SUNX

INSTRUCTION MANUAL

Photoelectric Sensor Terminal Connection Type

Multi-voltage Relay Contact Output | DC-voltage Non-contact Output

VF Series **VF2** Series

Thank you very much for using SUNX products. Please read this Instruction Manual carefully and thoroughly for the correct and optimum use of this product. Kindly keep this manual in a convenient place for quick reference.

WARNING

- **Never use this product as a sensing device for personnel protection.**
- **In case of using sensing devices for personnel protection, use products which meet laws and standards, such as OSHA, ANSI or IEC etc., for personnel protection applicable in each region or country.**

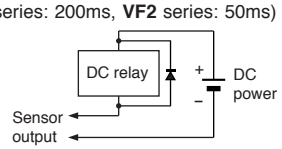
1 SPECIFICATIONS

Type / Item / Model No. (Note 1)	Multi-voltage relay contact output					DC-voltage non-contact output			
	Thru-beam	Retroreflective	Retroreflective (With polarizing filters (Note 2))	Diffuse reflective		Thru-beam	Retroreflective	Retroreflective (With polarizing filters (Note 2))	Diffuse reflective
	VF-M10 (T)	VF-RM5 (T)	VF-PRM3	VF-D500 (T)	VF-D1000 (T)	VF2-M10	VF2-RM5	VF2-PRM3	VF2-D500
Sensing range	10m	0.1 to 5m (Note 3)	0.2 to 3m (Note 3)	500mm (Note 4)	1m (Note 4)	10m	0.1 to 5m (Note 3)	0.2 to 3m (Note 3)	500mm (Note 4)
Hysteresis	—			15% or less of operation distance		—			10% or less of operation distance
Supply voltage	24 to 240V AC $^{+10}_{-15}$% or 12 to 240V DC $^{+10}_{-15}$%					12 to 24V DC±10%			
Power / Current 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)				Emitter: 25mA or less Receiver: 25mA or less	45mA or less		
Output	Relay contact 1a ・Switching capacity: 250V 1A AC (resistive load) 30V 2A DC (resistive load) ・Electrical life: 500,000 or more switching operations (switching frequency 3,600 operations/hour) ・Mechanical life: 100,000,000 or more switching operations (switching frequency 36,000 operations/hour)					NPN transistor universal ・Maximum sink current: 100mA ・Applied voltage: 30V DC or less PNP open-collector transistor ・Maximum source current: 100mA			
Response time	20ms or less					3ms or less			
Protection	IP66 (IEC)								
Ambient temperature	-10 to +60°C (No dew condensation or icing allowed), Storage: -20 to +70°C								
Ambient humidity	35 to 85% RH, Storage: 35 to 85% RH								
Material	Enclosure: PBT, Lens: Acrylic (front surface of retroreflective type sensor with polarizing filters: Triacetate)								
Weight	Emitter: 75g approx. Receiver: 95g approx.	95g approx.				Emitter: 70g approx. Receiver: 85g approx.	85g 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 pc. for the **VF** series **RF-230** (Reflector): 1 pc. for the retroreflective type sensor Adjusting screwdriver: 1 pc. for the diffuse reflective type sensor and for sensors with timer functions 2 sets of sensor mounting bracket, gland, gland washer and gland packing are attached for the thru-beam type sensors.								

Notes: 1) The model No. with suffix '**T**' stands for the timer incorporated models.
The model No. with suffix '**P**' shown on the label affixed to the thru-beam type sensor is the emitter, '**D**' shown on the label is the receiver.
(e.g.) Thru-beam type sensor emitter: **VF-M10P**, Thru-beam type sensor receiver: **VF-M10D**
2) The retroreflective type sensor with polarizing filters may not stably detect specular or glossy objects through transparent film since light is polarized by the transparent film. For details, refer to '**9 RETRO REFLECTIVE TYPE SENSOR WITH POLARIZING FILTERS**'.
3) The sensing range 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**, **VF2-PRM3**: 0.2m) away.
4) The sensing range of the diffuse reflective type sensor is specified for white non-glossy paper (200×200mm) as the object.

