages all over the world.

Retroreflective Sensor with Polarizing Filters VF-PRM3

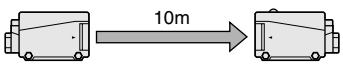
VF-PRM3-3 ensures reliable sensing even with shiny or specular objects traveling in any direction.



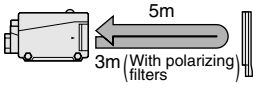
Long Sensing Range

The **VF** series ensures stable detection with its long sensing range.

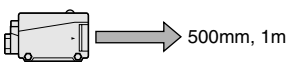
Thru-beam type



Retroreflective type



Diffuse reflective type



Timer Function Models

The sensing signal can be easily converted into a signal suitable for your control process. It is also suitable for PLC input.

- Timer duration: 0.1 to 5 sec. (Variable)
- Operation: ON-delay
  OFF-delay
  ONE SHOT
  (Normal)

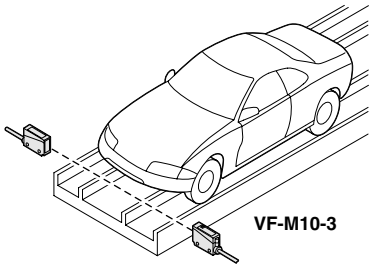
Non-contact Output Type Available

The **VF2** series which incorporates a dual circuit transistor output (NPN and PNP) is also available in the same sensor body. It is suited for fast switching sensing, or applications requiring a fast response.

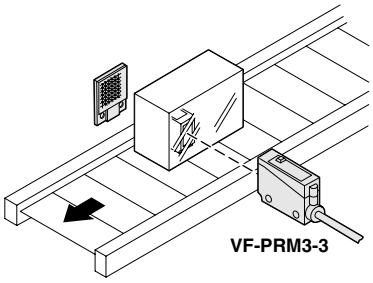
- Output: NPN universal transistor
  PNP open-collector transistor
- Power supply: 12 to 24V DC ± 10%

APPLICATIONS

Car positioning at parking garage

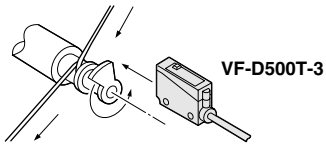


Sensing traveling objects

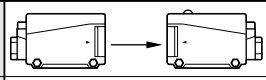
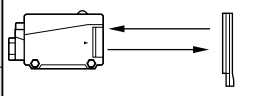
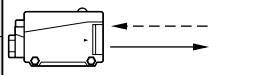


Sensing coil wire end

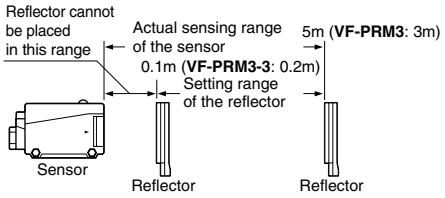
The wire is wound once round a pole having a fin. The sensor detects the rotating fin. By using the OFF-delay timer, an OFF signal can be generated when the wire ends.



ORDER GUIDE

Type	Appearance	Sensing range	Model No.	Timer function	Supply voltage	Output
Thru-beam		10m	**VF-M10-3**	———	24 to 240V AC ± 10% or 12 to 240V DC ± 10% (Note 2)	Relay contact 1a (Note 2)
			VF-M10T-3	Incorporated		
Retroreflective		0.1 to 5m (Note 1)	**VF-RM5-3**	———		
			VF-RM5T-3	Incorporated		
With polarizing filters		0.2 to 3m (Note 1)	**VF-PRM3-3**	———		
Diffuse reflective		500mm	**VF-D500-3**	———		
			VF-D500T-3	Incorporated		
Long sensing range		1m	**VF-D1000-3**	———		
			VF-D1000T-3	Incorporated		

Notes: 1) The sensing range for 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 (**VF-PRM3**: 0.2m) away.
2) Non-contact output type [NPN universal transistor/PNP open-collector transistor (two outputs), supply voltage 12 to 24V DC] is available. (Four types: **VF2-M10**, **VF2-RM5**, **VF2-PRM3**, **VF2-D500**)

