

SF1-N SERIES

20 mm Beam Pitch General Purpose Area Sensor

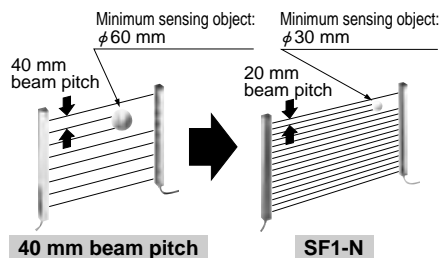


Wide sensing area
of 7 m × 1,260 mm
with 20 mm beam pitch

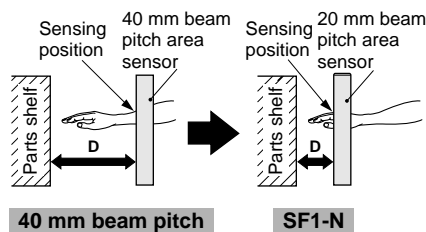
Refer to p.419~ for the light curtain.

20 mm beam pitch

- Compared to the conventional model, much smaller objects can be detected.



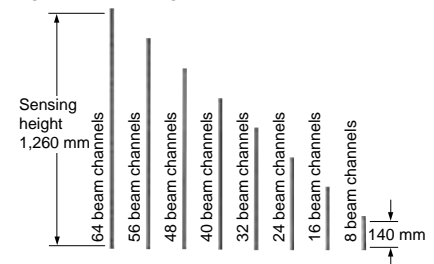
- Distance between parts shelf and sensor can be shortened (Enables miniaturization of equipment)



Smaller is the beam pitch, smaller can be the setting distance D.

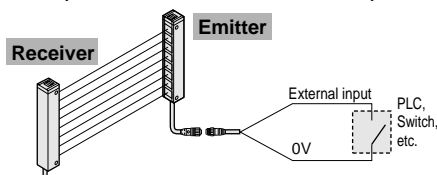
Wide variety

There are eight types of sensors having a sensing height ranging from 140 mm (8 beam channels) to 1,260 mm (64 beam channels). A spatter protection hood type sensor is also available that protects the sensing face against welding spatters.



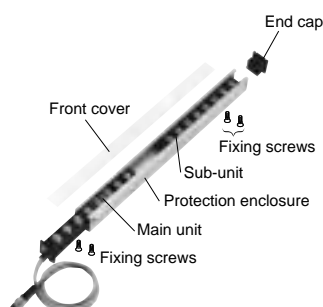
Incorporates useful functions

- Self-diagnosis function**
Both the emitter and the receiver automatically check the internal circuit every 5 ms. Should a trouble occur in the sensor, the output is forced to the OFF state. Further, the indicators show the type of error.
- Test input (emission halt) function**
The emission can be forcibly stopped by an external input to check if the output follows it. It is convenient for an operation check before start-up.



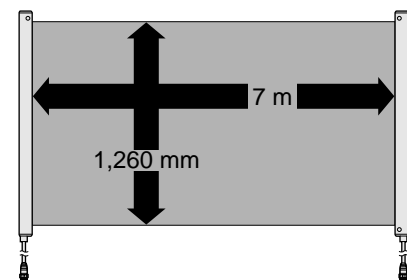
Modular construction

The SF1-N series has been the first to realize modular construction for 20 mm beam pitch area sensors. It allows easy change in the beam channel number.



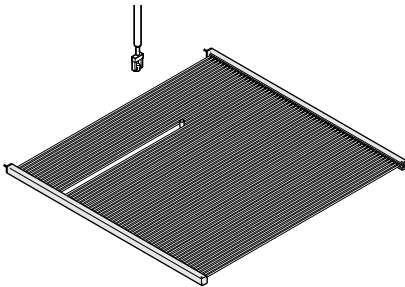
Long sensing range: 7 m

Its maximum sensing area is 7 m long and 1,260 mm high with a 20 mm beam pitch.

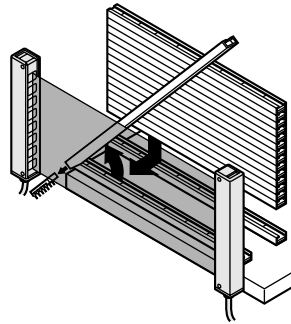


APPLICATIONS

Checking leftover workpiece



Detecting an object in handler



WARNING
Never use this product in any personnel safety application.

ORDER GUIDE

Sensors Mating cable is not supplied with the sensor. Please order it separately.

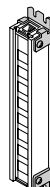
| Type | Appearance | Sensing range | Model No. | Number of beam channels | Sensing height (mm) | |
|-------------|------------------------------|---------------|-----------|-------------------------|---------------------|-------|
| Area sensor | | 7 m | SF1-N8 | 8 | 140 | |
| | | | SF1-N16 | 16 | 300 | |
| | | | SF1-N24 | 24 | 460 | |
| | | | SF1-N32 | 32 | 620 | |
| | | | SF1-N40 | 40 | 780 | |
| | | | SF1-N48 | 48 | 940 | |
| | | | SF1-N56 | 56 | 1,100 | |
| | | | SF1-N64 | 64 | 1,260 | |
| | With spatter protection hood | | 7 m | SF1-N8-H | 8 | 140 |
| | | | | SF1-N16-H | 16 | 300 |
| | | | | SF1-N24-H | 24 | 460 |
| | | | | SF1-N32-H | 32 | 620 |
| | | | | SF1-N40-H | 40 | 780 |
| | | | | SF1-N48-H | 48 | 940 |
| | | | | SF1-N56-H | 56 | 1,100 |
| | | | | SF1-N64-H | 64 | 1,260 |