2 CAUTIONS

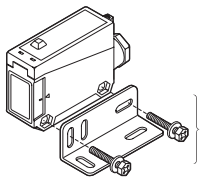
- This product has been developed / produced for inductrial use.
- Make sure that the power supply is off while wiring.
- Take care that wrong wiring will damage the sensor.
- Verify that the supply voltage variation is within the rating.
- If power is supplied from a commercial switching regulator, ensure that the frame ground (F.G.) terminal of the power supply is connected to an actual ground.
- In case noise generating equipment (switching regulator, inverter motor, etc.) is used in the vicinity of this product, connect the frame ground (F.G.) terminal of the equipment to an actual ground.
- Do not run the wires together with high-voltage lines or power lines or put them in the same raceway. This can cause malfunction due to induction.
- Take care that the sensor is not directly exposed to fluorescent lamp from a rapid-starter lamp, a high frequency lighting device or sunlight etc., as it may affect the sensing performance.
- Do not use during the initial transient time (**VF** series: 200ms, **VF2** series: 50ms) after the power supply is switched on.
- The cable length should be up to 100m.
- When connecting the induction load for a load, such as DC relay, the measure against surge should be done, as shown in the figure right.



- This sensor is suitable for indoor use only.
- Do not use this sensor in places having excessive vapor, dust, etc., or where it may come in direct contact with water, or corrosive gas.
- Take care that the sensor does not come in direct contact with water, oil, grease, organic solvents, such as, thinner etc., or strong acid, and alkaline.
- The following items are required, as conditions for use of **VF** series in order to conform to CE.
  - ・The output applied voltage should be the same as the supply voltage of the sensor.
  - ・Be sure to add a short-circuit protection (a fuse or a breaker) to the power supply input and the output.

3 MOUNTING

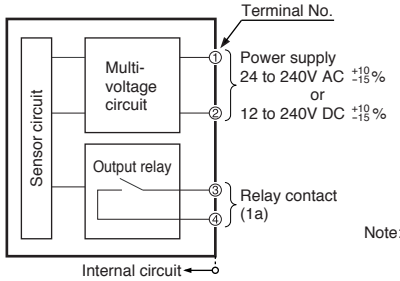
- The tightening torque should be 0.78N·m or less.



Sensor mounting bracket **MS-N70** (Accessory)

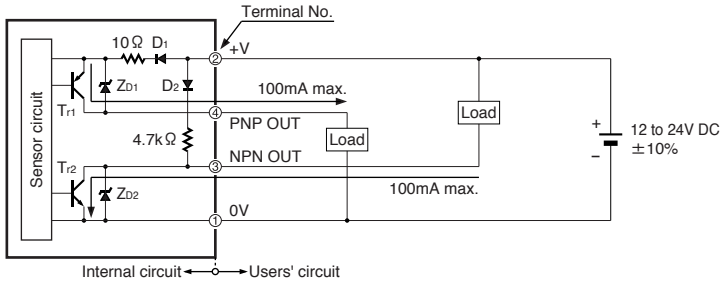
4 I/O CIRCUIT DIAGRAMS

- **Multi-voltage relay contact output / VF series**



Note: The emitter of the thru-beam type sensor has only two terminals for power supply (terminal No. ① and ②).

- **DC-voltage non-contact output / VF2 series**

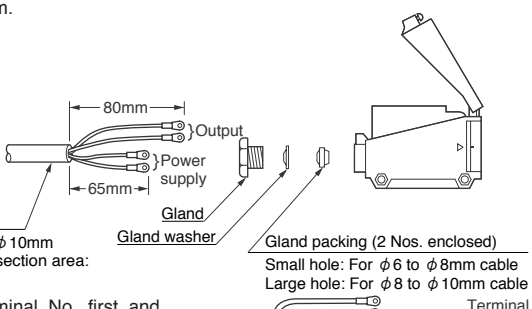


Note: The emitter of the thru-beam type sensor has only two terminals for power supply (terminal No. ① and ②).

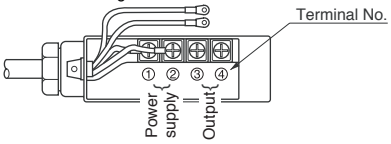
Symbols... D_1: Reverse supply polarity protection diode
D_2: Reverse current protection diode
Z_{D1}, Z_{D2}: Surge absorption zener diode
T_{r1}: PNP output transistor
T_{r2}: NPN output transistor

5 WIRING

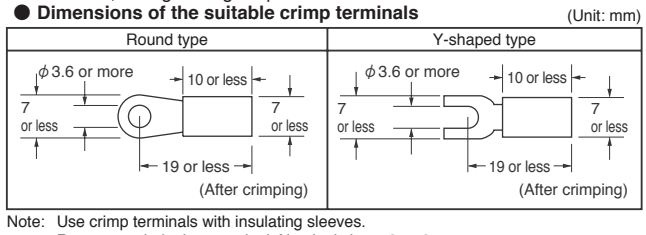
- Prepare the cable end as shown below.
To maintain a watertight performance, the cable should have an outer diameter between ϕ6 to ϕ10mm with a smooth covering material that allows the gland to be securely tightened, however, the tightening torque of the screw should be of 0.96 to 1.44N·m.



