



Ultra-slim

Type 4 PLe SIL3

NEW

LIGHT CURTAIN

SF4C_{SERIES}



Conforming to
OSHA / ANSI

JIS

Machine safeguarding without sacrificing productivity

Ultra-slim Light Curtain



Introducing a Type 4 light curtain that combines high end performance with an ultra-slim enclosure.

The SUNX **SF4C** series has been designed to offer a machine safeguarding solution without sacrificing productivity. Its size and shape allow for it to fit efficiently into small machinery while maximizing the usable working space for the equipment operator.

Slim **13 mm 0.512 in**

Min. sensing object: $\varnothing 25$ mm ($\varnothing 0.984$ in) [beam pitch 20 mm (0.787 in)]
Operating range: 0.1 to 3 m (0.328 to 9.843 ft)



Min.
160 mm
6.299 in

Max.
640 mm
25.197 in

- Zero dead zone mounting is possible
- Close vertical mounting of two units is possible

13.2 mm 0.520 in

SF4C (with mounting bracket)

43 mm 1.693 in

Previous model (with mounting bracket)

* Usable work space is 60 mm 2.362 in wider than previous model.

Industry first*

* Based on research conducted by SUNX as of March 2009.

Large built-in multi-purpose indicators

Large LED bars on each side of the light curtain provide a wide visibility indicator that can be customized for various applications by means of independent external inputs. The indicator can be used as an operation indicator, job indicator, etc.



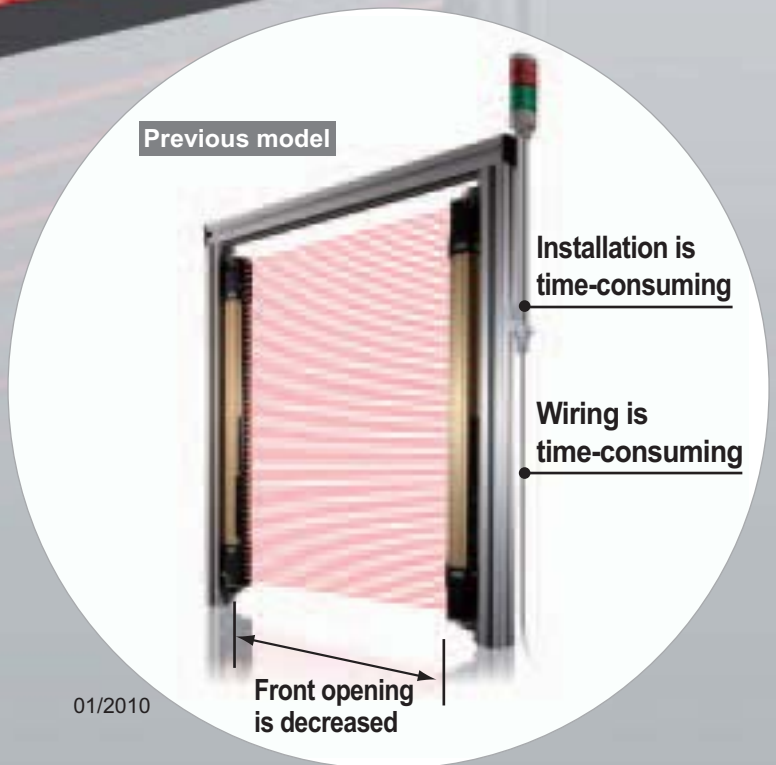
Smart equipment



Large multi-purpose indicator

88 mm
3.465 in

Center mounting on a $\square 30$ mm $\square 1.181$ in aluminum frame



Previous model

Installation is time-consuming

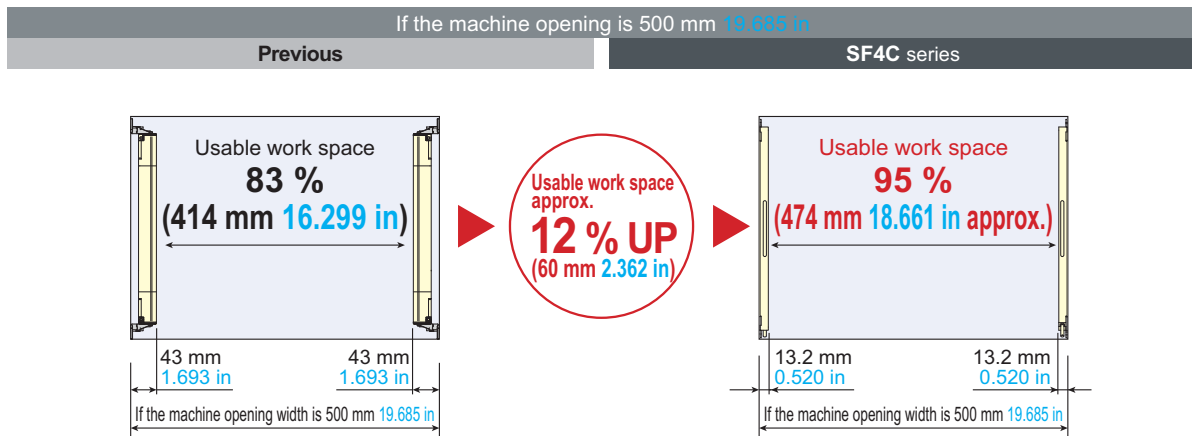
Wiring is time-consuming

Front opening is decreased

01/2010

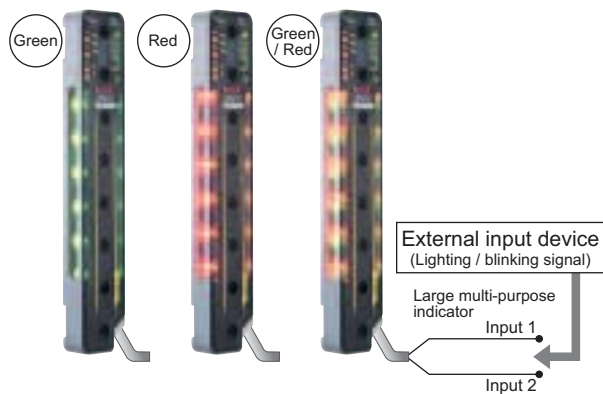
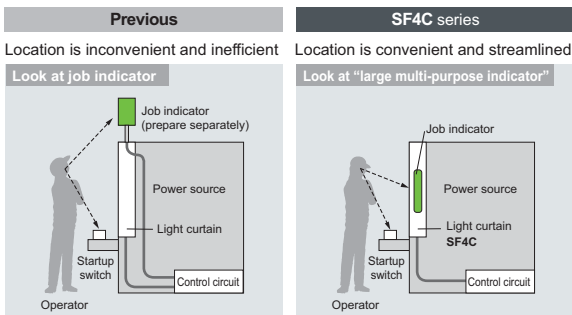
Slim size for efficient applications

Available work space is expanded from the previous model, and productivity is improved.



Can be used in a variety of applications for simplified equipment [Large multi-purpose indicator]

The bright LED indicators located in the center of both sides of each light curtain can be illuminated green or red by using external inputs. There is no need for setting up a separate indicator, so that equipment is consolidated.



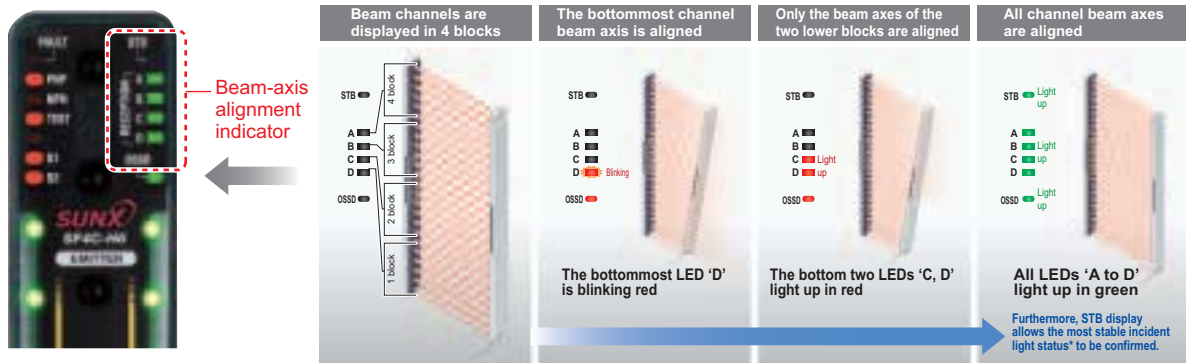
Applications

| Use as an operation indicator | Use as an error indicator | Use as a muting lamp |
|--|--|---|
| <p>Light curtain's presence and operation can be checked at a glance.</p> <ul style="list-style-type: none"> ● Solid green Equipment is operating ● Solid red Emergency stop | <p>Confirm errors at a glance. Also, details of the error condition can be checked on the digital display.</p> <ul style="list-style-type: none"> ● Blinking red Error present <p>Normal</p> <p>Error blinking</p> <p>Confirm detail of error quickly on the digital display.</p> | <p>There is no need to buy and install a separate muting lamp.</p> <p>* If a failure diagnosis of muting lamp is needed as by the result of risk assessment, use the handy-controller SFC-HC (available soon) to change the setting, and connect the muting lamp output wire (red) of this light curtain to an incandescent lamp separately.</p> |
| Use the handy-controller SFC-HC (available soon) to change lighting conditions. | Refer to p.6 for details | Refer to p.6 for details |

From designing and constructing equipment to exporting and maintenance

Beam-axis alignment indicators help to reduce startup time

The beam channels of the light curtain are displayed in four blocks so that incident light position is shown at a glance. When the beam channel at the bottommost channel (or topmost channel), which is used as a reference for beam-axis alignments, is correctly aligned, the LED blinks red. After this, each block lights red as the beam axes successively become aligned. When all channel beam axes are aligned, all LEDs light green. The display also has a stability indicator (STB) added so that setup can be carried out with greater stability.

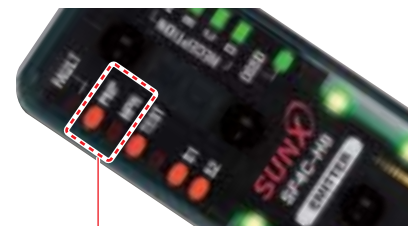
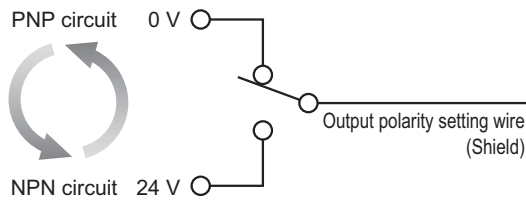


A single model supports both PNP and NPN polarities reducing model numbers

PNP transistor output and NPN transistor output are combined in a single model. Overseas equipment that uses PNP, replacement with NPN sensors, factories that are positively grounded, and transfer of equipment overseas are all situations where the control circuits for a single model are suitable for use worldwide.

■ Polarity can be changed easily by changing wiring

When the output polarity setting wire (shield) is connected to 0 V, PNP output is selected, and when it is connected to 24 V, it switches to NPN output.



PNP / NPN polarity indicator
Either PNP or NPN side lights depending on which is selected.

IP67 protection structure

An IP67 (IEC / JIS) rating is achieved with an ultra-slim size for protection from environmental factors.

Lightweight!

The SF4C series is made of resin that is approx. 45 % lighter than the conventional aluminum case type. Its lightweight body eases the burden on the mounting surface of the equipment and contributes to overall reduced weight during equipment transportation or overseas shipment.

*Except the cable part

Mutual interference is reduced without needing for interference prevention lines

The light curtain is equipped with the ELCA (Extraneous Light Check & Avoid) function, which has been proven to be strong against mutual interference. Because it automatically shifts the scan timing of the light curtain in order to avoid interference, it is not necessary to wire interference prevention lines between machineries.

A fast response time of 7 ms* for all models

A fast response time of 7 ms* is unified for all models regardless of the number of beam channels. This reduces the safety distance as well as the calculation work required for the safety distance among models with different beam channels.

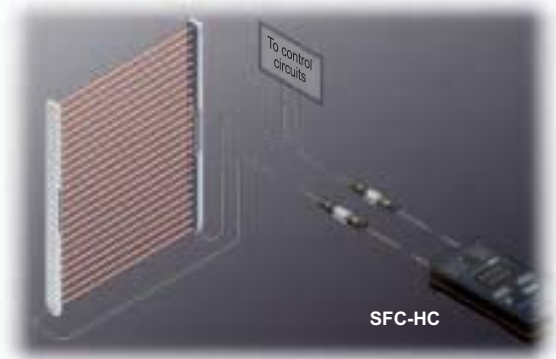
* When connecting safety sensors (light curtains, etc) to the safety input, the response time will be the total time of connected units.

Reducing the number of malfunctions caused by extraneous light

Double scanning method and retry processing are two new functions exclusive to SUNX, which are effective in eliminating the effects of momentary extraneous light from peripheral equipment. The reduction in operating errors caused by extraneous light reduces frequent stopping of machinery.

Handy-controller SFC-HC

(Available soon) that enables the user to select a variety of settings



Operation of the large multi-purpose indicators can be configured

| Mode | Operation of large multi-purpose indicators (factory setting: mode 0) | | | | | |
|------------|---|---------------------------------|-----------------------------------|-----------|-----------------|-------------------|
| | Large multi-purpose indicator 1 | Large multi-purpose indicator 2 | Control outputs (OSSD 1 / OSSD 2) | | Muting function | Override function |
| | High or Low | High or Low | ON | OFF | Enabled | Enabled |
| 0 | Solid red | Solid green | - | - | - | - |
| 1 | Blinking red | Blinking green | - | - | - | - |
| 2 | Solid red | Blinking green | - | - | - | - |
| 3 | Blinking red | Solid green | - | - | - | - |
| 4 (Note 1) | Solid red | Blinking red | - | - | - | - |
| 5 (Note 1) | Blinking green | Solid green | - | - | - | - |
| 6 (Note 1) | - | - | Solid green | Solid red | Blinking green | - |
| 7 (Note 1) | Solid red | Blinking red | - | - | Solid green | Blinking green |

Notes: 1) The blinking condition is prioritized over the solid condition.

2) During lockout, it is possible to blink red.

| Lockout blinking function | When lockout occurs |
|---------------------------|---------------------|
| Enabled | Blinking red |
| Disabled | ————— |

Fixed blanking function which allows selective beam channels to be activated improves productivity

The SF4C series is equipped with a fixed blanking function which allows specific beam channels to be selectively interrupted without causing the control output (OSSD) to output the OFF signal. This function is convenient for use with applications in which certain fixed obstacles tend to interrupt specific beam channels. Furthermore, this function provides greater safety as the control output (OSSD) will automatically output the OFF signal if the fixed obstacles are subsequently removed from the sensing area.