Mating cables Mating cable is not supplied with the sensor. Please order it separately.

| Appearance | Model No. | Description | |
|------------|-----------|--|---|
| | SF1-CC3A | Length: 3 m Weight: 600 g approx. (two cables) | 0.5 mm ² 4-core cabtyre cable, with connector on one end, two cables per set Cable outer diameter: ϕ 7 mm Connector outer diameter: ϕ 14 mm max. Cable color: Gray (for emitter) Gray with black line (for receiver) |
| | SF1-CC7A | Length: 7 m Weight: 950 g approx. (two cables) | |

Accessory

- MS-SF1-1 (Sensor mounting bracket)



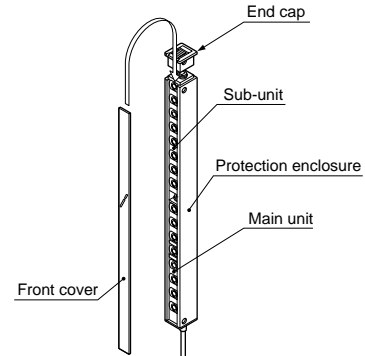
Four bracket set
(Four M6 (length 40 mm) truss head screws, four nuts)
and four spring washers are attached.)

SF1-N

ORDER GUIDE

Individual units and associated components can be purchased separately.

| Designation | Model No. | |
|-------------|----------------|----------------|
| | Emitter | Receiver |
| Main unit | SF1-NMP | SF1-NMD |
| Sub-unit | SF1-NSP | SF1-NSD |
| End cap | SF1-EP | SF1-ED |



| Applicable beam channels | | 8 beam channels | 16 beam channels | 24 beam channels | 32 beam channels | 40 beam channels | 48 beam channels | 56 beam channels | 64 beam channels |
|--------------------------|-----------|------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Designation | Model No. | MC-SF1-8 | MC-SF1-16 | MC-SF1-24 | MC-SF1-32 | MC-SF1-40 | MC-SF1-48 | MC-SF1-56 | MC-SF1-64 |
| Protection enclosure | Model No. | MC-SF1-8H | MC-SF1-16H | MC-SF1-24H | MC-SF1-32H | MC-SF1-40H | MC-SF1-48H | MC-SF1-56H | MC-SF1-64H |
| Front cover | Model No. | FC-SF1-8 | FC-SF1-16 | FC-SF1-24 | FC-SF1-32 | FC-SF1-40 | FC-SF1-48 | FC-SF1-56 | FC-SF1-64 |

Note: The model Nos. given above denote a single unit, not a pair of units.

OPTIONS

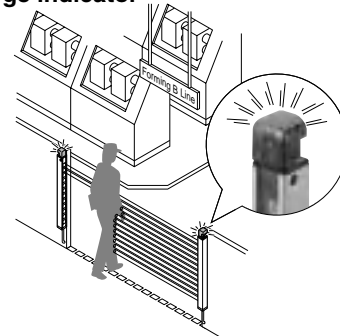
| Designation | Model No. | Description |
|--|-----------------|--|
| Large indicator for area sensor (Note) | SF-IND | <p>With the large indicators put on the sensors, the operation is easily observable from various directions.</p> <p>Specifications</p> <ul style="list-style-type: none"> Supply voltage: 12 to 24 V DC $\pm 10\%$ Ripple P-P 10% or less Current consumption: 30 mA or less Indicators: Three orange LEDs Either light up, blink, or light off as selected by the input wire Ambient temperature: -10 to $+55$ °C Cable: 0.2 mm² 3-core oil resistant cable, 2 m long Cable extension: Extension up to total 100 m is possible with 0.2 mm², or more, cable. Material: Polycarbonate (Cover), POM (Mounting base) <p>I/O circuit diagram</p> <p>• Input specifications Applied voltage: 24 V DC or less (between COM. and input) ON voltage: 9.6 V or more (between COM. and input) OFF voltage: 5 V or less (between COM. and input) Input impedance: 1 kΩ approx.</p> |
| Sensor mounting bracket | MS-SF1-P | It consists of one set of two brackets each for the emitter and the receiver. |

Note: Two SF-INDs are required if they are to be mounted on, both, the emitter and the receiver.

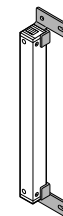
| Applicable beam channels | | 8 beam channels | 16 beam channels | 24 beam channels | 32 beam channels | 40 beam channels | 48 beam channels | 56 beam channels | 64 beam channels |
|--------------------------|-----------|-----------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| Designation | Model No. | OS-SF1-8 | OS-SF1-16 | OS-SF1-24 | OS-SF1-32 | OS-SF1-40 | OS-SF1-48 | OS-SF1-56 | OS-SF1-64 |

Note: The model Nos. given above denote a single unit, not a pair of units.

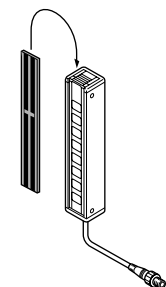
Large indicator



Sensor mounting bracket



Slit mask



The slit mask restrains the amount of beam emitted or received and hence reduces the interference between neighboring sensors.

It is also used in cases when the beam intensity is too strong penetrating through the sensing object. Replace the original front cover with the slit mask. However, the sensing range reduces when the slit mask is used.