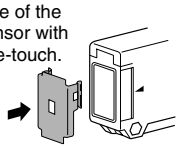


OPTIONS

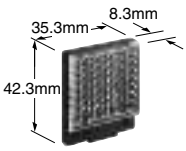
Designation	Model No.	Description	
Slit mask (For thru-beam type sensor only)	**OS-VF-3 × 6** (Slit size 3 × 6mm)	Slit on one side	• Sensing range: 2m • Min. sensing object: ϕ20mm
		Slit on both sides	• Sensing range: 1m • Min. sensing object: 3 × 6mm
	OS-VF-6 × 12 (Slit size 6 × 12mm)	Slit on one side	• Sensing range: 4m • Min. sensing object: ϕ20mm
		Slit on both sides	• Sensing range: 3m • Min. sensing object: 6 × 12mm
Reflector (For retroreflective type sensor only)	**RF-220**	• Sensing range: 0.1 to 4m (**VF-RM5□-3**) 0.2 to 2m (**VF-PRM3-3**) • Sensing object: ϕ35mm, or more, opaque object	
Reflector mounting bracket	**MS-RF22**	For **RF-220**	
	MS-RF23	For **RF-230**	
Sensor checker (Note)	**CHX-SC2**	It is useful for beam alignment of thru-beam type sensors. The optimum receiver position is given by indicators, as well as, an audio signal.	

Slit mask

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

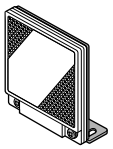


Reflector



Reflector mounting bracket

- **MS-RF23**



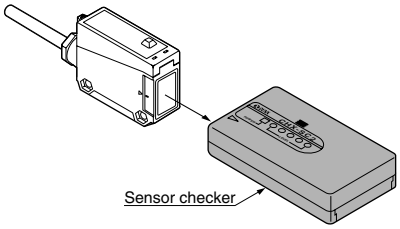
Two M4 (length 10mm) screws with washers are attached.