Auxiliary output has selectable output configuration

| Mode No. | Description |
|----------|--|
| 0 | Negative logic of the control outputs (OSSD 1, OSSD 2) (factory setting) |
| 1 | Positive logic of the control outputs (OSSD 1, OSSD 2) |
| 2 | For test input enabled: output OFF, For Disabled: output ON |
| 3 | For test input enabled: output ON, For Disabled: output OFF |
| 4 | For unstable incident beam: OFF (Note 1) |
| 5 | For unstable incident beam: ON (Note 1) |
| 6 | For muting: ON |
| 7 | For muting: OFF |
| 8 | For beam received: ON, For beam interrupted: OFF (Note 2) |
| 9 | For beam received: OFF, For beam interrupted: ON (Note 2) |
| A | For safety input enabled: ON, Disabled: OFF |
| B | For safety input enabled: OFF, Disabled: ON |
| C | For lockout: OFF |
| D | For lockout: ON |

Notes: 1) The output cannot be used while the fix blanking function, floating blanking function or the muting function is activated.

2) This device outputs the beam received / interrupted state under activating the auxiliary output switching function using the handy-controller irrespective of activating other functions, fixed blanking function, floating blanking function, and muting function.

Floating blanking function which allows non-specified beam channels to be deactivated improves productivity

1, 2 or 3 non-specified beam channels can be deactivated. If the number of beam channels that are interrupted is less than or equal to the set number of beam channels, then the control output (OSSD) will not output the OFF signal. This function is useful in the event when the positions of obstacles within the sensing area must be changed during object rearrangement, or when an object passes through the light curtain's sensing area.



Note: When the floating blanking function is used, the size of the min. sensing object is changed. Refer to "PRECAUTIONS FOR PROPER USE" (p.21) for details.

A variety of other functions can be selected

Setting monitoring function

This function allows the user to confirm the details of each light curtain setting.

Protection function

Unless the password is not input, any setting change of the light curtain cannot be allowed. The factory setting is set to invalid for the protecting function.

Copy function

Allows settings details to be copied into other light curtains. In the event that the same setting must be input into several different light curtains, this function will reduce the time required for the input of settings.

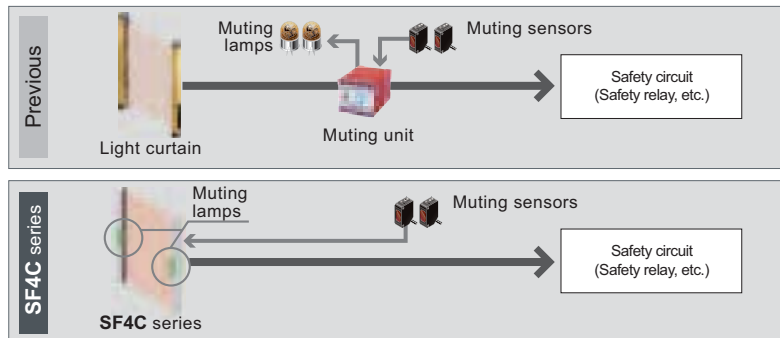
Muting lamp diagnosis setting

When the muting lamp diagnosis is disabled, the muting function will continue to operate even if the lamp is blown.

Useful built-in muting control function improves productivity

Safety, productivity, and cost reduction [Muting control function]

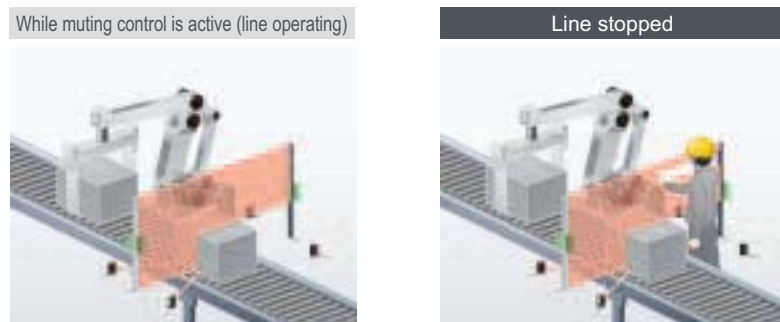
The light curtain has a built-in muting control function that causes the line to stop only when a person passes through the light curtain, and does not stop the line when an object passes through. The muting sensors and muting lamps can be connected directly to the light curtain. Furthermore, the large multi-purpose indicators can be used as muting lamps, which contribute to less wiring troubles, improvement of safety and productivity, and cost reduction.



* If a failure diagnosis of muting lamp is needed as by the result of risk assessment, use the handy-controller **SFC-HC** (available soon) to change the setting, and connect the muting lamp output wire (red) of this light curtain to an incandescent lamp separately.

Selective muting area [Separate muting control function for each beam channel] =HC

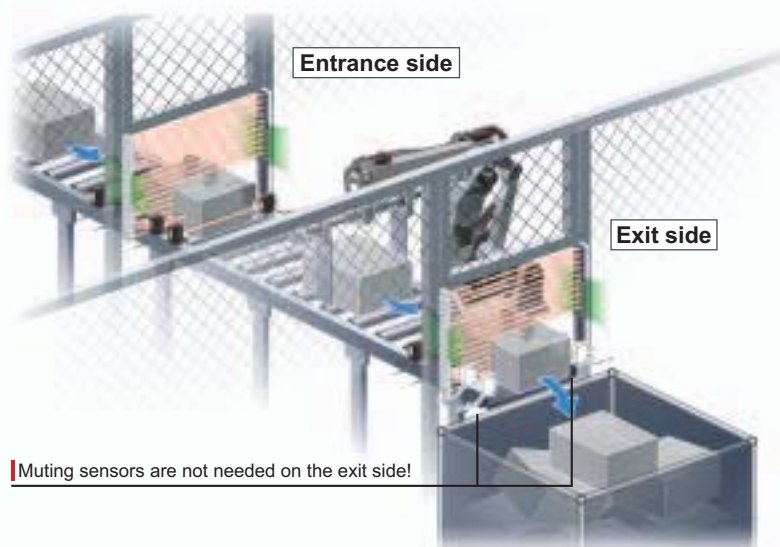
The handy-controller **SFC-HC** (available soon) can be used to carry out muting control for specified beam channels only. Because individual beam channel can be specified to suit the object, separate guards to prevent entry do not need to be set up.



For example, depending on the height of the object, the muting function can be activated for 10 beam channels starting from the bottom most, so that if the 11th or subsequent beam channels are interrupted, it is judged that a person has entered the area and the line stops.

Safety measures when objects exit [Exit muting control function] =HC

Muting at the exit of a machine is now possible using the handy-controller **SFC-HC** (available soon). Just set a four sec. delay timer on the muting sensors located at the exit. This is efficient for places with no installation space for muting sensors and also reduces cost and wiring.

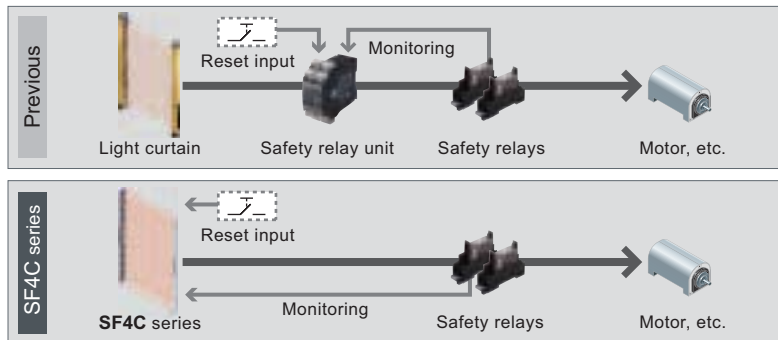


By installing muting sensors only within the dangerous zone and setting up a delay timer on the sensor, muting control is made possible even on the exit side where muting sensors cannot be installed.

Cost reduction in safety circuit without a safety relay unit

Safety circuit is constructed without the need for a safety relay unit [External device monitoring function]

The light curtain has a built-in external device monitoring function (such as deposited relay monitoring) and an interlock function. This allows a safety circuit to be constructed so that a separate safety relay unit is not needed, and the control box has become smaller to help to achieve to lower costs.



The light curtain can directly connect to external devices (safety relay, etc) without an exclusive control unit. This allows for simplified equipment, cost reduction, and error prevention.

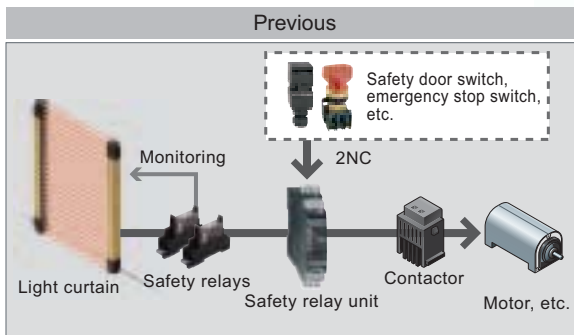
Industry first*! Wire-saving when connecting to safety devices [Safety input function]

Contact outputs such as an emergency stop switches or a safety door switches can be connected to the light curtain. Also, by using the handy-controller **SFC-HC** (available soon) up to three sets of light curtains can be cascade connected for a consolidated safety output.

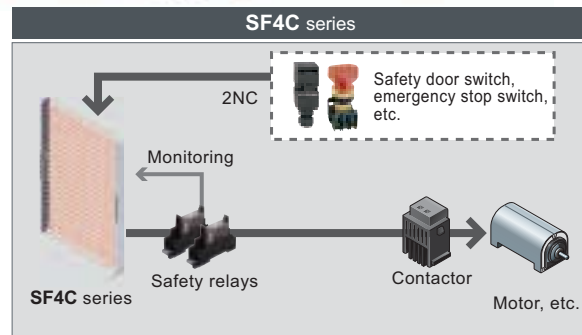


* Based on research conducted by SUNX as of March 2009.

Direct connection of safety devices

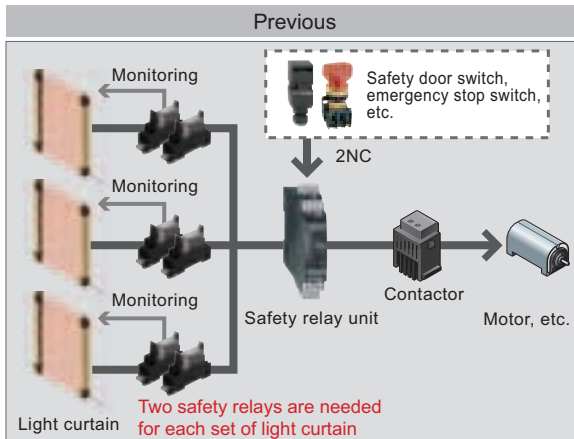


A safety relay unit is needed for connecting safety devices other than light curtain.

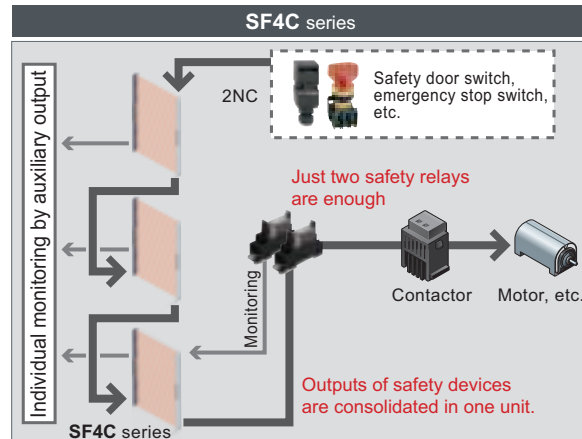


Direct connection of various safety devices is possible for a simplified safety circuit.

By using the handy-controller SFC-HC (available soon) up to three sets of light curtains can be cascade connected for a consolidated safety output.

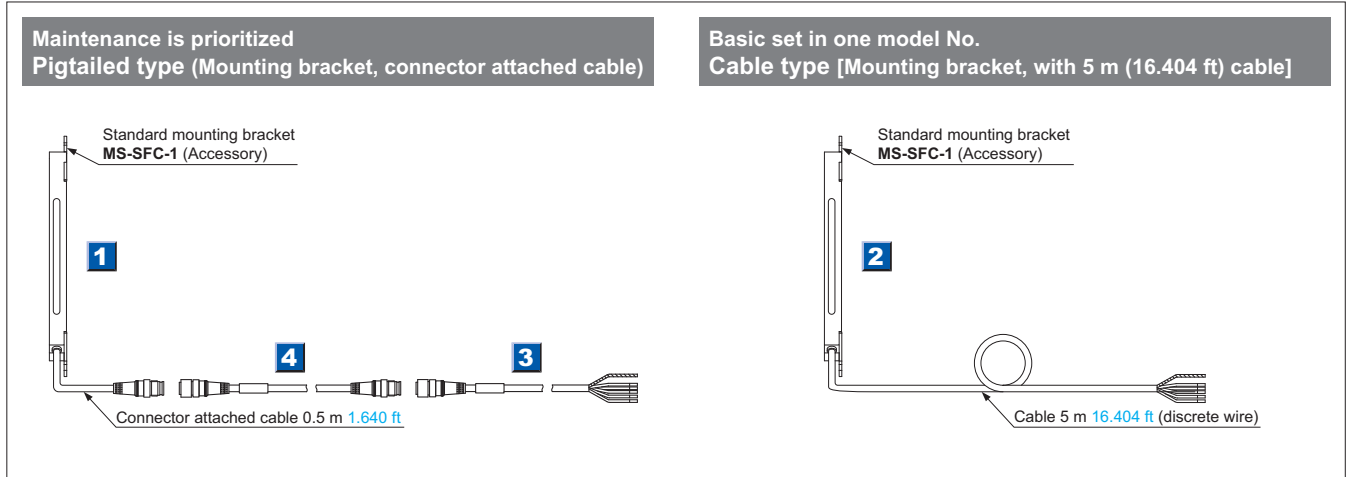


Three sets of light curtains require three sets of safety relays.



Individual monitoring on light curtains is possible while the outputs of three sets of light curtains and other safety devices are consolidated in one unit.