Sensing range

- Slit on emitter side: 3 m
- Slit on receiver side: 2.6 m
- Slit on both sides: 1.2 m

SPECIFICATIONS

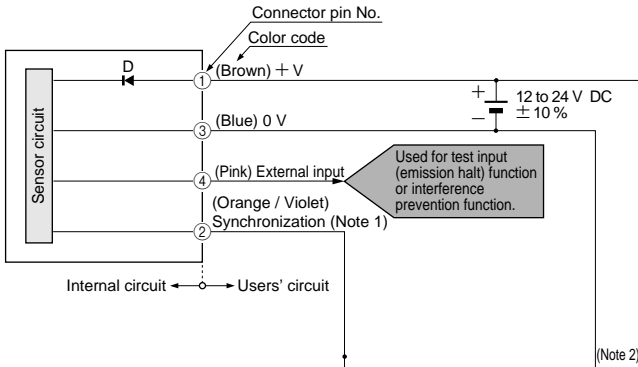
| Number of beam channels | | 8 | 16 | 24 | 32 | 40 | 48 | 56 | 64 |
|--|------------------------------|--|-----------------|---|-----------------|---|-----------------|---|-----------------|
| Model No. | | SF1-N8 | SF1-N16 | SF1-N24 | SF1-N32 | SF1-N40 | SF1-N48 | SF1-N56 | SF1-N64 |
| Item | With spatter protection hood | SF1-N8-H | SF1-N16-H | SF1-N24-H | SF1-N32-H | SF1-N40-H | SF1-N48-H | SF1-N56-H | SF1-N64-H |
| Sensing height | | 140 mm | 300 mm | 460 mm | 620 mm | 780 mm | 940 mm | 1,100 mm | 1,260 mm |
| Sensing range | | 7 m | | | | | | | |
| Beam pitch | | 20 mm | | | | | | | |
| Sensing object | | φ30 mm or more opaque object (φ35 mm or more opaque object if the setting distance is less than 0.5 m.) | | | | | | | |
| Supply voltage | | 12 to 24 V DC ± 10 % Ripple P-P 10 % or less | | | | | | | |
| Current consumption | | Emitter: 55 mA or less Receiver: 60 mA or less | | Emitter: 70 mA or less Receiver: 75 mA or less | | Emitter: 85 mA or less Receiver: 90 mA or less | | Emitter: 100 mA or less Receiver: 105 mA or less | |
| Output | | NPN open-collector transistor • Maximum sink current: 100 mA • Applied voltage: 30 V DC or less (between output and 0 V) • Residual voltage: 1.6 V or less (at 100 mA sink current) | | | | | | | |
| Output operation | | ON when all beam channels are received / OFF when one or more beam channels are interrupted (OFF, also, when the sensor fails. Refer to 'Operation matrix' on p.1110.) | | | | | | | |
| Short-circuit protection | | Incorporated | | | | | | | |
| Response time | | 12 ms or less | | | | | | | |
| Indicators | Emitter | Emitting indicator: Green LED (lights up under normal emission, blinks under emitting circuit failure or on cable break between the synchronization and the external input terminals when interference prevention function is used (only the emitting indicator of the Sensor B blinks), and lights off under no emission) | | | | | | | |
| | Receiver | Operation indicator: Red LED (lights up when one or more beam channels are interrupted, and blinks when extraneous light is received) Stable incident beam indicator: Green LED (lights up when all beam channels are received stably) Unstable incident beam indicator: Yellow LED (lights up when one or more beam channels are received unstably) ※ The three color indicators blink in rotation when the receiving circuit fails, and blink simultaneously when the output circuit fails. The operation indicator and the unstable incident beam indicator blink alternately when the synchronization wire breaks or the emitting circuit fails. | | | | | | | |
| Test input (emission halt) function | | Incorporated | | | | | | | |
| Interference prevention function | | Incorporated (Two units of sensors can be mounted close together.) | | | | | | | |
| Environmental resistance | Protection | IP65 (IEC) | | | | | | | |
| | Ambient temperature | - 10 to + 55 °C (No dew condensation or icing allowed), Storage: - 10 to + 60 °C | | | | | | | |
| | Ambient humidity | 35 to 85 % RH, Storage: 35 to 85 % RH | | | | | | | |
| | Ambient illuminance | Sunlight: 20,000 lx at the light-receiving face, Incandescent light: 3,500 lx at the light-receiving face | | | | | | | |
| | Noise immunity | Power line: 240 Vp, 10ms cycle, and 0.5 μs pulse width Radiation: 300 Vp, 10ms cycle, and 0.5 μs pulse width (with noise simulator) | | | | | | | |
| | Voltage withstandability | 1,000 V AC for one min. between all supply terminals connected together and enclosure | | | | | | | |
| | Insulation resistance | 20 MΩ, or more, with 500 V DC megger between all supply terminals connected together and enclosure | | | | | | | |
| | Shock resistance | 10 to 55 Hz frequency, 1.5 mm amplitude in X, Y and Z directions for two hours each 100 m/s ² acceleration (10 G approx.) in X, Y and Z directions for three times each | | | | | | | |
| Emitting element | | Infrared LED (modulated) | | | | | | | |
| Material | | Protection enclosure: Aluminum, Unit case: ABS, Front cover: Acrylic, Lens: Acrylic | | | | | | | |
| Cable | | 0.5 mm ² 4-core cabtyre cable, 0.5 m long with a round connector at the end ※ Use together with the optional mating cable | | | | | | | |
| Cable extension | | Extension up to total 20 m is possible, for both emitter and receiver, with 0.5 mm ² , or more, cable. | | | | | | | |
| Weight (Total of emitter and receiver) | | 500 g approx. | 840 g approx. | 1,170 g approx. | 1,500 g approx. | 1,830 g approx. | 2,170 g approx. | 2,500 g approx. | 2,830 g approx. |
| With spatter protection hood | | 630 g approx. | 1,080 g approx. | 1,530 g approx. | 1,990 g approx. | 2,440 g approx. | 2,900 g approx. | 3,350 g approx. | 3,800 g approx. |
| Accessory | | MS-SF1-1 (Sensor mounting bracket): 1 set for emitter and receiver | | | | | | | |