- **MS-RF22**



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

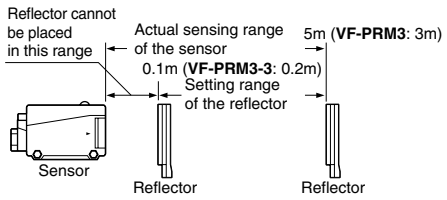
Sensor checker



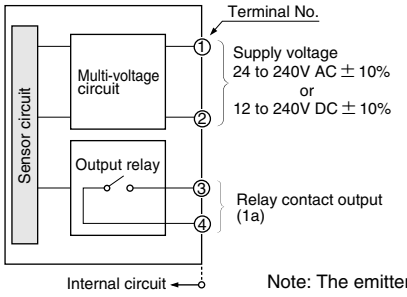
SPECIFICATIONS

Item \ Type	Thru-beam		Retroreflective			Diffuse reflective			
		With timer		With timer	With polarizing filters		With timer		With timer
Model No.	**VF-M10-3**	**VF-M10T-3**	**VF-RM5-3**	**VF-RM5T-3**	**VF-PRM3-3**	**VF-D500-3**	**VF-D500T-3**	**VF-D1000-3**	**VF-D1000T-3**
Sensing range	10m		0.1 to 5m (Note 1)		0.2 to 3m (Note 1)	500mm (Note 2)		1m (Note 2)	
Sensing object	ϕ20mm or more opaque object (Note 3)		ϕ50mm or more opaque or translucent object (Note 1)		ϕ50mm or more opaque, translucent or specular object (Note 1)	Opaque, translucent or transparent object			
Hysteresis	———					15% or less of operation distance			
Supply voltage	24 to 240V AC ± 10% or 12 to 240V DC ± 10%								
Power consumption	Emitter: 3VA or less (Average: 1.5W or less) Receiver: 3VA or less (Average: 1.5W or less)		3VA or less (Average: 1.5W or less)						
Output	Relay contact 1a • Switching capacity: 250V 1A AC (resistive load) 30V 2A DC (resistive load) • Electrical life: 100,000 or more operations (at rated AC load) 500,000 or more operations (at rated DC load) • Mechanical life: 100,000,000 or more operations								
Utilization category	DC-12 or DC-13								
Output operation	Switchable either Light-ON or Dark-ON								
Response time	20ms or less								
Operation indicator	Red LED (lights up when the output is ON)								
Sensitivity adjuster	———					Continuously variable adjuster			
Timer function (0.1 to 5 sec. variable)	———	Selectable from ON-delay, OFF-delay & ONE SHOT	———	Selectable from ON-delay, OFF-delay & ONE SHOT	———	———	Selectable from ON-delay, OFF-delay & ONE SHOT	———	Selectable from ON-delay, OFF-delay & ONE SHOT
Environmental resistance: Pollution degree	3 (Industrial environment)								
Environmental resistance: Protection	IP66 (IEC)								
Environmental resistance: Ambient temperature	− 10 to + 60°C (No dew condensation or icing allowed), Storage: − 20 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	1,500V AC for one min. between the power supply and output terminals, 1,000V AC for one min. between the relay contact terminals								
Environmental resistance: Insulation resistance	20MΩ, or more, with 500V DC megger between the power supply and output terminals, and between the relay contact terminals								
Environmental resistance: Vibration resistance	10 to 55Hz frequency, 1.5mm amplitude in X, Y and Z directions for two hours each								
Environmental resistance: Shock resistance	100m/s^2 acceleration (10G approx.) in X, Y and Z directions for three times each								
Emitting element	Infrared LED (modulated)				Red LED (modulated)	Infrared LED (modulated)			
Material	Enclosure: PBT, Lens: Acrylic (front surface of **VF-PRM3**: Triacetate)								
Connection method	Screw-on terminal connection								
Cable	Suitable for round cable ϕ6 to ϕ10mm (Conductor cross section area: 0.25 to 0.75mm^2)								
Cable length	Total length up to 100m is possible with 0.3mm^2, or more, cabtyre cable (thru-beam type: both emitter and receiver).								
Weight	Emitter: 75g approx. Receiver: 95g approx.		95g approx.						
Accessories	**MS-N70** (Sensor mounting bracket): 1 set, Gland and gland washer: 1 set, Gland packing (large/small 1 No. each): 1 set **VF-SKG** (Short-circuit metal joint): 1 No., **RF-230** (Reflector): 1 No. for the retroreflective type sensor Adjusting screwdriver: 1 No. for the diffuse reflective type sensor and for sensors with timer functions (suffixed with '**T**') (2 sets of sensor mounting bracket, gland, gland washer and gland packing are attached for the thru-beam type sensors.)								

Notes: 1) The sensing range and the sensing object for 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 (**VF-PRM3-3**: 0.2m) away.
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, even an object of 3 × 6mm can be



I/O CIRCUIT DIAGRAM

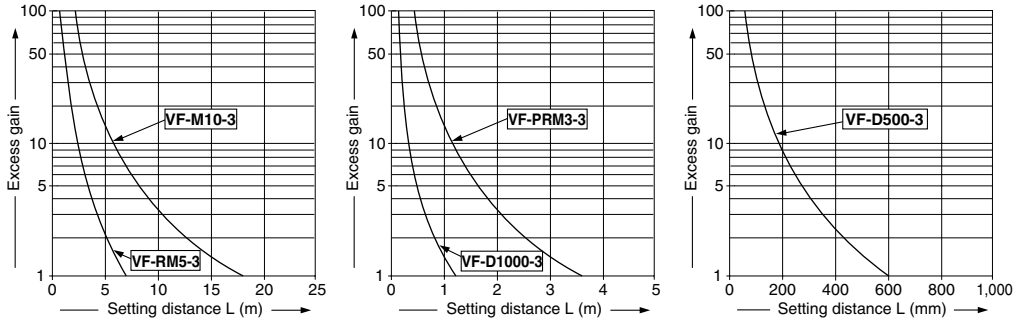


Note: The emitter of the thru-beam type sensor has only two terminals for power supply (① and ②).

SENSING CHARACTERISTICS (TYPICAL)