PRODUCT CONFIGURATION

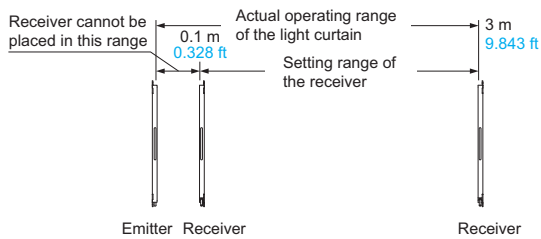


ORDER GUIDE

1 2 Light curtains

| Type | Appearance | Operating range (Note 1) | Model No. (Note 2) | | Number of beam channels | Protective height (mm in) |
|---|------------|--------------------------|---------------------|-----------------|-------------------------|---------------------------|
| | | | 1 Pigtailed type | 2 Cable type | | |
| Hand protection type <small>Min. sensing object: ø25 mm ø0.984 in (ø20 mm 0.787 in beam pitch)</small> | | | SF4C-H8-J05 | SF4C-H8 | 8 | 160 mm 6.299 in |
| | | | SF4C-H12-J05 | SF4C-H12 | 12 | 240 mm 9.449 in |
| | | | SF4C-H16-J05 | SF4C-H16 | 16 | 320 mm 12.598 in |
| | | | SF4C-H20-J05 | SF4C-H20 | 20 | 400 mm 15.748 in |
| | | | SF4C-H24-J05 | SF4C-H24 | 24 | 480 mm 18.898 in |
| | | | SF4C-H28-J05 | SF4C-H28 | 28 | 560 mm 22.047 in |
| | | | SF4C-H32-J05 | SF4C-H32 | 32 | 640 mm 25.197 in |

Notes: 1) The operating range is the possible setting distance between the emitter and the receiver. The light curtain can detect an object less than 0.1 m 0.328 ft away.



2) The model No. with suffix "E" shown on the label affixed to the product is the emitter, "D" shown on the label is the receiver.
(e.g.) Emitter of SF4C-H8-J05: SF4C-H8E-J05, Receiver of SF4C-H8-J05: SF4C-H8D-J05.

3 4 Mating cables

| Type | Appearance | Model No. | Description |
|---------------|----------------------|---|--|
| Mating cables | | SFB-CC3-MU | Length: 3 m 9.843 ft Net weight: 430 g approx. (2 cables) |
| | | SFB-CC7-MU | Length: 7 m 22.966 ft Net weight: 1,000 g approx. (2 cables) |
| | | SFB-CC10-MU | Length: 10 m 32.808 ft Net weight: 1,300 g approx. (2 cables) |
| | | SFB-CCJ10E-MU | Length: 10 m 32.808 ft Net weight: 660 g approx. (1 cable) |
| | SFB-CCJ10D-MU | Length: 10 m 32.808 ft Net weight: 680 g approx. (1 cable) | Cable with connectors on both ends for pigtailed type Cable color: Gray (for emitter), Gray with black line (for receiver) Connector color: Gray (for emitter), Black (for receiver) The min. bending radius: R6 mm R0.236 in |

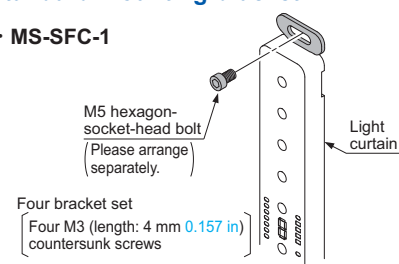
ORDER GUIDE

Spare parts (Accessories for light curtain)

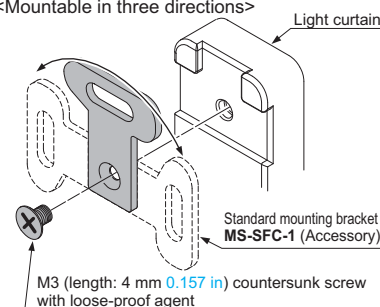
| Designation | Model No. | Description |
|---------------------------|------------------|---|
| Standard mounting bracket | MS-SFC-1 | Allows the light curtain to be mounted at the rear with one M5 hexagon-socket-head bolt. Mounting direction of the bracket can be selected between vertical or horizontal (no dead zone). (4 pcs. per set for emitter and receiver) |
| Test rod ø25 | SF4C-TR25 | Min. sensing object for regular checking (ø25 mm ø0.984 in) Available soon |

Standard mounting bracket

• MS-SFC-1



<Mountable in three directions>



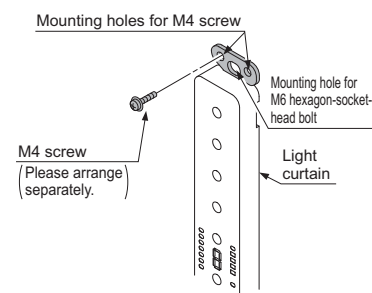
OPTIONS

Mounting bracket


| Designation | Model No. | Description |
|-----------------------------------|-----------------|--|
| NA2-N compatible mounting bracket | MS-SFC-2 | Used when changing over area sensor NA2-N series to the SF4C series. The mounting holes of NA2-N series can continue to be used. Center mounting by a M6 hexagon-socket-head bolt is also possible. (4 pcs. per set for emitter and receiver) |

NA2-N compatible mounting bracket

• MS-SFC-2



Control unit

| Designation | Appearance | Model No. | Description |
|------------------------|---|---------------|--|
| Slim type control unit |  | SF-C13 | Use a discrete wire cable to connect to the light curtain. Relay output. Compatible with up to Control Category 4. |

Recommended safety relay

Safety relay
Panasonic Electric Works Ltd.
SF series




Note: Contact Panasonic electric works Co. Ltd. for details on the recommended products.

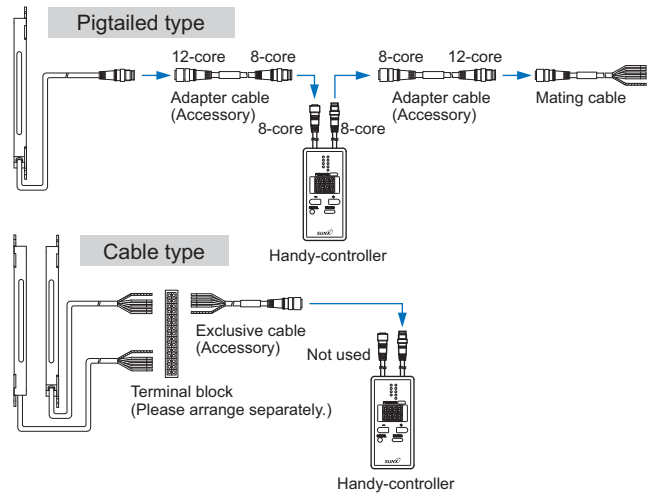
| Item | Type | Without LED indicator | With LED indicator |
|----------------------------------|-----------|---|--------------------|
| | Model No. | SFS3-DC24V | SFS3-L-DC24V |
| Contact arrangement | | 3a1b | |
| Rated nominal switching capacity | | 6 A / 250 V AC, 6 A / 30 V DC | |
| Min. switching capacity | | 1 mA / 5 V DC | |
| Coil rating | | 15 mA / 24 V DC | |
| Rated power consumption | | 360 mW | |
| Operation time | | 20 ms or less | |
| Release time | | 20 ms or less | |
| Ambient temperature | | -40 to +85 °C -40 to +185 °F (Humidity: 5 to 85 % RH) | |
| Applicable standards | | UL, C-UL, TÜV | |

Note: Refer to p.25 for dimensions and internal wiring diagram.

OPTIONS

Handy-controller (Available soon)

| Designation | Appearance | Model No. |
|------------------|---|-------------------------------------|
| Handy-controller |  | SFC-HC Available soon |



| Item | Model No. | SFC-HC |
|--------------------------|-----------|--|
| Supply voltage | | 24 V DC $\pm 10\%$ Ripple P-P 10 % or less (common to light curtain power supply) |
| Current consumption | | 65 mA or less |
| Communication method | | RS-485 two-way communications (Specific procedure) |
| Digital display | | 4-digit red LED display × 2 (Selected beam channels, setting contents etc. are displayed.) |
| Function indicators | | Green LED × 9 (Set function is displayed.) |
| Functions | | Fixed blanking / Floating blanking / Auxiliary output change / Safety input setting change / Large multi-purpose indicator setting change / Muting setting change / Interlock setting change / External device monitoring setting change / Override setting changing function 60 sec. / Protecting |
| Ambient temperature | | -10 to +55 °C +14 to +131 °F (No dew condensation or icing allowed), Storage: -25 to +70 °C -13 to +158 °F |
| Ambient humidity | | 30 to 85 % RH, Storage: 30 to 85 % RH |
| 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 |
| Cable | | 8-core shielded cable, 0.5 m 1.640 ft long, with a connector at the end (2 cables) |
| Weight | | Net weight: 200 g approx. |

Note: Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +20 °C **+68 °F**.

SPECIFICATIONS

Light curtain individual specifications

| Item | Type | Min. sensing object $\varnothing 25$ mm $\varnothing 0.984$ in type (20 mm 0.787 in beam pitch) | | | | | | |
|--|--|--|---|-------------------------|---|-------------------------|---|-------------------------|
| | | Pigtailed type | SF4C-H8-J05 | SF4C-H12-J05 | SF4C-H16-J05 | SF4C-H20-J05 | SF4C-H24-J05 | SF4C-H28-J05 |
| | Cable type | SF4C-H8 | SF4C-H12 | SF4C-H16 | SF4C-H20 | SF4C-H24 | SF4C-H28 | SF4C-H32 |
| No. of beam channels | | 8 | 12 | 16 | 20 | 24 | 28 | 32 |
| Protective height | | 160 mm 6.299 in | 240 mm 9.449 in | 320 mm 12.598 in | 400 mm 15.748 in | 480 mm 18.898 in | 560 mm 22.047 in | 640 mm 25.197 in |
| Current consumption | Large multi-purpose indicator lights off | Emitter: 70 mA or less Receiver: 85 mA or less | Emitter: 70 mA or less Receiver: 90 mA or less | | Emitter: 70 mA or less Receiver: 95 mA or less | | Emitter: 70 mA or less Receiver: 100 mA or less | |
| | Large multi-purpose indicator lights up | Emitter: 120 mA or less Receiver: 135 mA or less | Emitter: 120 mA or less Receiver: 140 mA or less | | Emitter: 120 mA or less Receiver: 145 mA or less | | Emitter: 120 mA or less Receiver: 150 mA or less | |
| PFHd | | 1.66×10^{-9} | 1.90×10^{-9} | 2.10×10^{-9} | 2.33×10^{-9} | 2.54×10^{-9} | 2.77×10^{-9} | 2.98×10^{-9} |
| MTTFd | | 100 years or more | | | | | | |
| Net weight (Total of emitter and receiver) | Pigtailed type | 240 g approx. | 300 g approx. | 360 g approx. | 420 g approx. | 490 g approx. | 550 g approx. | 610 g approx. |
| | Cable type | 630 g approx. | 700 g approx. | 760 g approx. | 820 g approx. | 880 g approx. | 950 g approx. | 1,000 g approx. |

SPECIFICATIONS

Light curtain common specifications

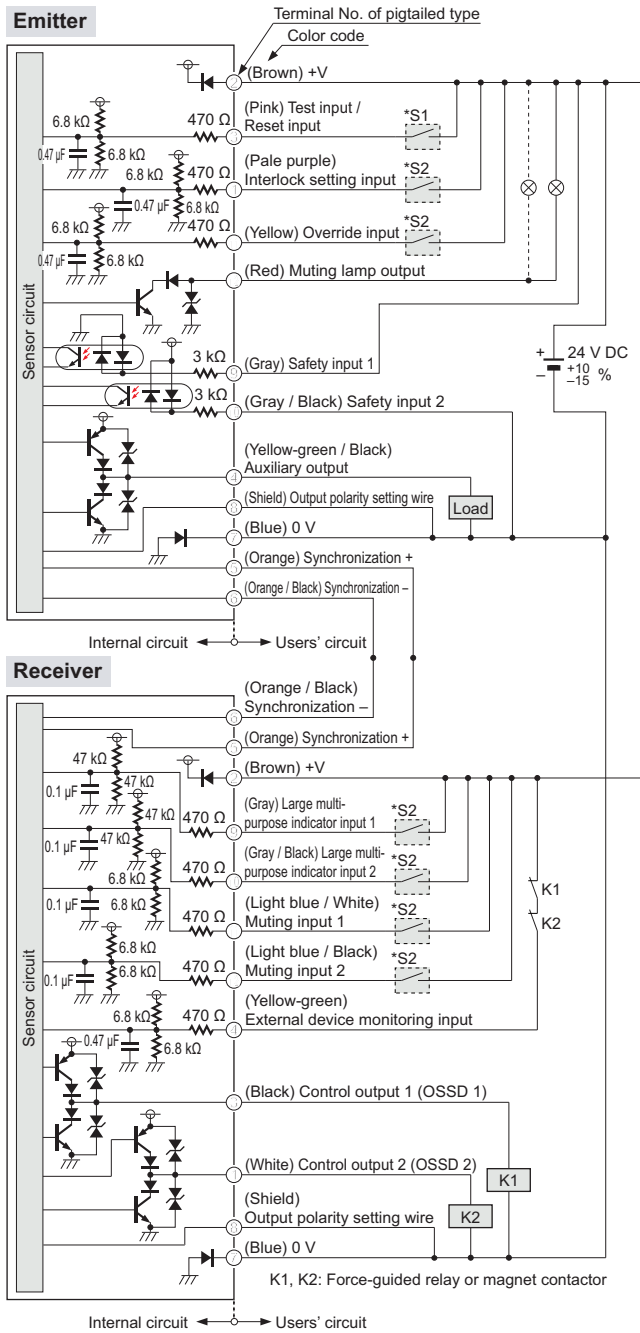
| Item | Type | Pigtailed type | Cable type |
|--------------------------------------|--|---|-----------------------------|
| | Model No. | SF4C-H□-J05 | SF4C-H□ |
| Applicable standards | International standard | IEC 61496-1/2 (Type 4), ISO 13849-1 (Category 4, PL _e), IEC 61508-1 to 7 (SIL 3) | |
| | Japan | JIS B 9704-1/2 (Type 4), JIS B 9705-1 (Category 4), JIS C 0508 (SIL 3) | |
| | Europe (EU) (Note 2) | EN 61496-1 (Type 4), EN 55011 | |
| | North America (Note 3) | UL 61496-1/2 (Type 4), UL 508, UL 1998 (Class 2), CSA 61496-1/2 (Type 4), CSA C22.2 No.14, OSHA 1910.212, OSHA 1910.217(C), ANSI B11.1 to B11.19, ANSI/RIA 15.06 | |
| Operating range (Note 4) | | 0.1 to 3 m 0.328 to 9.843 ft | |
| Min. sensing object (Note 5) | | ø25 mm ø0.984 in opaque object | |
| Effective aperture angle | | ±2.5° or less [for an operating range exceeding 3 m 9.843 ft (conforming to IEC 61496-2 / UL 61496-2)] | |
| Supply voltage | | 24 V DC $\begin{matrix} +10 \\ -15 \end{matrix}$ % Ripple P-P 10 % or less | |
| Control outputs (OSSD 1, OSSD 2) | PNP open-collector transistor / NPN open-collector transistor (switching method) | | |
| | <When selecting PNP output> | | <When selecting NPN output> |
| | <ul style="list-style-type: none"> • Max. source current: 200 mA • Applied voltage: same as supply voltage (between the control output and +V) • Residual voltage: 2.5 V or less (source current 200 mA, when using 10 m 32.808 ft length cable) • Leakage current: 200 µA or less (including power supply OFF condition) • Max. load capacity: 1 µF (No load to Max. output current) • Load wiring resistance: 3 Ω or less | <ul style="list-style-type: none"> • Max. sink current: 200 mA • Applied voltage: same as supply voltage (between the control output and 0 V) • Residual voltage: 2.5 V or less (sink current 200 mA, when using 10 m 32.808 ft length cable) • Leakage current: 200 µA or less (including power supply OFF condition) • Max. load capacity: 1 µF (No load to Max. output current) • Load wiring resistance: 3 Ω or less | |
| Operation mode | ON when all beam channels are received, OFF when one or more beam channels are interrupted (OFF also in case of any malfunction in the light curtain or the synchronization signal)(Note 6,7) | | |
| Protection circuit | Incorporated | | |
| Response time | | OFF response: 7 ms or less, ON response: 90 ms or less | |
| Auxiliary output (Non-safety output) | PNP open-collector transistor / NPN open-collector transistor (switching method) | | |
| | <When selecting PNP output> | | <When selecting NPN output> |
| | <ul style="list-style-type: none"> • Max. source current: 100 mA • Applied voltage: same as supply voltage (between the auxiliary output and +V) • Residual voltage: 2.5 V or less (source current 100 mA, when using 10 m 32.808 ft length cable) | <ul style="list-style-type: none"> • Max. sink current: 100 mA • Applied voltage: same as supply voltage (between the auxiliary output and 0 V) • Residual voltage: 2.5 V or less (sink current 100 mA, when using 10 m 32.808 ft length cable) | |
| Operation mode | OFF when control outputs are ON, ON when control outputs are OFF (Factory setting, operating mode can be changed using the SFC-HC (available soon) handy-controller). | | |
| Protection circuit | Incorporated | | |
| ELCA function | | Incorporated (reducing mutual interference automatically) | |
| Test / reset input function | | Incorporated | |
| Interlock function | | Incorporated [Manual reset / Automatic reset (Note 8)] | |
| External device monitoring function | | Incorporated | |
| Safety input function | | Incorporated (safety contact) | |
| Muting function | | Incorporated | |
| Override function | | Incorporated | |
| Optional functions (Note 9) | | Fixed blanking, floating blanking, auxiliary output change, safety input (safety sensor), large multi-purpose indicator setting change, interlock setting change, external relay monitoring setting change, muting setting change, override setting change, protecting | |
| Environmental resistance | Degree of protection | IP67 / IP65 (IEC) | |
| | Ambient temperature | -10 to +55 °C +14 to +131 °F (No dew condensation or icing allowed), Storage: -25 to +60 °C -13 to +140 °F | |
| | Ambient humidity | 30 to 85 % RH, Storage: 30 to 85 % RH | |
| | Ambient illuminance | Incandescent light: 5,000 lx or less at the light-receiving face | |
| | Dielectric strength voltage | 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 | |
| | Vibration resistance | 10 to 55 Hz frequency, 0.75 mm 0.030 in amplitude in X, Y and Z directions for two hours each | |
| | Shock resistance | 300 m/s ² acceleration (30 G approx.) in X, Y and Z directions for three times each | |
| Emitting element | Infrared LED (Peak emission wavelength: 855 nm 0.034 mil) | | |
| Material | Enclosure: Polycarbonate alloy, Sensing surface: Polycarbonate alloy | | |
| Cable | 0.15 mm ² 12-core heat-resistant PVC cable, 0.5 m 1.640 ft long with connector | 0.15 mm ² 12-core heat-resistant PVC cable, 5 m 16.404 ft long | |
| Cable extension | Extension up to 40.5 m 132.874 ft is possible for both emitter and receiver, with 0.2 mm ² or more cable. (Note 10) | | |
| Accessories | MS-SFC-1 (Standard mounting bracket): 1 set, SF4C-TR25 (Test rod): 1 No. | | |

- Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +20 °C **+68 °F**.
2) Regarding EU Machinery Directive, a Notified Body, TÜV SÜD, has certified with the type examination certificate.
3) With regards to the standards in the US, under the US regulation 29 CFR 1910.7, TÜV SÜD, a Nationally Recognized Testing Laboratory (NRTL) certified by OSHA, has certified with the safety certificate based on UL / ANSI standards.
With regards to the standards in Canada, under the safety regulations based on CEC (Canadian Electric Code), TÜV SÜD, a Certification Body accredited by SCC, has certified with the safety certificate based on CSA standards.
4) The operating range is the possible setting distance between the emitter and the receiver. The light curtain can detect an object less than 0.1 m **0.328 ft** away.
5) When the floating blanking function is used, the size of the min. sensing object is changed. For details, refer to "Safety distance" (p.21-).
6) The outputs are not "OFF" when muting function is active even if the beam channel is interrupted.
7) In case the blanking function is valid, the operation mode is changed. For details, refer to "Safety distance" (p.21-).
8) The manual reset and automatic reset are possible to be switched depending on the wiring status.
9) In case of using optional function, the handy-controller **SFC-HC** (available soon) is required.
10) When the muting lamp is used, the cable can be extended within ~~0.201~~ **0.066 ft** (for emitter / receiver).

I/O CIRCUIT AND WIRING DIAGRAMS

I/O circuit diagram

<In case of using I/O circuit for PNP output>



* S1, S2

Switch S1

- Test input / Reset input
For manual reset
Vs to Vs - 3.5 V (sink current 5 mA or less): OFF (Note)
Open: ON
- For automatic reset
Vs to Vs - 3.5 V (sink current 5 mA or less): ON (Note)
Open: OFF

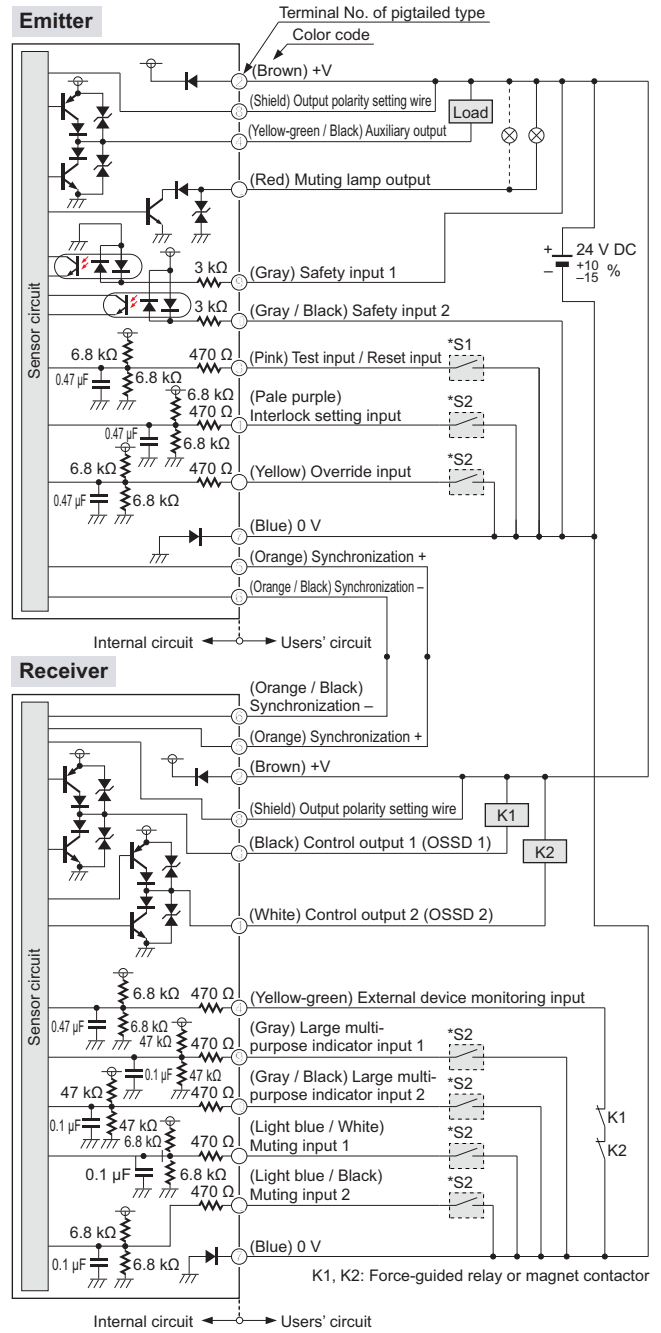
Switch S2

- Interlock setting input, Override input, Muting input 1 / 2, Large multi-purpose indicator input 1 / 2,
Vs to Vs - 3.5 V (sink current 5 mA or less): Valid (Note)
Open: Invalid

Note: Vs is the applying supply voltage.

I/O circuit diagram

<In case of using I/O circuit for NPN output>



* S1, S2

Switch S1

- Test input / Reset input
For manual reset
0 to +2.5 V (source current 5 mA or less): OFF
Open: ON
- For automatic reset
0 to +2.5 V (source current 5 mA or less): OFF
Open: ON

Switch S2

- Interlock setting input, Override input, Muting input 1 / 2, Large multi-purpose indicator input 1 / 2,
0 to +2.5 V (source current 5 mA or less): Valid
Open: Invalid

I/O CIRCUIT AND WIRING DIAGRAMS

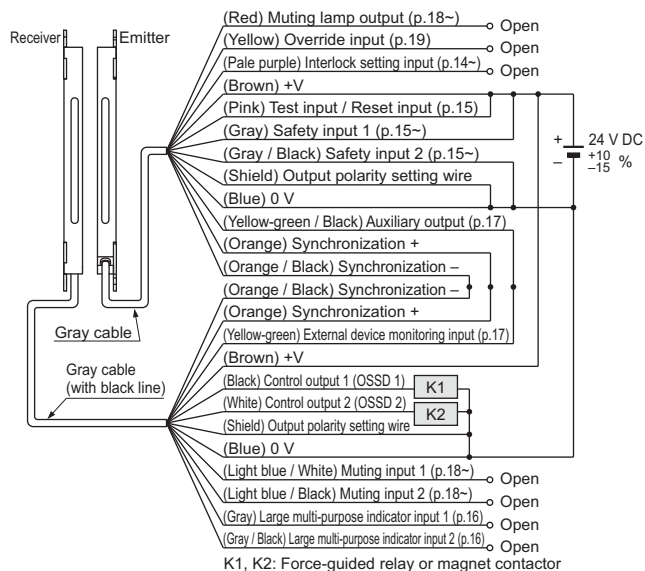
Connection example

Basic wiring: Min. operation only

This is the general configuration using one set of the emitter and receiver facing each other. The control outputs (OSSD 1 / OSSD 2) turn OFF if the light is interrupted, while they automatically turn ON if receive the light.

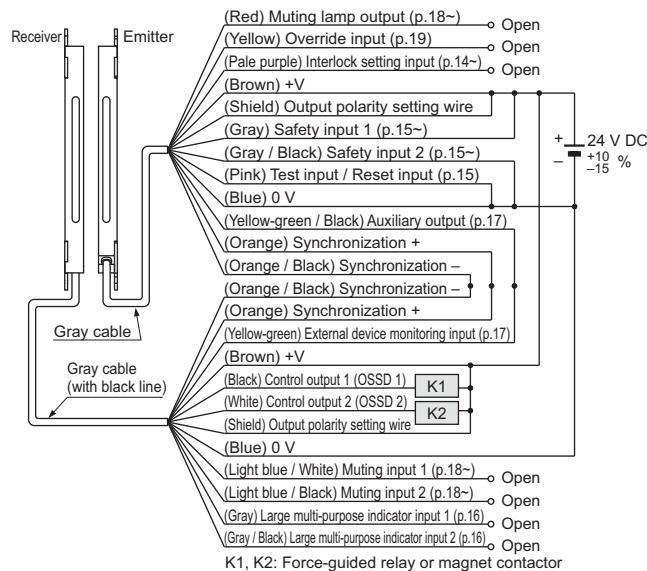
The auxiliary output is used to invalid the external device monitoring function. The auxiliary output cannot be connected to external devices.

<In case of using I/O circuit for PNP output>



| | |
|-------------------------------------|----------------------------|
| Interlock function | Disabled (Automatic reset) |
| External device monitoring function | Disabled |
| Auxiliary output | Not used |
| Output polarity setting wire | PNP |
| Safety input | Invalid |

<In case of using I/O circuit for NPN output>



| | |
|-------------------------------------|----------------------------|
| Interlock function | Disabled (Automatic reset) |
| External device monitoring function | Disabled |
| Auxiliary output | Not used |
| Output polarity setting wire | NPN |
| Safety input | Invalid |

PRECAUTIONS FOR PROPER USE

Interlock function

- You can select whether interlock is enabled (manual reset) or disabled (automatic reset) by the way in which the interlock setting input wire (pale purple) is connected.

| Interlock function | Reset operation | Interlock setting input (pale purple) |
|--------------------|-----------------|---|
| Enabled | Manual reset | When selecting PNP output: Connected to +V When selecting NPN output: Connected to 0 V |
| Disabled | Automatic reset | Open |

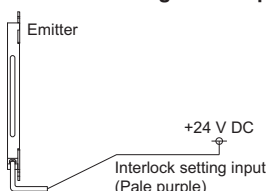


Make sure that there exist no operator in the dangerous zone when using the interlock function, which can result in death or serious injury.

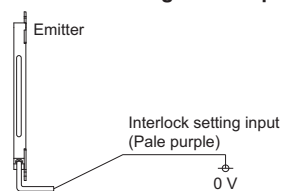
Interlock enabled (manual reset)

- The control outputs (OSSD 1 / OSSD 2) are not turned ON automatically even though this light curtain is receiving the light. When this light curtain is reset in light received condition [open the test input / reset input → short-circuit the light curtain to +V for PNP output or 0 V for NPN output → open], the control outputs (OSSD 1 / OSSD 2) are turned ON.

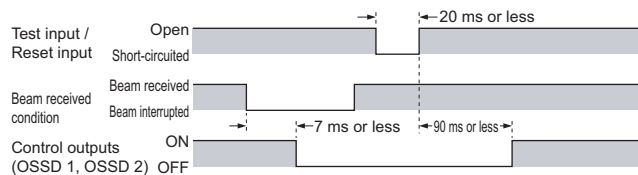
<When selecting PNP output>



<When selecting NPN output>



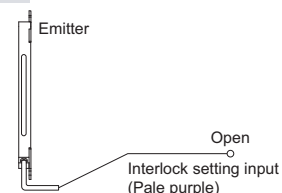
<Time chart>



The reset switch shall be placed in area where all of the dangerous zone shall be comprehended and outside of the dangerous zone.

Interlock disabled (automatic reset)

- The control outputs (OSSD 1 / OSSD 2) are turned ON automatically when this light curtain receives light.