SF1-N

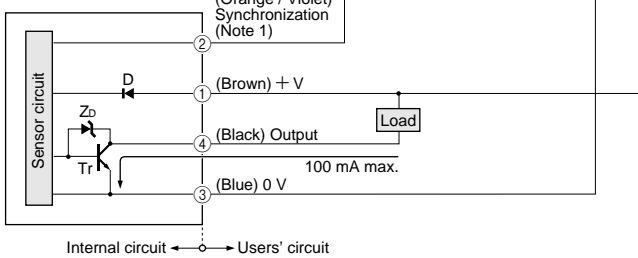
I/O CIRCUIT AND WIRING DIAGRAMS

I/O circuit diagram

Emitter



Receiver

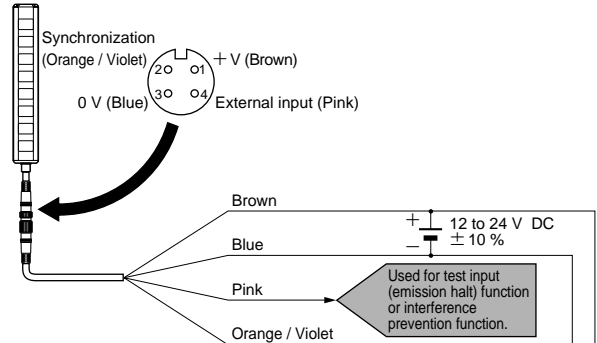


- Notes: 1) Do not connect the synchronization wire to the ES terminal (external input) of NPS sensor controller.
 2) To supply power to the emitter and the receiver from separate power supplies, be sure to connect both 0V (blue) wires in common and adjust both the power supplies to the same voltage.
 3) Unused wires must be insulated to ensure that they do not come into contact with wires already in use.

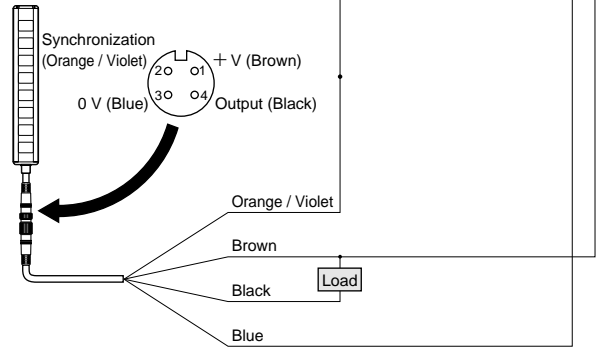
Symbols ... D: Reverse supply polarity protection diode
 Zd: Surge absorption zener diode
 Tr: NPN output transistor

Wiring diagram

Emitter



Receiver

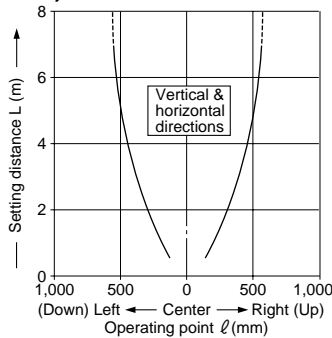
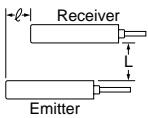


- Notes: 1) Do not connect the synchronization wire to the ES terminal (external input) of NPS sensor controller.
 2) To supply power to the emitter and the receiver from separate power supplies, be sure to connect both 0V (blue) wires in common and adjust both the power supplies to the same voltage.
 3) Unused wires must be insulated to ensure that they do not come into contact with wires already in use.

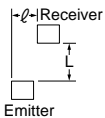
SENSING CHARACTERISTICS (TYPICAL)

Parallel deviation (All models)

Vertical direction

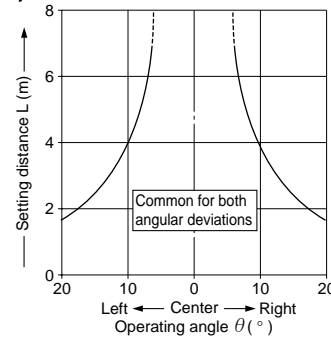
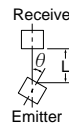


Horizontal direction

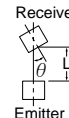


Angular deviation (All models)

Emitter angular deviation



Receiver angular deviation



PRECAUTIONS FOR PROPER USE

Refer to p.1135~ for general precautions.