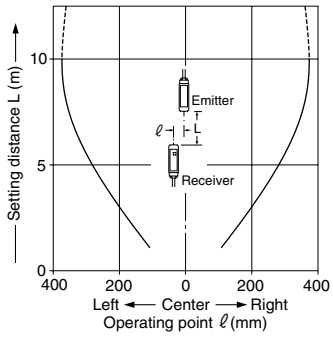
All models

Correlation between setting distance and excess gain

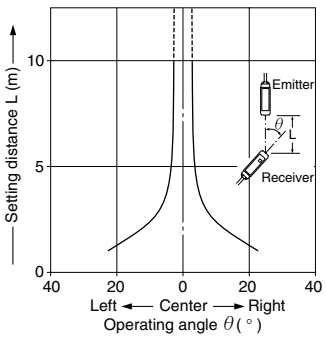


VF-M10-3 VF-M10T-3 Thru-beam type

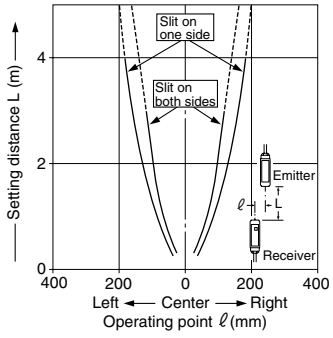
Parallel deviation



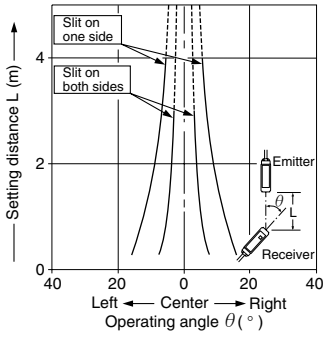
Angular deviation



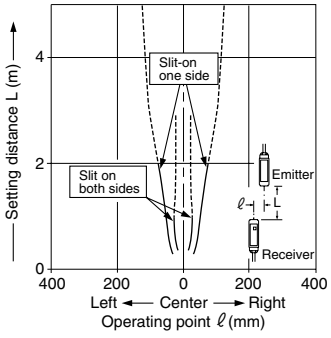
Parallel deviation with slit masks (OS-VF-6 × 12)



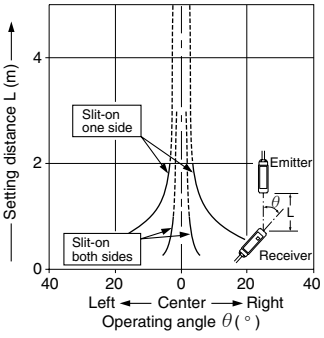
Angular deviation with slit masks (OS-VF-6 × 12)



Parallel deviation with slit masks (OS-VF-3 × 6)



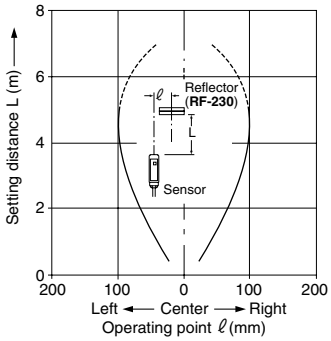
Angular deviation with slit masks (OS-VF-3 × 6)



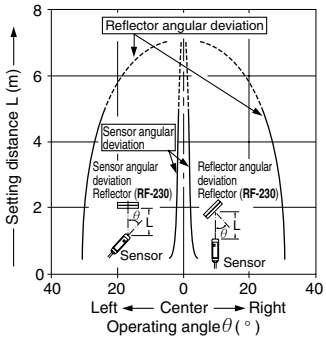
SENSING CHARACTERISTICS (TYPICAL)

VF-RM5-3 VF-RM5T-3 Retroreflective type

Parallel deviation

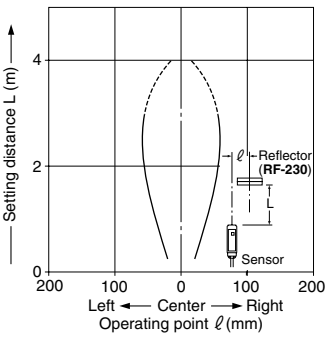


Angular deviation

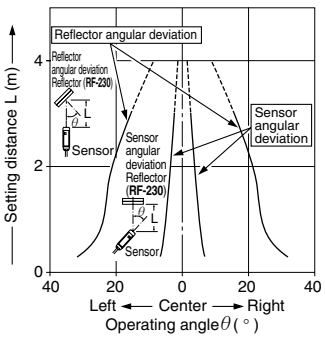


VF-PRM3-3 Retroreflective type

Parallel deviation

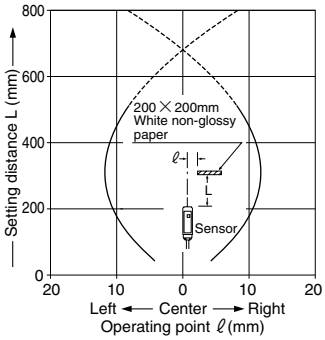


Angular deviation



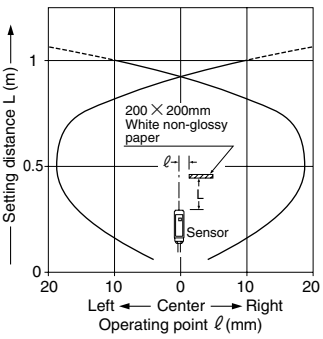
VF-D500-3 VF-D500T-3 Diffuse reflective type