In case that this light curtain is used under automatic reset mode, set the system not to be automatic reset by the safety relay unit, etc. (conforming to EN 60204-1)

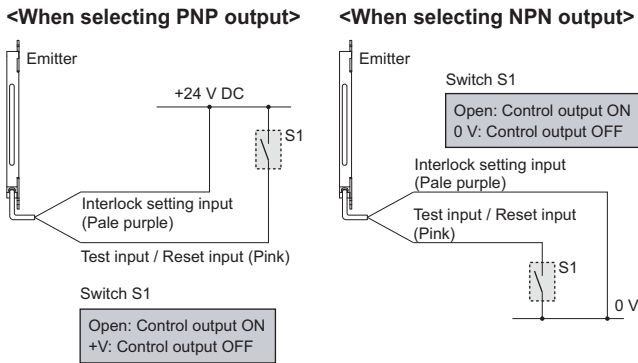
- It is also possible to change the interlock setting condition by the using the handy-controller **SFC-HC** (available soon).

PRECAUTIONS FOR PROPER USE

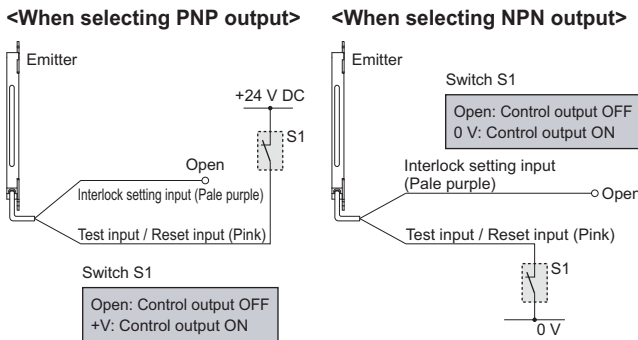
Test input function

- This function enables checking of the device operation by forcibly turning ON / OFF the control outputs (OSSD 1 / OSSD 2) of the receiver with the emitting light is received.
- The selection of output ON / OFF is available by applying the test input / reset input wire (pink).

Interlock function enabled (manual reset)

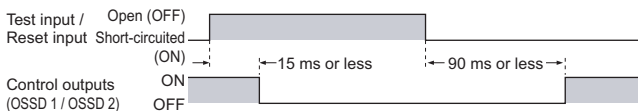


Interlock function enabled (automatic reset)



- When the test input is valid, the control outputs (OSSD 1 / OSSD 2) become OFF.
- By using this function, malfunction due to extraneous noise or abnormality in the control outputs (OSSD 1 / OSSD 2) and the auxiliary output can be determined even from the equipment side.
- In case of PNP output, normal operation is restored when the test input / reset input wire (pink) is connected to +V (for manual reset: open).
- In case of NPN output, normal operation is restored when the test input / reset input wire (pink) is connected to 0 V (for manual reset: open).

<Time chart>



Do not use the test input function for the purpose of stopping the machine in which this light curtain is installed. Failure to do so could result in death or serious injury.

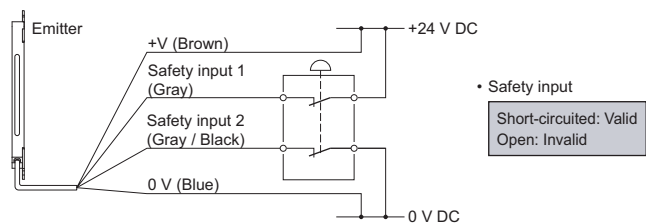
Safety input function

- This function controls the control outputs (OSSD 1 / OSSD 2) of this light curtain by receiving detection signal of a safety contact or safety sensor which is connected to the safety input 1 wire (gray) and the safety input 2 wire (gray / black).
- The control outputs (OSSD 1 / OSSD 2) forcibly turning OFF when safety input 1 / 2 is OFF.
- A safety contact can be connected at the factory setting of this light curtain.
- When connecting a safety sensor, the handy-controller **SFC-HC** (available soon) is required. Furthermore, the number of safety sensor, which be able to connect this light curtain is 2.
- Series connection is also available when connecting other **SF4C** series to the safety input 1 wire (gray) and the safety input 2 wire (gray / black).
- The safety contacts are available for an emergency stop switch with two N.C. (Normally Closed) contacts, etc., and the safety sensor is available for a light curtain or a safety switch with semiconductor output etc.

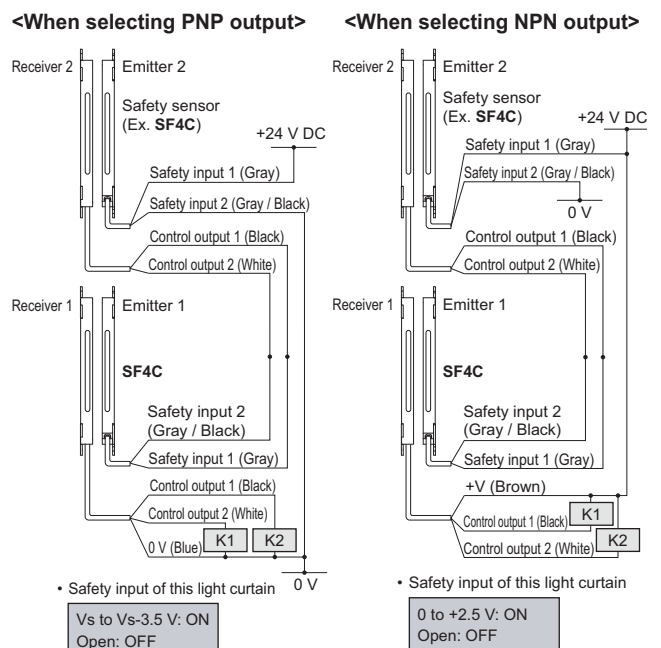
<Output operations of a safety contact and a safety sensor>

| | N.C. (Normally Closed) type | Operation at ON state | Operation at OFF state |
|----------------|--|---|------------------------|
| Safety contact | ON with object non-contacted status (Emergency stop switch, etc.) | Safety input 1: +V Safety input 2: 0 V | Open |
| Safety sensor | Light-ON (Light curtain etc.) Normally closed ON (Safety switch etc.) | When using PNP output: +V When using NPN output: 0 V | |

Wiring example for safety contact



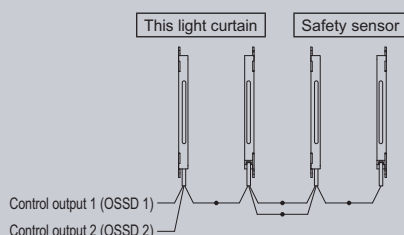
Wiring example for safety sensor (light curtain etc.)



Note: Vs is the applying supply voltage.

PRECAUTIONS FOR PROPER USE

- Use 0.2 mm² or more shielded cable when connecting other SF4C series cable to the safety input 1 / 2.
- When extending the cable of other SF4C series which is connected to the safety input 1 / 2, use the exclusive cable and the total cable length should be 40.5 m 132.874 ft or less (for each emitter / receiver). If the total cable length is exceeding 40.5 m 132.874 ft, the device may malfunction, resulting in death or serious injury.
- Response time of safety sensor is the sum of the response time of this light curtain and safety sensor itself.



Response time of this light curtain Response time of safety sensor

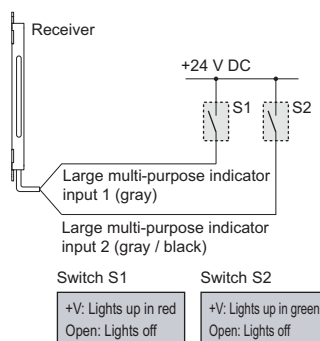
7 ms

<Ex.> In case of using SF4C as safety sensor.
Response time of safety sensor + response time of this light curtain = 7 ms + 7 ms = 14 ms

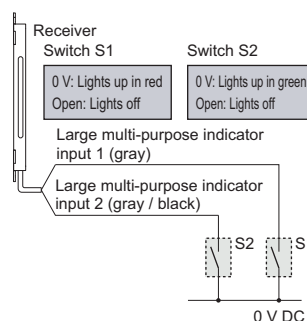
Large multi-purpose indicator function

- The selection of lights up / lights off is available by applying the large multi-purpose indicator input 1 (gray) or the large multi-purpose indicator input 2 (gray / black).

<When selecting PNP output>

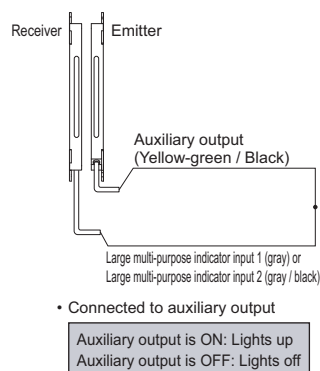


<When selecting NPN output>

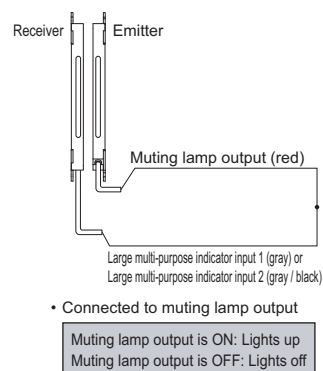


- By wiring the large multi-purpose indicator input 1 (gray) and the large multi-purpose indicator input 2 (gray / black) to the auxiliary output wire (yellow-green / black) or the muting lamp output wire (red), the outputs operate simultaneously with the outputs.

When used in conjunction with auxiliary output



When used as muting lamps



- It is also possible to change the large multi-purpose indicator operation setting (lights up, blinks, lights off) by using the handy-controller SFC-HC (available soon).

- Use a safety contact which incorporates two N.C. (Normally Closed) contacts and connect both the safety input 1 wire (gray) and the safety input 2 wire (gray / black). Take care that if only one wire is connected, the light curtain may not operate normally.
- When using the light curtain in PNP output (or NPN output), use PNP output (or NPN output) safety sensor. The control outputs (OSSD 1 / OSSD 2) become OFF by using wrong output type of sensor.
- Series connection is also available when connecting other SF4C series to the safety input 1 / 2. However, this light curtain does not incorporate the interference prevention function. Thus, take sufficient care when installing the light curtains.
- Use a safety sensor which incorporates a crossover short-circuit function in the control output and connect both the safety input 1 wire (gray) and the safety input 2 wire (gray / black). Take care that if only one wire is connected, the device may not operate normally.
- Make sure to connect to +V or 0 V when not using safety input function.



| Safety input function | For PNP output | | For NPN output | |
|---------------------------|----------------------------|------------------------------------|----------------------------|------------------------------------|
| | Safety input 1 wire (gray) | Safety input 2 wire (gray / black) | Safety input 1 wire (gray) | Safety input 2 wire (gray / black) |
| Safety contact input mode | Connected to +V | Connected to 0 V | Connected to +V | Connected to 0 V |
| Safety sensor input mode | Connected to +V | Connected to +V | Connected to 0 V | Connected to 0 V |

- It is possible to change the setting of input mode by using the handy controller SFC-HC (available soon).

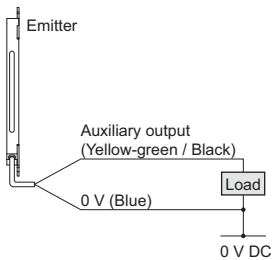
PRECAUTIONS FOR PROPER USE

Auxiliary output (Non-safety output)

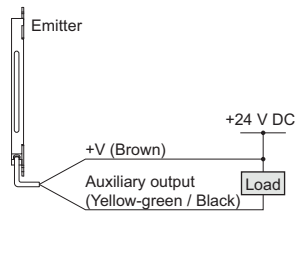
- This light curtain incorporates the auxiliary output for the non-safety output. The auxiliary output is incorporated in the emitter.

| Auxiliary output setting | Normal operation | | | Lockout |
|---|------------------|-----------------------------------|-------------------|---------|
| | Test input | Control outputs (OSSD 1 / OSSD 2) | | |
| | | Light received | Light interrupted | |
| Negative logic of the control outputs (OSSD 1 / OSSD 2) | ON | OFF | ON | ON |

<When selecting PNP output>

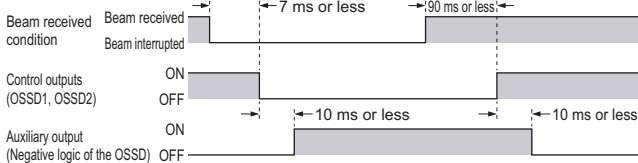


<When selecting NPN output>



Note: When the external device monitoring function is set disabled, the auxiliary output cannot be used. For details, refer to "External device monitoring function" listed below.

<Time chart>



Do not use the auxiliary output for the purpose of stopping the machine in which the SF4C series is installed. Failure to do so could result in death or serious injury.

- It is also possible to change the auxiliary output by using the handy-controller SFC-HC (available soon).

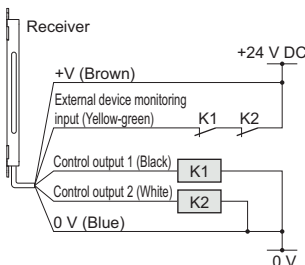
External device monitoring function

- This is the function for checking whether the external safety relay connected to the control outputs (OSSD 1, OSSD 2) perform normally in accordance with the control outputs (OSSD 1, OSSD 2) or not. Monitor the contact "b" of the external safety relay, and if any abnormality such as deposit of the contact, etc. is detected, change the status of the light curtain into lockout one, and turn OFF the control outputs (OSSD 1, OSSD 2).

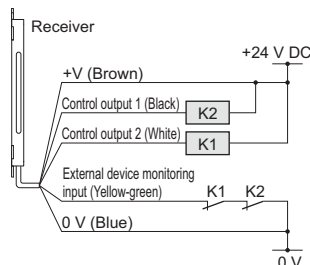
In case of setting the external device monitoring function to enabled

- Connect the external device monitoring input (yellow-green) to the external safety relay connected the control outputs (OSSD 1, OSSD 2).

<When selecting PNP output>

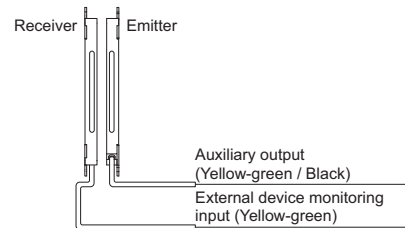


<When selecting NPN output>



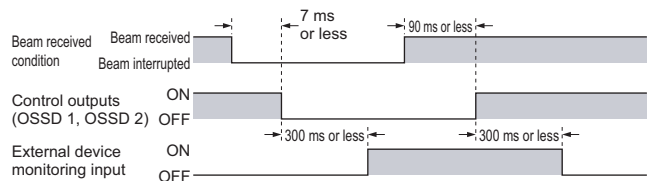
In case of setting the external device monitoring function to disabled

- Connect the external device monitoring input (yellow-green) to the auxiliary output (yellow-green / black). At this time, set the auxiliary output as "negative logic of control outputs (OSSD 1, OSSD 2)" (factory setting).
- The auxiliary output (yellow-green / black) cannot be connected to external devices.