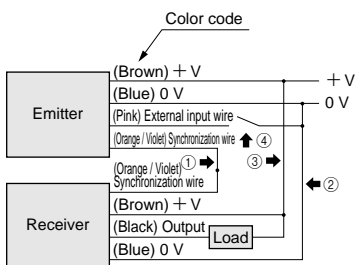
- Never use this product as a sensing device for personnel protection.
- For sensing devices to be used as safety devices for press machines or for personnel protection, use products which meet standards, such as OSHA, ANSI or IEC etc., for personnel protection applicable in each region or country.
- If this product is used as a sensing device for personnel protection, death or serious body injury could result.
- For a product which meets safety standards, use the following products.
Type4 : **SF4-AH** series (p.420~), **SF2-EH** series (p.486~)
Type2 : **SF2-A** series (p.446~), **SF2-N** series (p.464~)

Mounting

- Do not use the sensor without the front cover or the enclosure. IP protection cannot be maintained and a contact failure may occur between modular units.
- When mounting the sensor, the tightening torque should be 2 N·m or less.

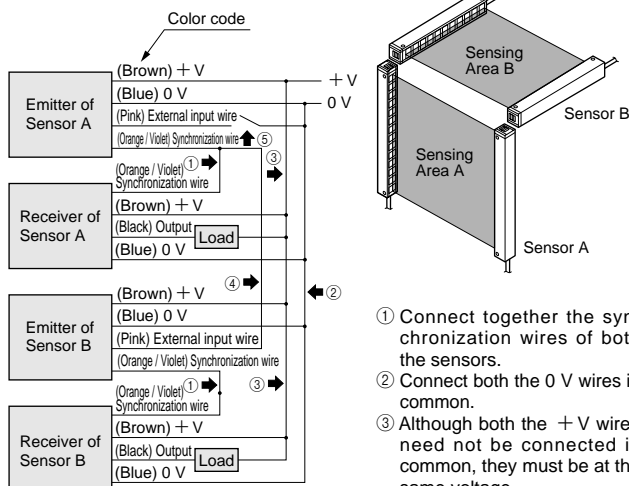
Wiring

When using one set of sensor



- ① Connect both the synchronization wires.
- ② Connect both the 0 V wires in common.
- ③ Although both the + V wires need not be connected in common, they must be at the same voltage.
- ④ To use the test input (emission halt) function, connect a switch between the external input wire and 0V. If this function is not used, insulate the external input wire.

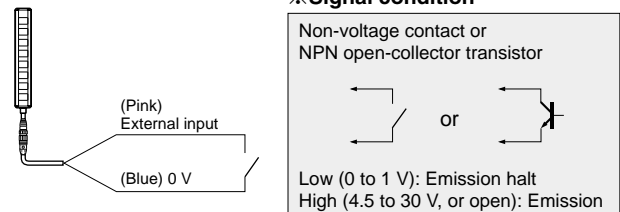
When using two sets of sensors (Using interference prevention function)



- ① Connect together the synchronization wires of both the sensors.
- ② Connect both the 0 V wires in common.
- ③ Although both the + V wires need not be connected in common, they must be at the same voltage.
- ④ Connect the external input wire of Sensor B to synchronization wire of Sensor A to prevent interference between Sensor A and Sensor B.
- ⑤ To use the test input (emission halt) function, connect a switch between the external input wire of Sensor A and 0 V. If this function is not used, insulate the external input wire.

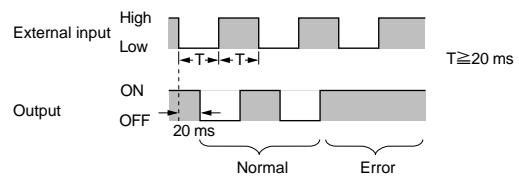
Test input (emission halt) function

- Making the external input wire (pink) Low stops the emission and turns off the emitting indicator. Because this function turns the output on and off without any object, it is useful for a start-up test.



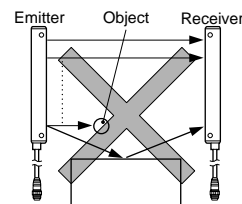
Note: When two sets are used with interference prevention, the external input wire that is not connected to the synchronization wire is short-circuited to 0V (refer to 'Wiring'). This stops the emission of both sensors.

- If the output follows the change (High and Low) of the external input, the sensor is normal. If it does not, the sensor is in error condition.



Others

- Do not use during the initial transient time (1.5 sec.) after the power supply is switched on.
- Take care that the sensor is not directly exposed to fluorescent light from a rapid-starter lamp or a high frequency lighting device, as it may affect the sensing performance.
- Install the sensor where it cannot be affected by a beam reflected from a machinery frame or a workpiece.



If the reflected beam from machine or workpiece is received, beam interruption is not achieved.

SF1-N

PRECAUTIONS FOR PROPER USE

Refer to p.1135~ for general precautions.

Operation matrix

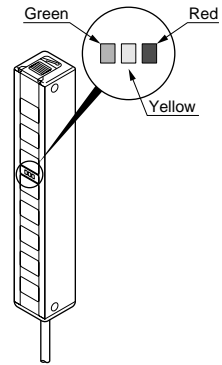
• The condition of the sensor can be known from the operation indicators of the sensor and the output operation.