Sensing field



VF-D1000-3 VF-D1000T-3 Diffuse reflective type

Sensing field

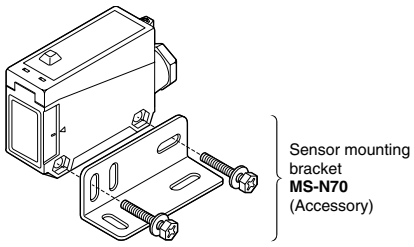


PRECAUTIONS FOR PROPER USE

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

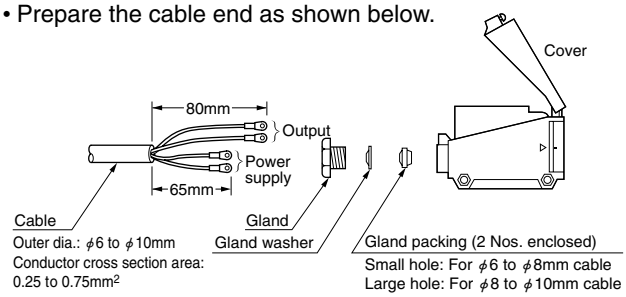
• The tightening torque should be 0.78N·m or less.



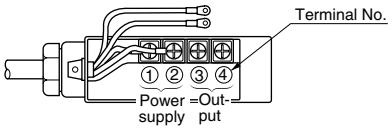
Wiring

• Cable must be circular and ϕ6 to ϕ10mm in diameter. If the cable has a diameter other than the specified or is distorted, waterproofness cannot be maintained.

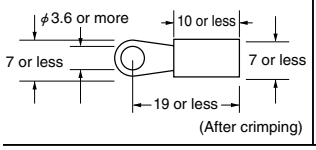
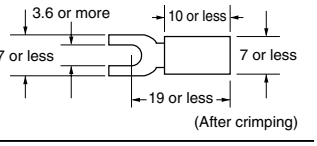
• Prepare the cable end as shown below.



Terminal position



Dimensions of the suitable crimp terminals (Unit: mm)

Round type	Y-shaped type
	

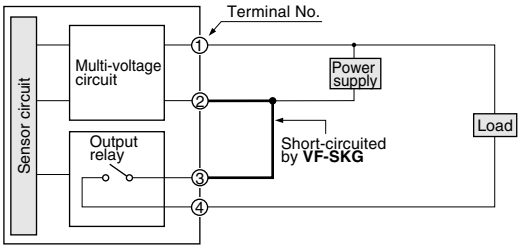
Note: Use crimp terminals with insulating sleeves.
Recommended crimp terminal: Nominal size 1.25 × 3.5

PRECAUTIONS FOR PROPER USE

Mounting the short-circuit metal joint (VF-SKG)

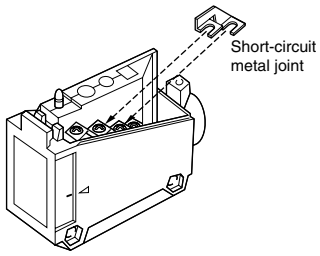
• If the sensor and the load are supplied power from the same power supply, the number of wires can be reduced by one by using the enclosed short-circuit metal joint.

Connection example



Mounting

• Loosen the screws on terminals ② and ③. Mount the short-circuit metal joint **VF-SKG** on the terminals as shown on the right.

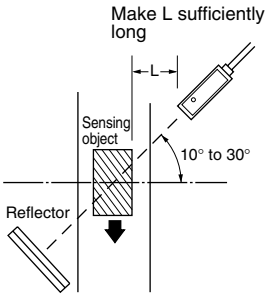


Retroreflective type sensor (VF-RM5 and VF-RM5T)

• 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.

※**VF-PRM3-3** does not need the above adjustment.



Retroreflective type sensor with polarizing filters (VF-PRM3-3)

• 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 (glossy) 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.

Timer functions and output operation

• The timer incorporated models have three types of convenient timer functions.

ON-delay (OND)

<Function>: Neglects short output signals.
<Application>: As only long signals are extracted, this function is useful for detecting if a line is clogged, or for sensing only objects taking a long time to travel.