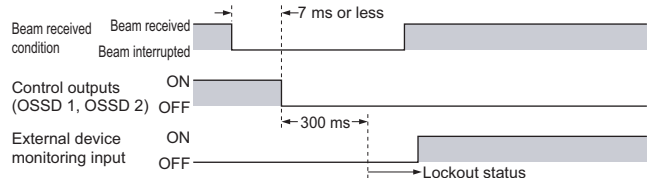
- It is also possible to set the external device monitoring function to disabled by using the handy-controller SFC-HC (available soon).

<Time chart (normal)>

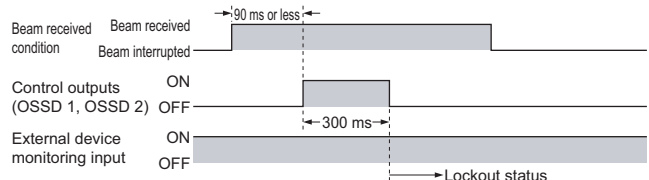


- The time set for external light curtain monitoring is 300 ms or less. Exceeding 300 ms turns the light curtain into lockout status. It can be set within 100 to 600 ms (in units of 10 ms) by using the handy-controller SFC-HC (available soon).

<Time chart (Error ①)>



<Time chart (Error ②)>



PRECAUTIONS FOR PROPER USE

Muting function

- Incorrect use of the muting control may cause accidents. Please understand the muting control fully, and use it. As for the muting control, the following international standards define the requirements.

ISO 13849-1 (JIS B 9705-1)
IEC 61496-1 (UL 61496 / JIS B 9704-1)
IEC 60204-1 (JIS B 9960-1)
IEC / TS 62046
EN 415-4
ANSI B11.19-1990
ANSI / RIA R15.06-1999

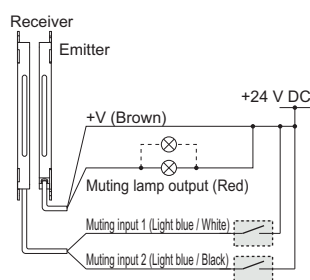


- Use the muting control while the machine cycle is not in danger mode. Maintain safety with the other measure while the muting control is activated.
- For the application that the muting control is activated when a workpiece passes through the sensor, place the muting sensor so that the conditions for the muting control cannot be satisfied by intrusion of personnel when the workpiece is passing through the sensor or the workpiece is not passing through it.
- The muting lamp should be installed in a position where it can always be seen by operators who set or adjust the machine.
- Be sure to check the operation of the muting function before its use. Furthermore, check the state of the muting lamp (cleanliness or brightness etc.).

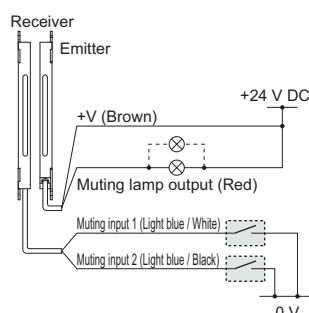
- The muting function turns the safety function of this light curtain into disabled temporarily. When the control outputs (OSSD 1, OSSD 2) are ON, this function is available for passing the workpiece through the sensing area of the light curtain without stopping the machinery.

Muting function enabled

<When selecting PNP output>



<When selecting NPN output>



- The muting function becomes valid when all the conditions listed below are satisfied:
 - ① The control outputs (OSSD 1, OSSD 2) shall be ON.
 - ② The safety input 1 / 2 shall be ON.
 - ③ Time difference between the time during muting input 1 / 2 becomes ON from OFF (open) and the time during muting input 1 / 2 becomes OFF (open) from ON should be between 0.03 to 3 sec. (Note 1)
- The lamp to be connected to the muting lamp output shall be an incandescent lamp of 1.5 to 6 W. (When the muting lamp diagnosis function is enabled) (Note 2)
- The following devices, photoelectric sensor with semiconductor output, inductive proximity sensor, position switch on N.O. (Normally open) contact, etc. are available for applying to the muting sensor.

- Notes: 1) By using handy-controller **SFC-HC** (available soon), and connecting normally open (N.O.) type muting sensor to muting input A, and normally closed (N.C.) type muting sensor to muting input B, then muting function can be used for 0 to 3 sec.
- 2) Using handy-controller **SFC-HC** (available soon) can configure muting lamp diagnosis function. If setting muting lamp diagnosis function to ineffective, muting function continues even when the lamp is out or not connected.
- 3) The muting time of this light curtain is unlimited by factory setting. Using the handy-controller **SFC-HC** (available soon), muting time can be set in 1 sec. unit from 1 to 600 sec.

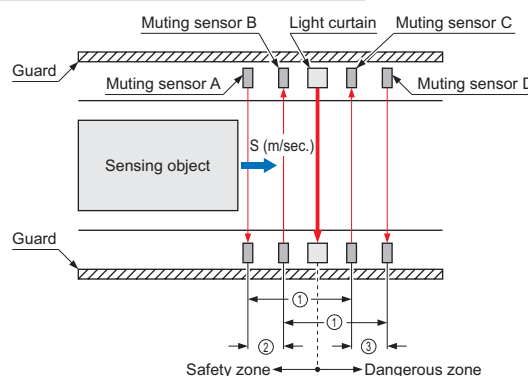
Specification for muting sensor

| | Operation when sensor is ON | Operation when sensor is OFF |
|---|-----------------------------|------------------------------|
| N.O. (Normally open) type ON with "Dark-ON" condition (photoelectric sensor, etc.) ON with "Normally open" condition (inductive proximity sensor, etc.) ON with object contacted condition (position switch, etc.) | 0 V or +V | Open |



- Be sure to use the muting sensor that satisfies the above table "**Specification for muting sensor**". If the other muting sensor not satisfying the specification above, the muting function might become enabled with the timing that the machine designer cannot expect and could result in serious injury or death.
- It is recommended that two muting lamps should be connected in parallel. However, take care not to exceed 6 W in total.

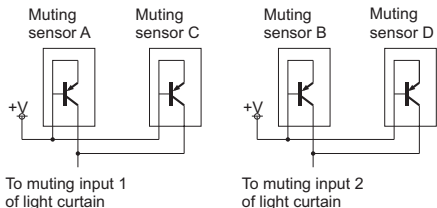
Installation condition of muting sensor



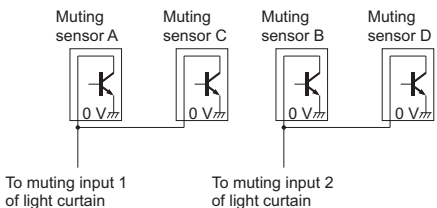
- ① Shorten the distances between muting sensors A to C and between B to D than the whole length of the sensing object.
- ② The time of the sensing object to be passed through the muting sensors A to B shall be 0.03 to under 3 sec.
Distance between A and B (m) < S (m/sec.) × 3 (sec.)
S: The moving speed (m/sec.) of the sensing object
- ③ The time of the sensing object to be passed through the muting sensors C to D shall be under 3 sec.
Distance between C and D (m) < S (m/sec.) × 3 (sec.)
S: The moving speed (m/sec.) of the sensing object

PRECAUTIONS FOR PROPER USE

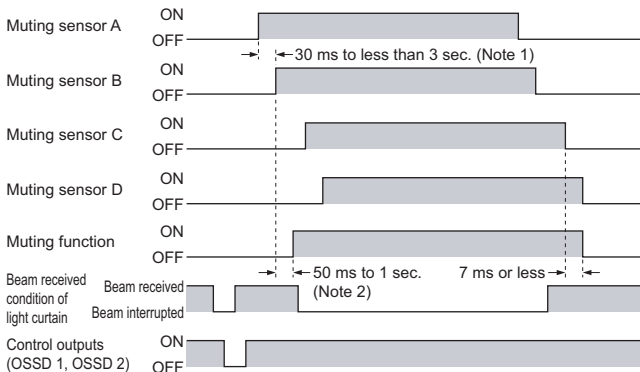
<In case of PNP output>



<In case of NPN output>



<Time chart>



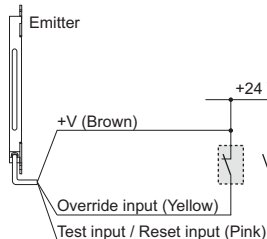
- Notes: 1) By using handy-controller **SFC-HC** (available soon), and connecting normally open (N.O.) type muting sensor to muting input A, and normally closed (N.C.) type muting sensor to muting input B, then muting function can be used for 0 to 3 sec.
 2) If the muting lamp does not light up even if 1 sec. or more when the muting lamp diagnosis function is valid, the muting function becomes invalid. When the muting lamp diagnosis function is invalid, the muting function becomes valid after 0.05 sec. from the input conditions of the muting sensor A (C) and B (D) were satisfied.

• It is possible to set the muting function into disabled per beam channel respectively and to specify the input order of the muting inputs 1, 2 to be set into enabled by using the handy-controller **SFC-HC** (available soon).

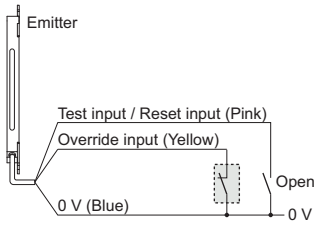
Override function

- This function sets the safety function of this light curtain enabled forcibly. When using the muting function, the override function can be used to start the machinery at times such as when the control outputs (OSSD 1 and OSSD 2) are OFF or when the muting sensors are ON when the line is to be started.

<When selecting PNP output>



<When selecting NPN output>



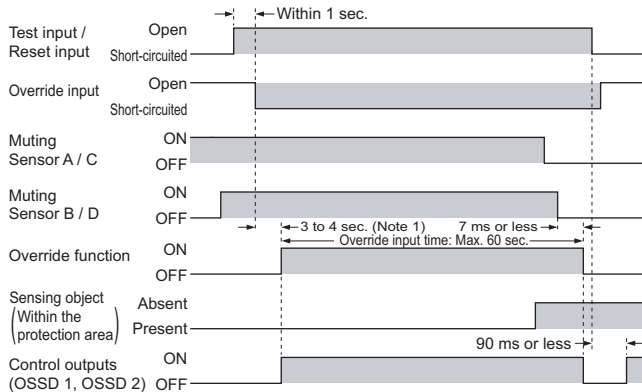
- The override function becomes valid when all the conditions listed below are satisfied:
 - ① The safety input 1 / 2 shall be ON.
 - ② The signal shall be input to either muting input 1 or 2, or to both of the inputs.
 - ③ The override input (yellow) shall be connected to +V (0 V when using NPN output), and the test input / reset input shall be opened (3 sec. continuously).
 - ④ When the muting lamp diagnosis function is enabled, an incandescent lamp of 1.5 to 6 W shall be connected. (Factory setting is disabled) (Note 1)

If one of the four conditions above becomes valid or timing exceeds 60 sec. (Note 2), the override function becomes valid.

- Notes: 1) Using handy-controller **SFC-HC** (available soon) can configure muting lamp diagnosis function. If setting muting lamp diagnosis function to ineffective, muting function continues even when the lamp is out or not connected.
 2) By using handy-controller **SFC-HC** (available soon), a change between 1 and 600 sec. by 1 sec. per unit is possible.
 3) The override function operates only when the automatic reset is ON (the interlock is disabled).

- Make sure to operate the system for starting override function manually. Furthermore, the system shall be placed in area where all of the dangerous zone shall be comprehend and outside of the dangerous zone.
- Using override function, make sure that there exist no operator in the dangerous zone, which may result in death or serious injury.

<Time chart>

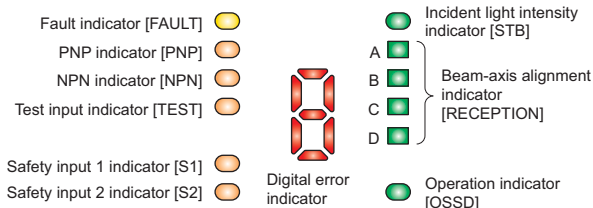


Note: This is when the muting lamp diagnosis function is valid. If the muting lamp does not light up even if 1 sec. or more is passed, the override function becomes invalid. When the muting lamp diagnosis function is invalid, the muting function becomes valid 3 sec. after the input conditions of the muting sensor A (C) and B (D) were satisfied.

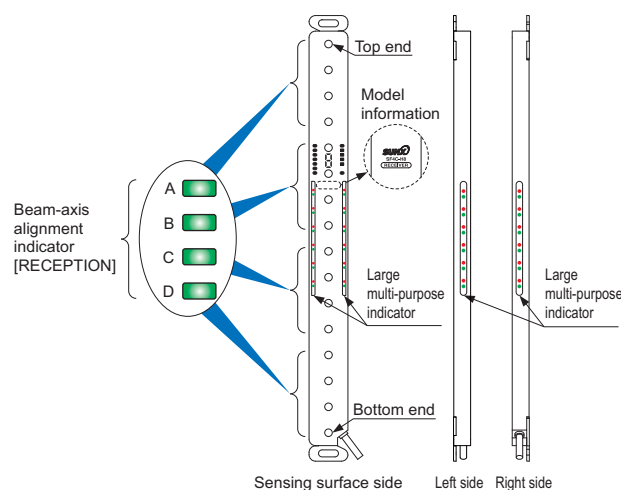
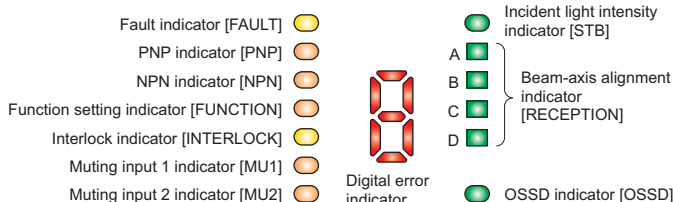
PRECAUTIONS FOR PROPER USE