- ☀: lights up ●: Blinks ●: lights off △: Uncertain (operation according to situation)
- ✕: Locked due to breakdown

| Item | | Unit | | Receiver (Note) | | | Outputs | | |
|--|--|--------------------------------|--|---|-------------------------------|--|---------|---|-------------------------------|
| | | Emitting indicator (Green LED) | Indicators | | | Stable incident beam indicator (Green LED) | | Unstable incident beam indicator (Yellow LED) | Operation indicator (Red LED) |
| | | | Stable incident beam indicator (Green LED) | Unstable incident beam indicator (Yellow LED) | Operation indicator (Red LED) | | | | |
| Normal operation | Beam received stably (All beams) | ☀ | ☀ | ● | ● | ● | ON | | |
| | Beam interrupted (One or more beams are interrupted) | ☀ | ● | ● | ● | ☀ | OFF | | |
| Error conditions | Emitting element failure | ☀ | ● | ● | ● | ☀ | OFF | | |
| | Emitting circuit failure | ● | ● | ● | ● | ☀ | | | |
| | Receiving element failure | ☀ | ● | ● | ● | ☀ | OFF | | |
| | Receiving circuit failure | ☀ | ● | ● | ● | ☀ | | | |
| | Output error | ☀ | ● | ● | ● | ● | ✕ | | |
| | Power wire broken | Receiver | ☀ | ● | ● | ● | ● | OFF | |
| | | Emitter | ● | ● | ● | ● | ● | | |
| | Synchronization wire broken | ☀ | ● | ● | ● | ☀ | OFF | | |
| | Synchronization / External input wire broken (Sensor B only when the interference prevention function is used) | ● | ● | ● | ● | ☀ | OFF | | |
| Insufficient beam intensity (Beam received unstably) | ☀ | ☀ | ● | ● | ● | ON | | | |

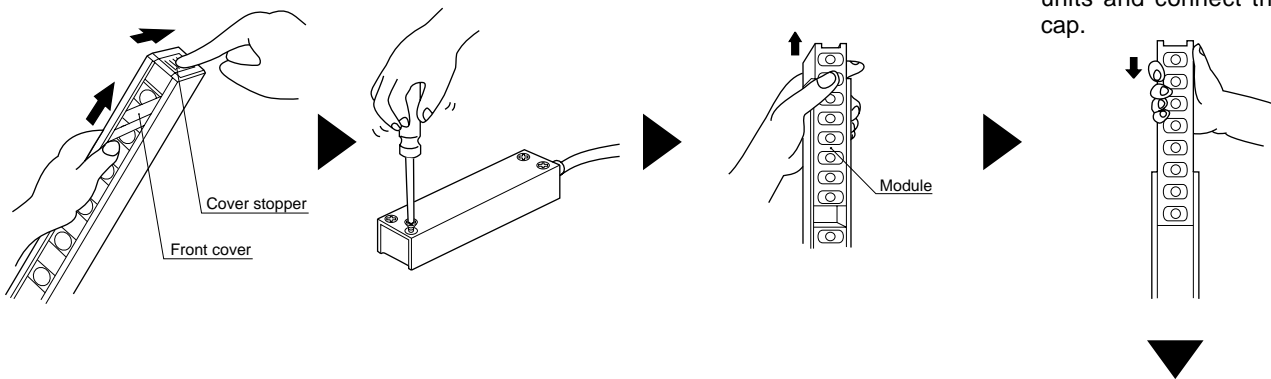
Note: The indicators on the receiver operate as follows depending on the incident light intensity.

| Incident light intensity (%) | Output operation | Indicator operation | | |
|------------------------------|----------------------------|--|---|---------------------------|
| | | Stable incident beam indicator (Green) | Unstable incident beam indicator (Yellow) | Operation indicator (Red) |
| High | Beam received operation | ☀ | ● | ● |
| 125% (ON) | Beam received operation | ☀ | ● | ● |
| 100% | Beam interrupted operation | ● | ● | ☀ |
| Low | Beam interrupted operation | ● | ● | ☀ |
| 0% (OFF) | Beam interrupted operation | ● | ● | ☀ |



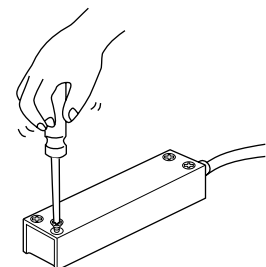
Changing the number of beam channels

- ① Slide the cover stopper in the direction of the arrow and pull the front cover upward.
- ② Remove the four fixing screws on the rear face.
- ③ Pull the modules upward one by one with your hands.
- ④ Arrange the new protection enclosure and front cover that matches the required sensing height. Insert the units and connect the end cap.



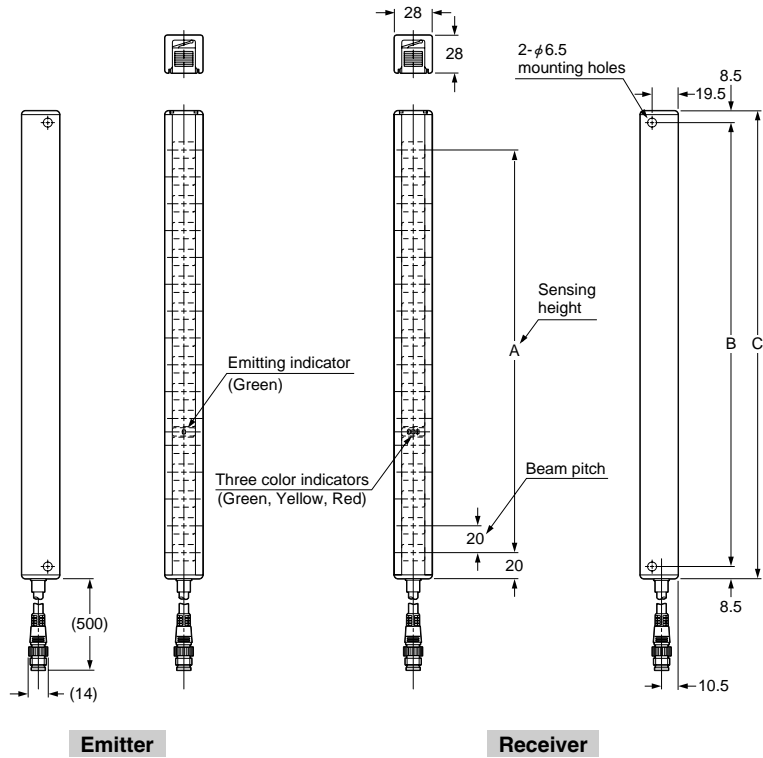
- Notes:
- 1) Be sure to turn the power supply off before linking units. If this is not done, the sensor may get damaged.
 - 2) Do not apply excess force to the units while linking.
 - 3) Be sure to put the end cap on the top.
 - 4) The fixing screws are attached to the protection enclosure.