OFF-delay (OFD)

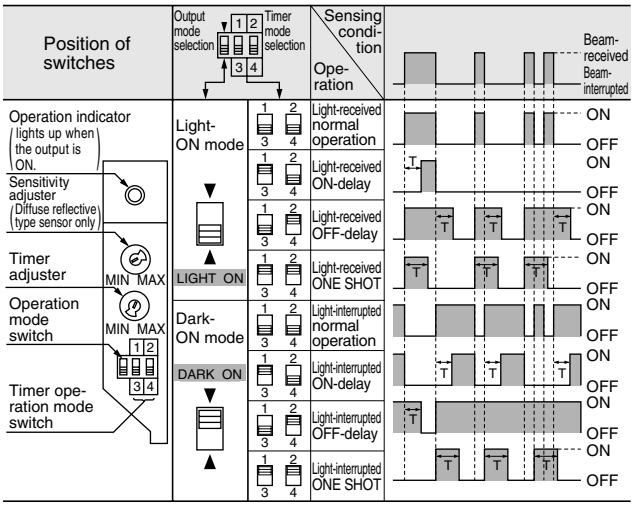
<Function>: Extends the output signal for a fixed period of time.
<Application>: This function is useful if the output signal is so short that the connected device cannot respond.

ONE SHOT (OSD)

<Function>: Outputs a fixed width signal upon sensing.
<Application>: This function is useful when the input specifications of the connected device require a signal of fixed width. Of course, it is also useful for extending a short width signal to a desired width.

Various other applications are possible.

Selection switch and timer operation



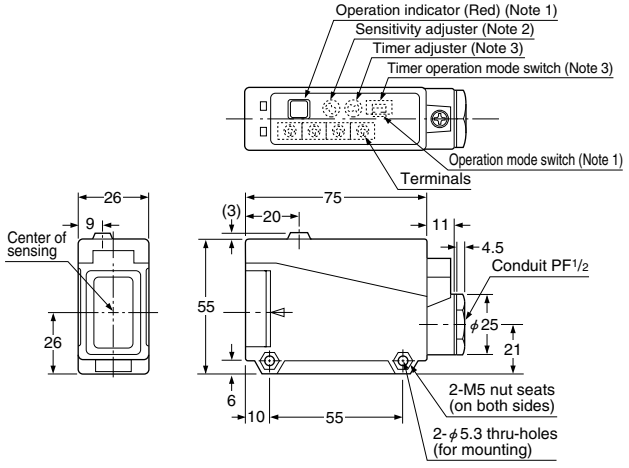
Timer period: T = 0.1 to 5 sec. (variable)

Others

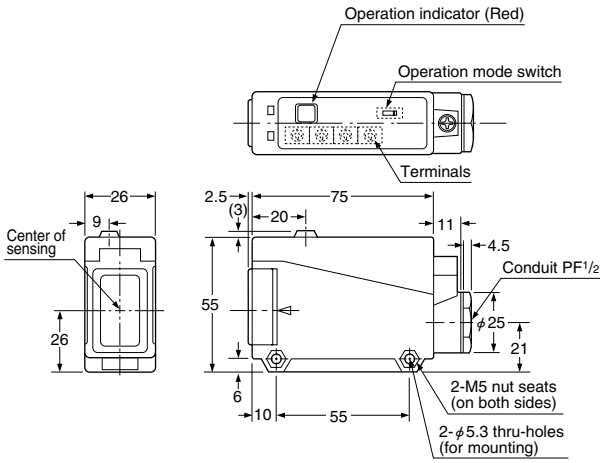
• Do not use during the initial transient time (200ms) after the power supply is switched on.

DIMENSIONS (Unit: mm)