- Check the terminal No. first and connect from the terminal No. ①. However, the tightening torque of the screw should be of 0.48N·m or less.
- Fix the cover with the mounting screw.
However, the tightening torque of the screw should be of 0.48 to 0.76N·m.



- **Dimensions of the suitable crimp terminals** (Unit: mm)

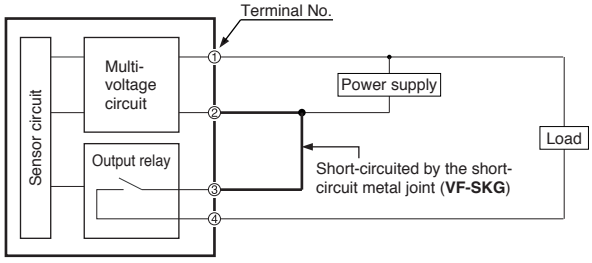


Note: Use crimp terminals with insulating sleeves.
Recommended crimp terminal: Nominal size 1.25×3.5

6 MOUNTING THE SHORT-CIRCUIT METAL JOINT (VF-SKG) (Accessory for VF series)

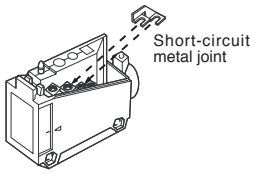
● If the sensor and the load are supplied power from the same power supply, the number of wires can be reduced by one by using the enclosed short-circuit metal joint.

Connection example



How to mount

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

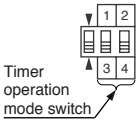


7 ADJUSTMENTS

● Adjust the sensitivity, observing the operation indicator (red). However, since the condition for lighting up of the indicator depends on the combination of the sensing condition and the selected operation Light-ON / Dark-ON, verify if from the table on the light.

Sensing condition	Operation mode switch	
	Light-ON (LIGHT ON) ▼	Dark-ON (DARK ON) ▲
Light	☀ Lights up	○ Lights off
Dark	○ Lights off	☀ Lights up

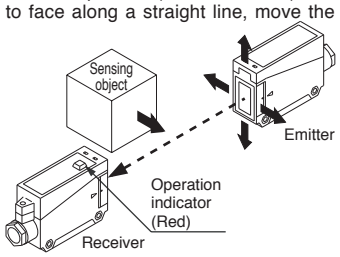
● For the sensor with timer, be sure to adjust in the state where the timer function is not operating. As shown in the figure right, set the timer operation mode switches to '3' and '4' respectively.



● Beam alignment

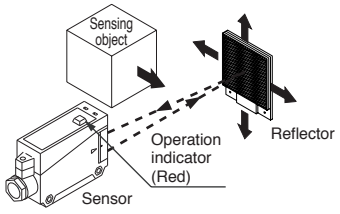
Thru-beam type sensor

① Set the operation mode switch to the Light-ON mode position (LIGHT ON side).
② Placing the emitter and the receiver face to face along a straight line, move the emitter in the up, down, left and right directions, in order to determine the range of the light received condition with the help of the operation indicator (red). Then, set the emitter at the center of this range.
③ Similarly, adjust for up, down, left and right angular movement of the emitter.
④ Further, perform the angular adjustment for the receiver also.



Retroreflective type sensor

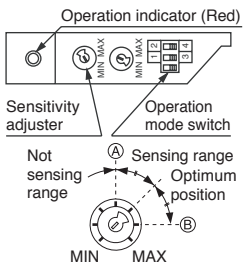
① Set the operation mode switch to the Light-ON mode position (LIGHT ON side).
② Placing the sensor and the reflector face to face along a straight line, move the reflector in the up, down, left and right directions, in order to determine the range of the light received condition with the help of the operation indicator (red). Then, set the reflector at the center of this range.
③ Similarly, adjust for up, down, left and right angular movement of the reflector.
④ Further, perform the angular adjustment for the sensor also.