- ⑤ Tighten the four fixing screws and insert the front cover by pulling the cover stopper back.



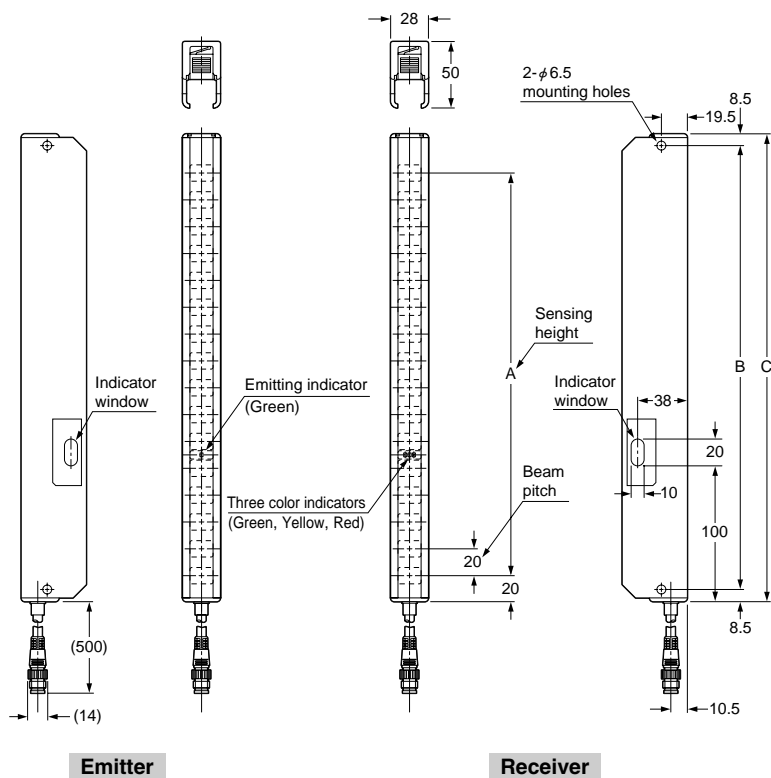
DIMENSIONS (Unit: mm in) The CAD data in the dimensions can be downloaded from the SUNX website: <http://www.sunx.co.jp/>

SF1-N□ Sensor



| Model No. | A | B | C |
|-----------|-------|-------|-------|
| SF1-N8 | 140 | 172 | 189 |
| SF1-N16 | 300 | 332 | 349 |
| SF1-N24 | 460 | 492 | 509 |
| SF1-N32 | 620 | 652 | 669 |
| SF1-N40 | 780 | 812 | 829 |
| SF1-N48 | 940 | 972 | 989 |
| SF1-N56 | 1,100 | 1,132 | 1,149 |
| SF1-N64 | 1,260 | 1,292 | 1,309 |

SF1-N□-H Sensor

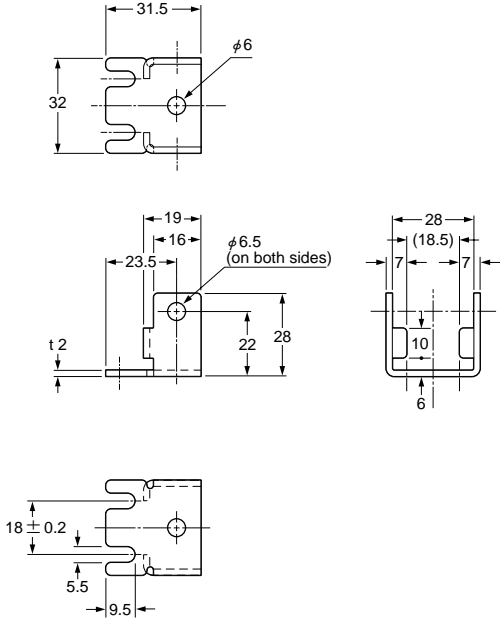


| Model No. | A | B | C |
|-----------|-------|-------|-------|
| SF1-N8-H | 140 | 172 | 189 |
| SF1-N16-H | 300 | 332 | 349 |
| SF1-N24-H | 460 | 492 | 509 |
| SF1-N32-H | 620 | 652 | 669 |
| SF1-N40-H | 780 | 812 | 829 |
| SF1-N48-H | 940 | 972 | 989 |
| SF1-N56-H | 1,100 | 1,132 | 1,149 |
| SF1-N64-H | 1,260 | 1,292 | 1,309 |

SF1-N

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

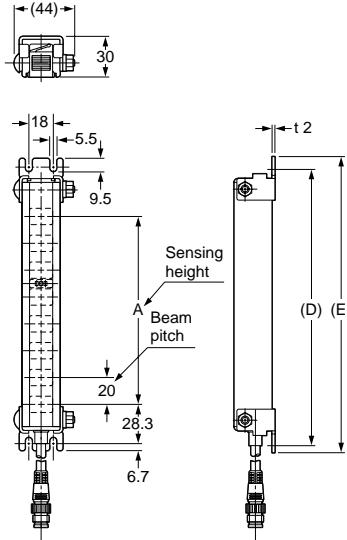
MS-SF1-1 Sensor mounting bracket (Accessory)



Assembly dimensions

Mounting drawing with SF1-N□.