Part description and function

Indicator section of emitter



Indicator section of receiver



Common to emitter and receiver

| Description | Function |
|---|---|
| Large multi-purpose indicator (Red / Green) (Note 1) | When the large multi-purpose indicator input 1 is valid: lights up in red When the large multi-purpose indicator input 2 is valid: lights up in green When the large multi-purpose indicator input invalid: OFF |
| Incident light intensity indicator (Orange / Green) [STB] | When stable light is received: lights up in green When unstable light is received: lights up in orange When light is interrupted: OFF (Note 2) |
| Beam-axis alignment indicator (Red / Green) [RECEPTION] | A When light curtain top receives light: lights up in red When light curtain top end receives light: blinks in red When control outputs (OSSD 1 / OSSD 2) are ON: light up in green |
| | B When light curtain upper middle receives light: lights up in red When control outputs (OSSD 1 / OSSD 2) are ON: lights up in green |
| | C When light curtain lower middle receives light: lights up in red When control outputs (OSSD 1 / OSSD 2) are ON: lights up in green |
| | D When light curtain bottom receives light: lights up in red When light curtain bottom end receives light: blinks in red When control outputs (OSSD 1 / OSSD 2) are ON: lights up in green |
| Digital error indicator (Red) | When light curtain is lockout: lights up for incident error content. |
| Fault indicator (Yellow) [FAULT] | When fault occurs in the light curtain: lights up or blinks |
| PNP indicator (Orange) [PNP] | When PNP output is set: lights up |
| NPN indicator (Orange) [NPN] | When NPN output is set: lights up |

Emitter

| Description | Function |
|---|--|
| Operation indicator (Red / Green) [OSSD] (Note 3) | Lights up while light curtain operation is as follows [sequential operation]: When control outputs (OSSD 1 / OSSD 2) are OFF: lights up in red When control outputs (OSSD 1 / OSSD 2) are ON: lights up in green |
| Test input indicator (Orange) [TEST] | When test input is valid: lights up When test input is invalid: OFF |
| Safety input 1 indicator (Orange) [S1] | When safety input 1 is valid: lights up When safety input 1 is invalid: OFF |
| Safety input 2 indicator (Orange) [S2] | When the safety input 2 is valid: lights up When the safety input 2 is invalid: OFF |


Receiver

| Description | Function |
|--|---|
| OSSD indicator (Red / Green) [OSSD] | When control outputs (OSSD 1 / OSSD 2) are OFF: lights up in red When control outputs (OSSD 1 / OSSD 2) are ON: lights up in green |
| Function setting indicator (Orange) [FUNCTION] | When handy-controller is connected: blinks When blanking function is enabled: lights up (Note 4) |
| Interlock indicator (Yellow) [INTERLOCK] | When interlock is enabled: lights up When interlock is disabled: OFF |
| Muting input 1 indicator (Orange) [MU1] | When muting input 1 is valid: lights up When muting input 1 is invalid: OFF |
| Muting input 2 indicator (Orange) [MU2] | When muting input 2 is valid: lights up When muting input 2 is invalid: OFF |

Notes: 1) It is also possible to change the large multi-purpose indicator operation setting (lights up, blinks, lights off) by using the handy-controller **SFC-HC** (available soon).

- The status when light is interrupted refers to the status that the some obstacle is existed in the sensing area.
- Since the color of the operation indicator changes according to the ON / OFF status of the control outputs (OSSD 1, OSSD 2), the operation indicator is marked as "OSSD" on the light curtain.
- The blanking function is set by using the handy-controller **SFC-HC** (available soon).
- The description given in [] is marked on the light curtain.


PRECAUTIONS FOR PROPER USE

 When this light curtain is used in the “PSDI mode”, an appropriate control circuit must be configured between this light curtain and the machinery. For details, be sure to refer to the standards or regulations applicable in each region or country.

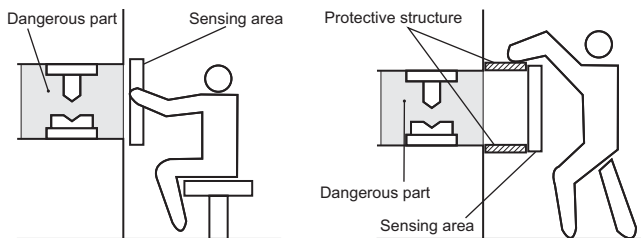
• This catalog is a guide to select a suitable product. Be sure to read instruction manual attached to the product prior to its use.
 • Both emitter and receiver are adjusted in combination at factory setting, please apply both emitter and receiver with the same serial No. The serial No. is indicated on the plates of both emitter and receiver. (Indicated under model No.)

• Make sure to carry out the test run before regular operation.
 • Do not install this light curtain with a machine whose operation cannot be stopped immediately in the middle of an operation cycle by an emergency stop equipment.

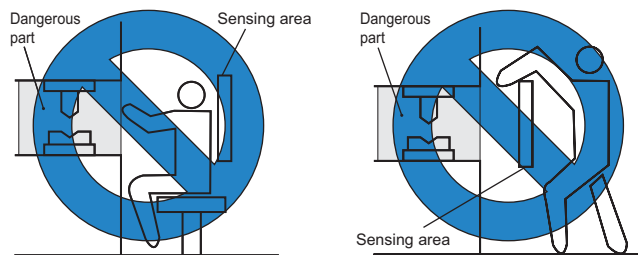
Sensing area

 Make sure to install this light curtain such that any part of the human body must pass through its sensing area in order to reach the dangerous parts of the machinery. If the human body is not detected, there is a danger of serious injury or death.
 • Do not use any reflective type or retroreflective type arrangement.
 • Furthermore, never use this light curtain facing several receivers towards one emitter or vice versa.


Example of correct installation

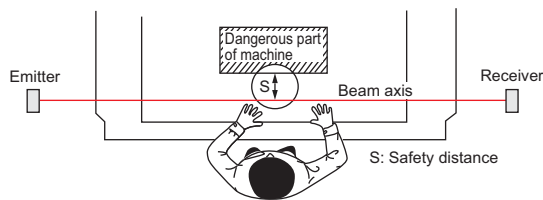



Example of incorrect installation



Safety distance

 Calculate the safety distance correctly, and always maintain a distance which is equal to or greater than the safety distance, between the sensing area of this light curtain and the dangerous parts of the machinery. (Please check the latest standards for the equation.) If the safety distance is miscalculated or if sufficient distance is not maintained, there is a danger of serious injury or death.
 • Before designing the system, refer to the relevant standards of the region where this device is to be used and then install this device.



 The sizes of the minimum sensing objects for this light curtain vary depending on whether or not the floating blanking function is being used. Calculate the safety distance with the proper size of the minimum sensing object and appropriate equation.

Size of minimum sensing object when applying floating blanking function

| | Invalid | Setting (Note 1) | | |
|--|---------------------|---------------------|---------------------|---------------------|
| | | 1 beam channel | 2 beam channels | 3 beam channels |
| Min. sensing object when applying floating blanking function | ø25 mm ø0.984 in | ø45 mm ø1.772 in | ø65 mm ø2.559 in | ø85 mm ø3.346 in |

Note: Refer to p.6 for details of the floating blanking function.

• Safety distance is calculated based on the following equation when a person moves perpendicular (normal intrusion) to the sensing area of the light curtain. In case the intrusion direction is not perpendicular to the sensing area, be sure to refer to the relevant standard (regional standard, specification of the machine, etc.) for details of the calculation. (Please check the latest standards for the equation.)

For use in Europe (EU) (as EN 999)] (Also applicable to ISO 13855 / JIS B 9715)

For intrusion direction perpendicular to the sensing area
 <In case that the minimum sensing object is ø40 mm ø1.575 in or less>

- Equation ① $S = K \times T + C$
 S: Safety distance (mm)
 Minimum required distance between the sensing area surface and the dangerous parts of the machine
 K: Intrusion velocity of operator's body or object (mm/sec.)
 Normally taken as 2,000 (mm/sec.) for calculation
 T: Response time of total equipment (sec.)
 $T = T_m + T_{SF4C}$
 T_m: Maximum halting time of machinery (sec.)
 T_{SF4C}: Response time of the SF4C series 0.007 (sec.)
 C: Additional distance calculated from the size of the minimum sensing object of the light curtain (mm)
 However, the value of “C” cannot be less than 0.
 $C = 8 \times (d - 14)$
 d: Minimum sensing object diameter (mm)

PRECAUTIONS FOR PROPER USE

- For calculating the safety distance “S”, there are the following five cases.
First calculate by substituting the value $K = 2,000$ (mm/sec.) in the equation previous. Then, classify the obtained value of “S” into three cases, 1) $S < 100$, 2) $100 \leq S \leq 500$, and 3) $S > 500$. For Case 3) $S > 500$, recalculate by substituting the value $K = 1,600$ (mm/sec.). After that, classify the calculation result into two cases, 4) $S \leq 500$ and 5) $S > 500$. For details, refer to the instruction manual enclosed with this product.
- When this light curtain is used in the “PSDI mode”, an appropriate safety distance “S” must be calculated. For details, be sure to refer to the standards or regulations applicable in each region or country.

<In the case that the minimum sensing object is $\phi 40$ mm $\phi 1.575$ in or more>

- Equation ① $S = K \times T + C$
S: Safety distance (mm)
K: Intrusion velocity of operator’s body or object (mm/sec.)
Taken as 1,600 (mm/sec.) for calculation
T: Response time of total equipment (sec.)
 $T = T_m + T_{SF4C}$
 T_m : Maximum halting time of machinery (sec.)
 T_{SF4C} : Response time of the SF4C series 0.007 (sec.)
C: Additional distance calculated from the size of the minimum sensing object of the light curtain (mm)
 $C = 850$ (mm) (Constant)

For use in the United States of America (as per ANSI/RIA 15.06)

- Equation ② $S = K \times (T_s + T_c + T_{SF4C} + T_{bm}) + D_{pf}$
S: Safety distance (mm)
Minimum required distance between the sensing area surface and the dangerous parts of the machine
K: Intrusion velocity {Recommended value in OSHA is 63 (inch/sec.) $\approx 1,600$ (mm/sec.)}
ANSI/RIA 15.06 does not define the intrusion velocity “K”. When determining “K”, consider possible factors including physical ability of operators.
 T_s : Halting time calculated from the operation time of the control element (air valve, etc.) (sec.)
 T_c : Maximum response time of the control circuit required for functioning the brake (sec.)
 T_{SF4C} : Response time of light curtain (sec.)
 T_{bm} : Additional halting time tolerance for the brake monitor (sec.)
The following equation holds when the machine is equipped with a brake monitor.
 $T_{bm} = T_a - (T_s + T_c)$
 T_a : Setting time of brake monitor (sec.)
When the machine is not equipped with a brake monitor, it is recommended that 20 % or more of $(T_s + T_c)$ is taken as additional halting time.
 D_{pf} : Additional distance calculated from the size of the minimum sensing of the
 $D_{pf} = 61.2$ mm **2.409 in**


$$\left[\begin{aligned} D_{pf} &= 3.4 \times (d - 0.276) \text{ (inch)} \\ &\approx 3.4 \times (d - 7) \text{ (mm)} \end{aligned} \right]$$

d: Minimum sensing object diameter 0.985 (inch) ≈ 25 mm

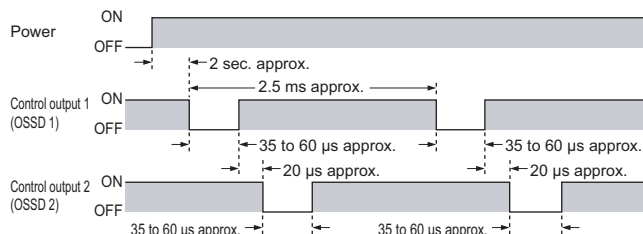
- If the floating blanking function is used, min. sensing object become larger.
When $d > 64$ mm **2.5 in**, $D_{pf} = 900$ mm **3 ft** as per ANSI/RIA 15.06

Output waveform [Control outputs (OSSD 1, OSSD 2) ON]


- Since the receiver performs the self-diagnosis of the output circuit when the light curtain is in beam received condition (ON status), the output transistor becomes OFF status periodically. (Refer to the figure below.)
When the OFF signal is fed back, the receiver judges the output circuit as normal. When the OFF signal is not fed back, the receiver judges either the output circuit or wiring as error, and the control outputs (OSSD 1, OSSD 2) maintain OFF status.

 Since the OFF signal of this light curtain might cause malfunction, perform the connection paying attention to the input response time of the machine to be connected to this light curtain.

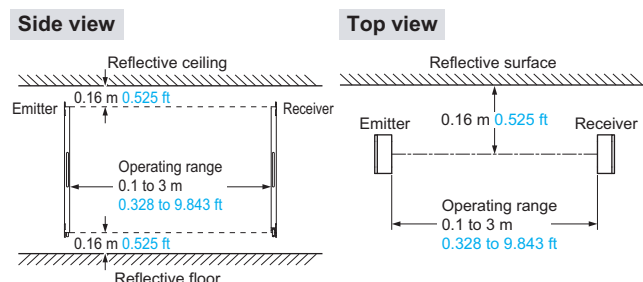
<Time chart>



Influence of reflective surfaces


 If there exists a reflective surface in the place where this light curtain to be installed, make sure to install this light curtain so that reflected light from the reflective surface does not enter into the receiver, or take countermeasures such as painting, masking, roughening, or changing the material of the reflective surface, etc. Failure to do so may cause the device not to detect, resulting in death or serious injury.

- Install this light curtain at a distance of 0.16 m **0.525 ft** or more from reflective surfaces such as metal walls, floors, ceilings, sensing objects, covers, panels or glass surfaces.



PRECAUTIONS FOR PROPER USE


Handy-controller (available soon)



This light curtain enables to set each function using the handy-controller **SFC-HC** (available soon). Among the functions, the contents related to the safety distance such as the size of the minimum sensing object and response time are varied depending on the setting condition. When setting each function, re-calculate the safety distance, and make enough space larger than the calculated safety distance. Failure to do so might cause the accident that the device cannot stop quickly before reaching the dangerous area of the machinery, resulting in the serious injury or death.

- Refer to the instruction manual enclosed with the handy-controller for details of the function settings for using handy-controller **SFC-HC** (available soon).

Troubleshooting quick reference sheet

| Digital error indicator | Possible cause |
|---|--|
| 0 | Incorrect wiring. Affected by large noise. Handy-controller setting error. |
| 3 | Incorrect number of beam channels of emitter and receiver. |
| 4 | <Emitter side lights up> Interlock setting input wire (pale purple) or test input / reset input wire (pink) connected incorrectly. <Receiver side lights up> Affected by extraneous light, or mutual interference occurring. |
| 5 | <Emitter side lights up> Safety input 1 (gray) or safety input 2 (gray / black) connected incorrectly. <Receiver side lights up> Control output 1 (black), control output 2 (white) connected incorrectly. |
| 6 | Output polarity setting wires (shield) connected incorrectly. Output polarity setting wire is disconnected or short-circuited to other wire. |
| 7 | <In case of using the external device monitoring function> External device (safety relay, etc.) is connected incorrectly or welding, out of the specified range. <In case of not using the external device monitoring function> Auxiliary output wire (yellow-green / black) and external device monitoring input wire (yellow-green) are disconnected. Auxiliary output wire (yellow-green / black) is disconnected or short-circuited. Auxiliary output setting is changed by SFC-HC (available soon). |
| 8 | Wiring, voltage or supply capacity is incorrect. |
| 9 | <Emitter side lights up> Muting lamp output wire (red) connected incorrectly. Muting lamp is out of the specified range. Muting lamp output circuit malfunction. <Receiver side lights up> Control output 1 (black), control output 2 (white) connected incorrectly or flowing overcurrent. |
| E | Emitter is in lockout status. |
| F | Affected by noise. Internal circuit is broken down. |
| G | Synchronization + wire (orange) or synchronization – wire (orange / black) connected incorrectly. Receiver or emitter malfunction. |
| i | Receiver is in lockout status. |
|  | Test input / reset input wire (pink) is open when selecting automatic reset. Test input / reset input wire (pink) is connected to 0 V or +V when selecting manual reset. |

Others

- Our products have been developed / produced for industrial use only.
- Do not use during the initial transient time (2 sec.) after the power supply is switched on.
- Avoid dust, dirt and steam.
- Take care that the sensor does not come in direct contact with water, oil, grease, or organic solvents, such as, thinner, etc.
- Take care that the sensor is not directly exposed to fluorescent lamp from a rapid-starter lamp or a high frequency lighting device, as it may affect the sensing performance.