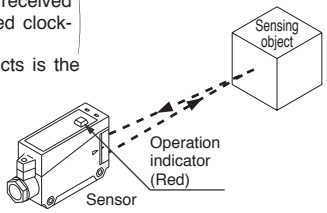


● Sensitivity adjustment

Diffuse reflective type sensor

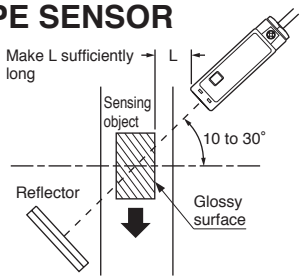
① Turn the sensitivity adjuster fully counterclockwise to the minimum sensing range position, MIN.
② Place an object at the required distance from the sensor, turn the sensitivity adjuster gradually clockwise, and find out point Ⓐ where the sensor changes to the light received condition.
③ Remove the object, turn the sensitivity adjuster further clockwise, and find out point Ⓑ where the sensor changes to the light received condition again with only the background.
When the sensor does not go to the light received condition even if the adjuster is fully turned clockwise, point Ⓑ is this extreme point.
④ The optimum position to stably detect objects is the center point between Ⓐ and Ⓑ.





8 RETROREFLECTIVE TYPE SENSOR

● 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.
* Retroreflective type sensor with polarizing filters do not need the above adjustment.



9 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, take the following measures given below.

<Example of sensing objects>

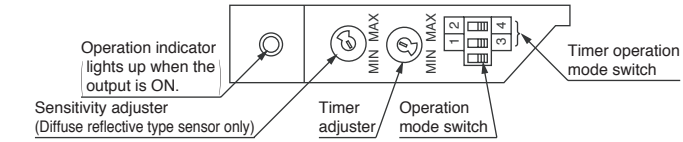
・ Can wrapped by clear film
・ Aluminum sheet covered by plastic film
・ Gold or silver color (glossy) label or wrapping paper

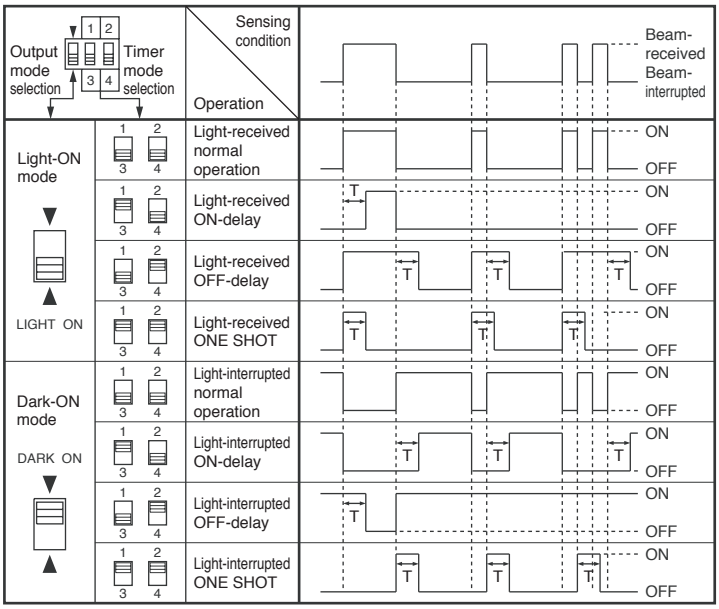
<Measures>

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

10 TIMER FUNCTION (Only timer incorporated models)

● The timer incorporated models have three types of convenient timer functions in addition to the normal operation.





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

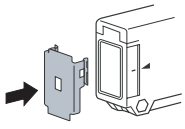
11 SLIT MASK (OPTIONAL) (Exclusively for thru-beam type sensor)

● With the slit mask (**OS-VF-□**), the sensor can detect a small object. However, the sensing range is reduced when the slit mask is mounted.

Slit mask applied	Assembly	Min. sensing object	Sensing range
Without slit mask	—	ϕ20mm	10m
OS-VF-6×12 (6×12mm)	Slit on one side	ϕ20mm	4m
	Slit on both sides	6×12mm	3m
OS-VF-3×6 (3×6mm)	Slit on one side	ϕ20mm	2m
	Slit on both sides	3×6mm	1m

How to mount

・ Check the directions of the slit mask and press it to the lens surface till you feel a click.



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