The assembly for the spatter protection hood type (SF1-N□-H) is similar.

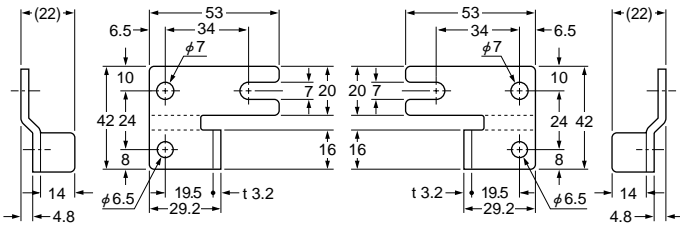


| Model No. | A | D | E |
|-------------|-------|-------|-------|
| SF1-N8(-H) | 140 | 205 | 219 |
| SF1-N16(-H) | 300 | 365 | 379 |
| SF1-N24(-H) | 460 | 525 | 539 |
| SF1-N32(-H) | 620 | 685 | 699 |
| SF1-N40(-H) | 780 | 845 | 859 |
| SF1-N48(-H) | 940 | 1,005 | 1,019 |
| SF1-N56(-H) | 1,100 | 1,165 | 1,179 |
| SF1-N64(-H) | 1,260 | 1,325 | 1,339 |

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

Four bracket set
(4 pcs. each of M6 (length 40 mm) truss head screws, nuts and spring washers are attached.)

MS-SF1-P Sensor mounting bracket (Optional)



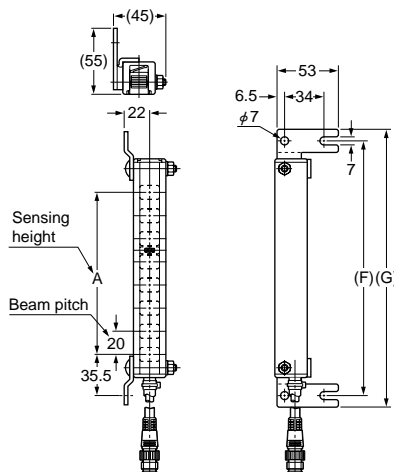
Material: Cold rolled carbon steel (SPCC)
(Uni-chrome plated)

Four bracket set

Assembly dimensions

Mounting drawing with SF1-N□.

The assembly for the spatter protection hood type (SF1-N□-H) is similar.



| Model No. | A | F | G |
|-------------|-------|-------|-------|
| SF1-N8(-H) | 140 | 220 | 240 |
| SF1-N16(-H) | 300 | 380 | 400 |
| SF1-N24(-H) | 460 | 540 | 560 |
| SF1-N32(-H) | 620 | 700 | 720 |
| SF1-N40(-H) | 780 | 860 | 880 |
| SF1-N48(-H) | 940 | 1,020 | 1,040 |
| SF1-N56(-H) | 1,100 | 1,180 | 1,200 |
| SF1-N64(-H) | 1,260 | 1,340 | 1,360 |

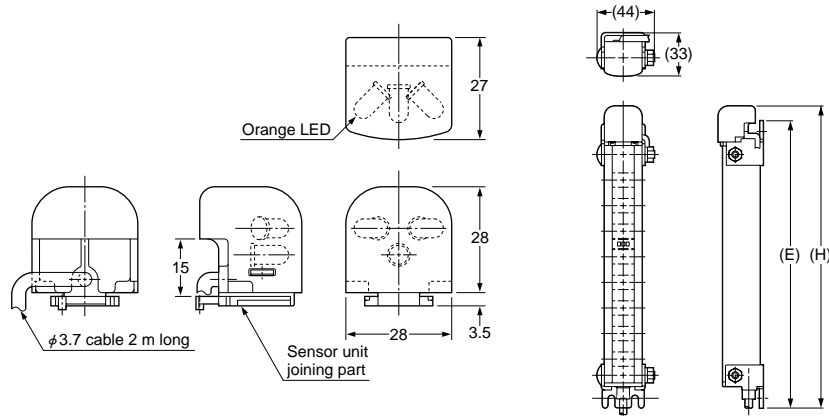
DIMENSIONS (Unit: mm in) The CAD data in the dimensions can be downloaded from the SUNX website: <http://www.sunx.co.jp/>

SF-IND

Large indicator for area sensor (Optional)

Assembly dimensions

Mounting drawing with sensor mounting bracket attached **SF1-N□**.
The assembly for the spatter protection hood type (**SF1-N□-H**) is similar.



| Model No. | E | H |
|--------------------|-------|-------|
| SF1-N8(-H) | 219 | 232 |
| SF1-N16(-H) | 379 | 392 |
| SF1-N24(-H) | 539 | 552 |
| SF1-N32(-H) | 699 | 712 |
| SF1-N40(-H) | 859 | 872 |
| SF1-N48(-H) | 1,019 | 1,032 |
| SF1-N56(-H) | 1,179 | 1,192 |
| SF1-N64(-H) | 1,339 | 1,352 |