Disclaimer

- The applications described in the catalog are all intended for examples only. The purchase of our products described in the catalog shall not be regarded as granting of a license to use our products in the described applications. We do NOT warrant that we have obtained some intellectual properties, such as patent rights, with respect to such applications, or that the described application may not infringe any intellectual property rights, such as patent rights, of a third party.

* Refer to the instruction manual for details.

DIMENSIONS (Unit: mm in)

The CAD data in the dimensions can be downloaded from the SUNX website: <http://www.sunx.com>

SF4C-□

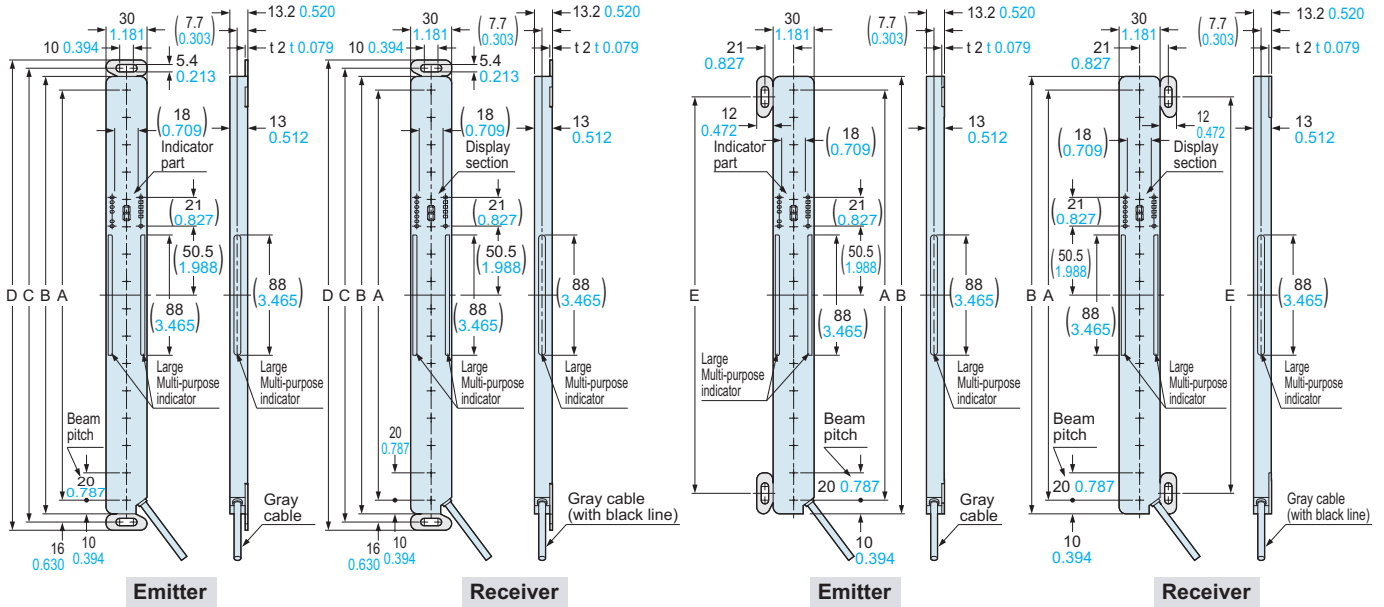
Light curtain

Mounting bracket assembly dimensions

Mounting drawing for the light curtain on which the standard mounting brackets **MS-SFC-1** (accessory) are mounted.

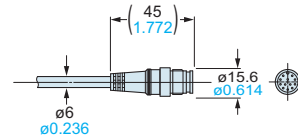
<Center mounting>

<Dead zoneless mounting>



| Model No. | | A | B | C | D | E |
|--------------|----------|------------|------------|------------|------------|------------|
| SF4C-H8-J05 | SF4C-H8 | 140 5.512 | 160 6.299 | 172 6.772 | 184 7.244 | 130 5.118 |
| SF4C-H12-J05 | SF4C-H12 | 220 8.661 | 240 9.449 | 252 9.921 | 264 10.394 | 210 8.268 |
| SF4C-H16-J05 | SF4C-H16 | 300 11.811 | 320 12.598 | 332 13.071 | 344 13.543 | 290 11.417 |
| SF4C-H20-J05 | SF4C-H20 | 380 14.961 | 400 15.748 | 412 16.220 | 424 16.693 | 370 14.567 |
| SF4C-H24-J05 | SF4C-H24 | 460 18.110 | 480 18.898 | 492 19.370 | 504 19.842 | 450 17.717 |
| SF4C-H28-J05 | SF4C-H28 | 540 21.260 | 560 22.047 | 572 22.520 | 584 22.992 | 530 20.866 |
| SF4C-H32-J05 | SF4C-H32 | 620 24.409 | 640 25.197 | 652 25.669 | 664 26.142 | 610 24.016 |

<Connector of the pigtailed type SF4C-H□-J05>

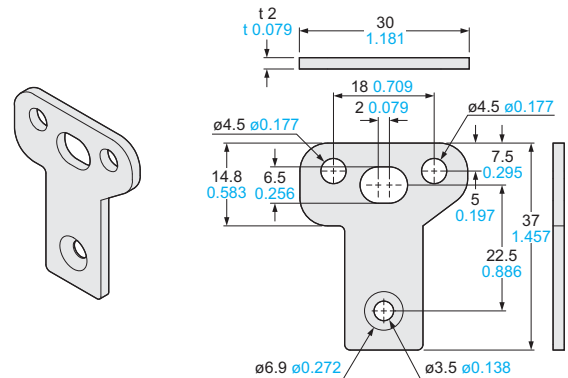
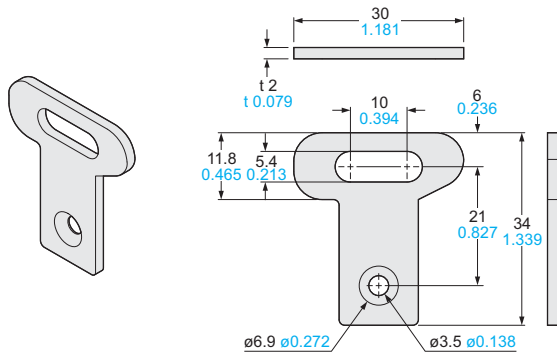


MS-SFC-1

Standard mounting bracket (Accessory)

MS-SFC-2

NA2-N compatible mounting bracket (Optional)



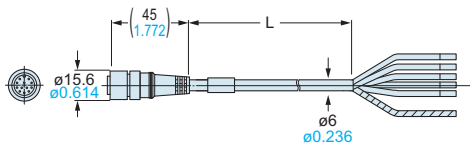
Material: Stainless steel (SUS304)
 Four bracket set
 Four M3 (length 4 mm 0.157 in) countersunk screws are attached.

Material: Stainless steel (SUS304)
 Four bracket set
 Four M3 (length 4 mm 0.157 in) countersunk screws are attached.

DIMENSIONS (Unit: mm in)

The CAD data in the dimensions can be downloaded from the SUNX website: <http://www.sunx.com>

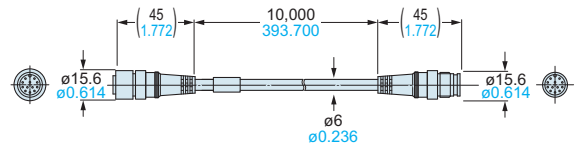
SFB-CC□-MU Mating cable with connector on one end (Optional)



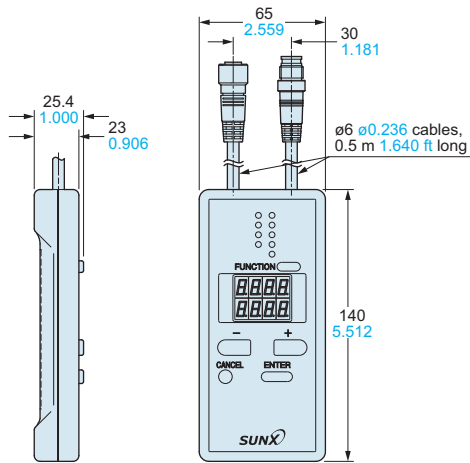
• Length L

| Model No. | Length L |
|--------------------|----------------|
| SFB-CC3-MU | 3,000 118.110 |
| SFB-CC7-MU | 7,000 275.590 |
| SFB-CC10-MU | 10,000 393.700 |

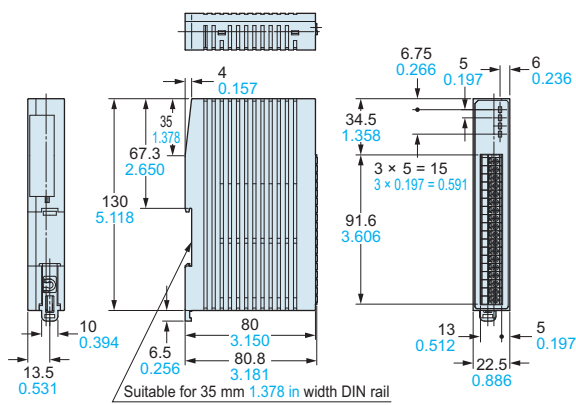
SFB-CCJ10□-MU Mating cable with connectors on both ends (Optional)



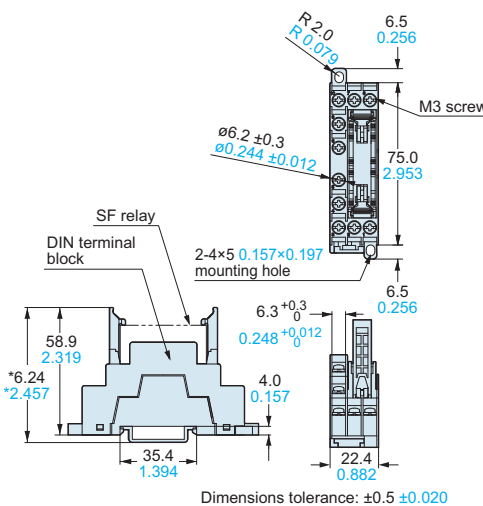
SFC-HC Handy-controller (Available soon)



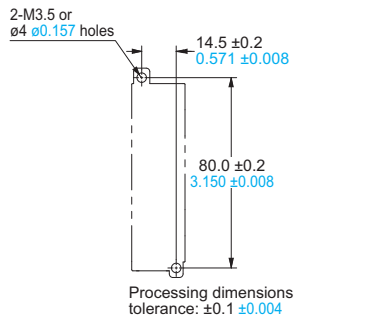
SF-C13 Control unit (Optional)



SFS3-DC24V SFS3-L-DC24V Safety relay manufactured by Panasonic Electric Works Ltd.

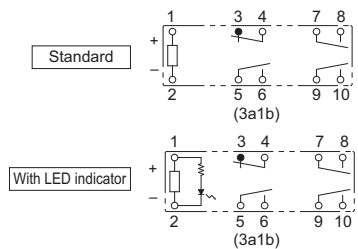


Mounting hole processing diagram

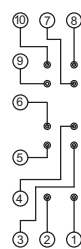


* Reference value (when using DIN rail ATA 48011)
 Note: The round terminal is not used on DIN terminal block.

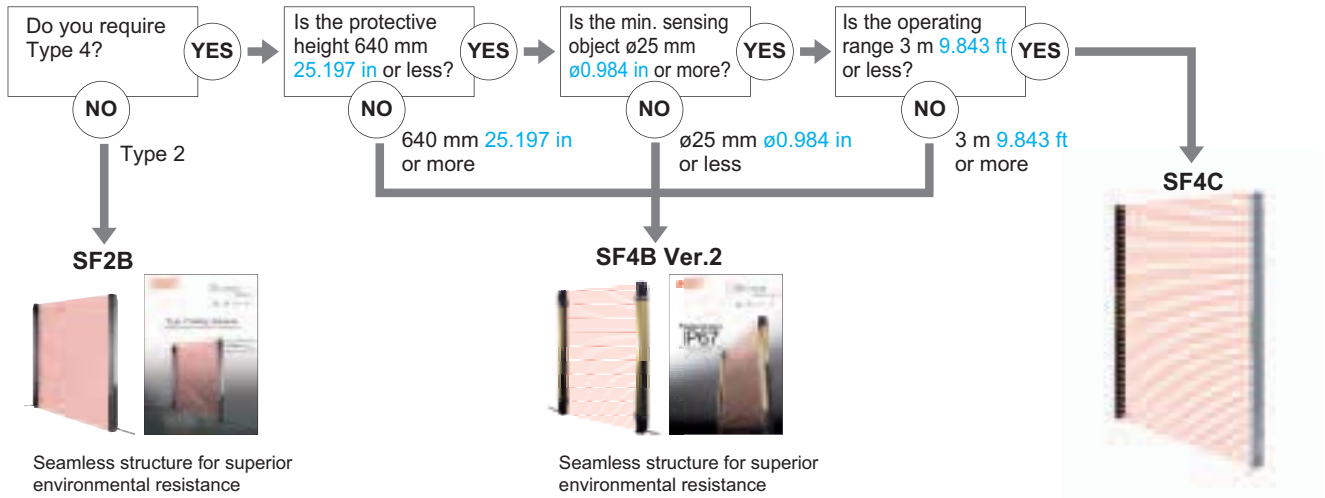
SF relay internal wiring diagram (Bottom view)



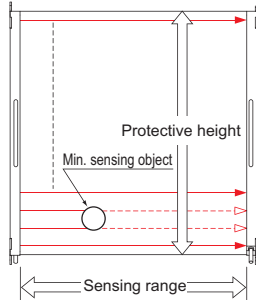
DIN terminal internal wiring diagram (Top view)



Light curtain selection guide



• Definition of terms



All information is subject to change without prior notice.

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