VF-M10□ VF-RM5□ VF-D500□ VF-D1000□ Sensor

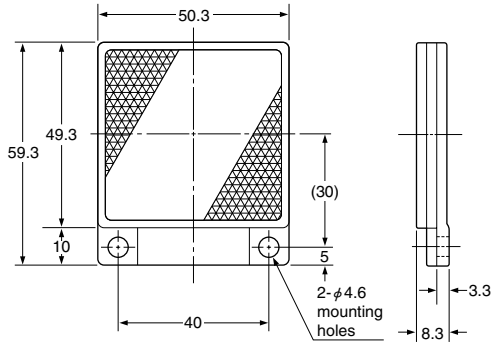


VF-PRM3-3 Sensor



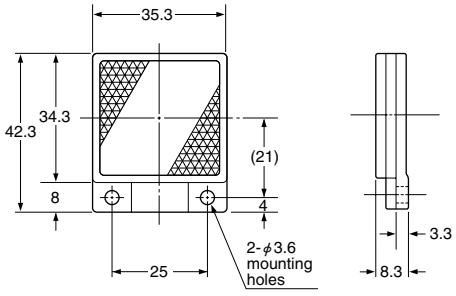
Notes: 1) All units, except emitters, are incorporated with operation indicators.
2) Only the diffuse reflective type sensor is incorporated with the sensitivity adjuster.
3) Only the timer incorporated type sensors have the timer adjuster.

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



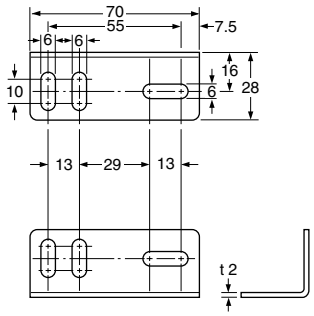
Material: Acrylic (Reflector)
ABS (Base)

RF-220 Reflector (Optional)



Material: Acrylic (Reflector)
ABS (Base)

MS-N70 Sensor mounting bracket (Accessory)

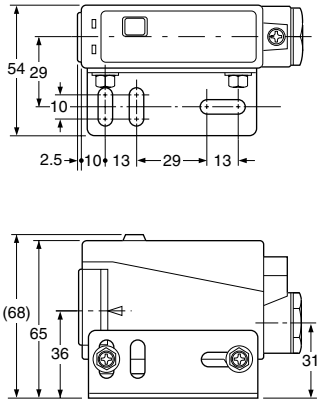


Material: Cold rolled carbon steel (SPCC)
(Uni-chrome plated)

Two M5 cross-recessed hexagon bolts (with spring washers and plain washers) and two M5 nuts are attached.

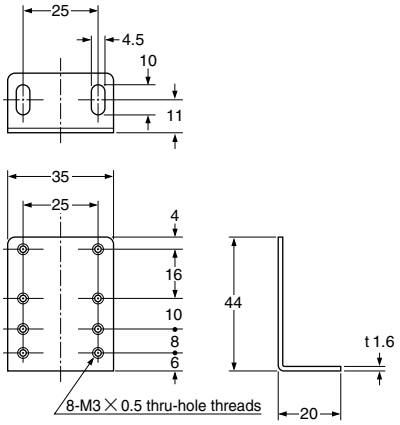
Assembly dimensions

Mounting drawing with **VF-PRM3**



DIMENSIONS (Unit: mm)

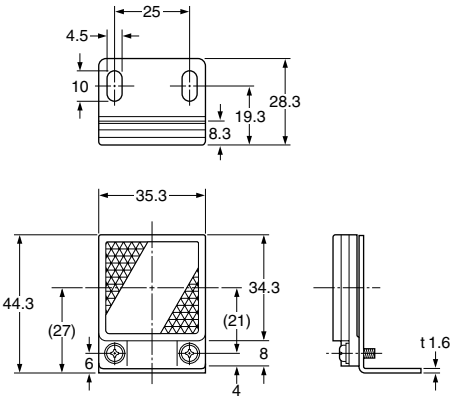
MS-RF22 Reflector mounting bracket for **RF-220** (Optional)



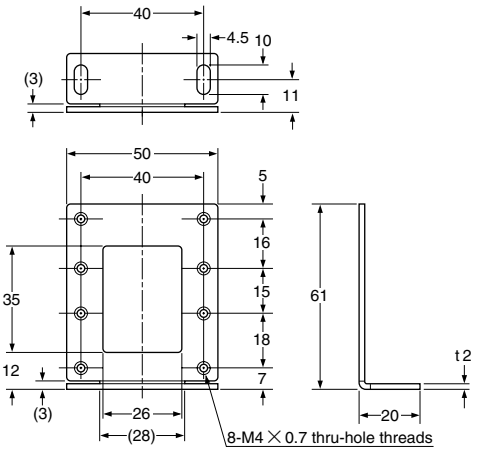
Matelial: Cold rolled carbon steel (SPCC)
(Uni-chrome plated)

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

Assembly dimensions



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



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

Two M3 (length 10mm) screws with washers are attached.

Assembly dimensions

