



Type2  
**NEW** LIGHT CURTAIN  
SF2B<sub>SERIES</sub>



Conforming to  
OSHA / ANSI

**JIS**

# Type 2 Safety Solution

International regulations for safety measures at reasonable cost



- Sensing range '13 m **42.651 ft**'
- 'ZERO' dead zone
- Environmental resistance 'UP'

# Achieving a safety design that complies with international standards at reasonable cost ... From area sensors to the new era of light curtains

EN 954

IEC 61496-1/2

ISO 12100

ISO 13849-1

JIS B 9705-1

OSHA/ANSI  
OHSAS 18001

Type2 Light Curtain

International standard safety design

## SF2B<sub>SERIES</sub>

Reasonable cost

**SUNX**  
ISM

SUNX provides the optimum devices for varying risk levels to achieve safe designs while also balancing costs.

# Safety regulations are established throughout the world that require different safety designs for different risk levels.

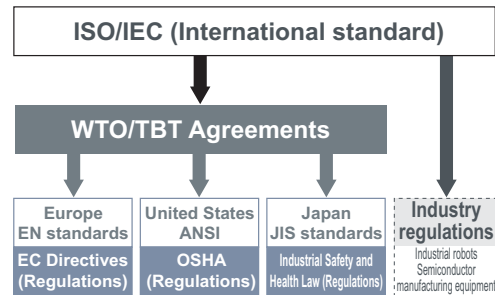
'Safety' in the working environment is something that everybody who works in that environment wants, and manufacturers and equipment designers also have a duty to ensure the safety of these people.

Risk assessment is a necessary part of the implementation of safety designs that follow the general principles underlying international standards, such as 'People can make mistakes' and 'Equipment can break down'.

'Risk assessment' is a procedure whereby risk is assessed and the safety measures are carried out at a level which is in accordance with the magnitude of such risk. The starting line for safety design is to consider all risks and then to implement measures against those risks in the order of risk priority.

Regulations governing safety design are being developed around the world also.

Safety design considerations are being included in industry standards based on ISO/IEC which are being implemented around the world.



## Safety solutions corresponding to different risk levels - Type 2 & Type 4

Is it necessary for international standards for safety equipment to be applied to equipment which does not present the risk of serious injury or death?

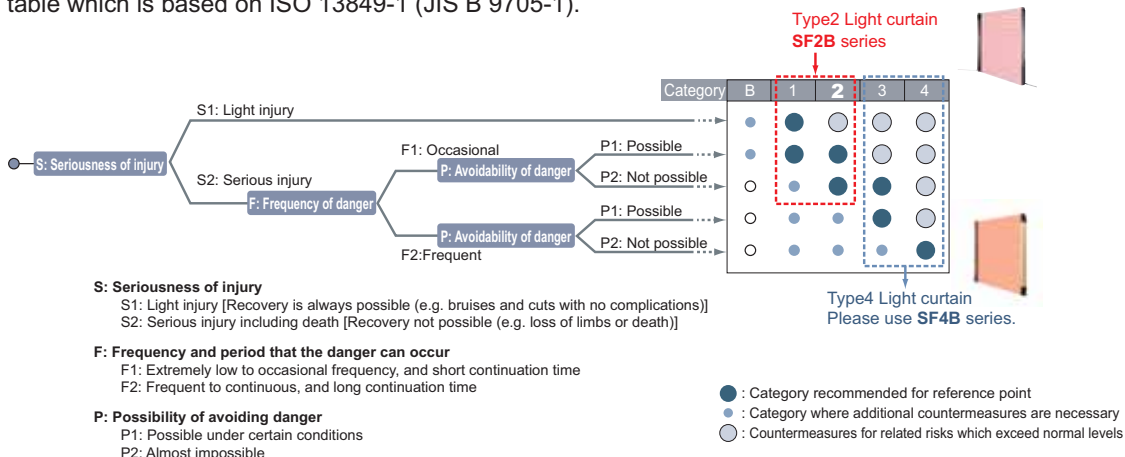
In addition, are the necessary safety designs the same for equipment which does present the risk of serious injury or death and equipment which presents the risk of slight injury?

International standards require risk assessment to be carried out so that source of the danger can be identified and safety design can be implemented in accordance with the size of the risk, in order to reduce the risk to an acceptable level.

In order to provide safety designs which correspond to different risk levels, SUNX has created two types of light curtain (Type 2 and Type 4) which both comply with international safety standards.

## Risk diagnosis using risk assessment

The safety design system centering around light curtains is selected using the following diagnosis table which is based on ISO 13849-1 (JIS B 9705-1).



# Compact, long-range, 'zero' dead zone Excellent basic performance in addition to compliance with international safety standards.

In addition to compliance with the IEC 61496 (Type 2) international safety standard, excellent performance with good ease of use is provided in a wide variety of applications from compact machinery installed side-by-side to save space, through to large equipment for long-range, wide-area sensing.

The SF2B series helps to make safety measures easier and plays an indispensable part in creating a safe working environment.



Thickness 26 mm 1.024 in  
when setting up

**New concept** **'ZERO'** **Dead zone**

Unit length = Protective height



● Sensing range  
**13 m**  
42.651 ft

1.8 times  
previous models

● Maximum sensing width  
(Protective height)  
**1,912 mm**  
75.275 in



Only 6 mm 0.236 in from the center of the first beam channel to the edge of the light curtain (Arm / Foot protection type) has 26 mm 1.024 in

\* Image shows installation to equipment with no glossiness.



Cables can be routed freely



## A large number of variations to suit different needs

Abundant range of variations available with sensing widths from 168 mm to 1,912 mm **6.614 in to 75.275 in**

Two types are available for different minimum sensing object sizes. Furthermore, sub-sensors for serial connection (optional) can be used to connect up to three sets of light curtains (up to a total maximum of 128 beam channels; however the **SF2B-A** allows up to 96 beam channels when two sets are connected, and up to 64 beam channels when three sets are connected).

### Hand protection type SF2B-H

Minimum sensing object  $\phi 27$  mm  $\phi 1.063$  in  
(20 mm 0.787 in beam pitch)



### Arm / Foot protection type SF2B-A

Minimum sensing object  $\phi 47$  mm  $\phi 1.850$  in  
(40 mm 1.575 in beam pitch)



### Serial connection of up to three sets is possible

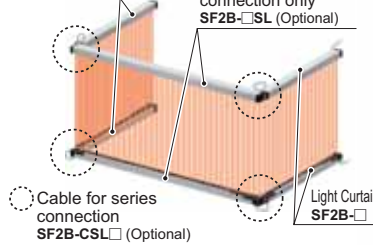
Light curtains can be connected in series by using the sub-sensors for serial connection.



- The light curtains and the sub-sensors for serial connection (optional) have different part numbers. When connecting light curtains in series, be sure to use the sub-sensors for serial connection and serial connection cables which are sold separately.
- The **SF2B-H8** and **SF2B-A4** cannot be connected in series. For details, refer to 'PRECAUTIONS FOR PROPER USE' (P.26~).

Sub-sensor for series connection only  
**SF2B-SL** (Optional)

Sub-sensor for series connection only  
**SF2B-SL** (Optional)



Hand protection type and Arm / Foot protection type can be used together.



## 'ZERO' dead zone New concept

Unit length = protective height, so mounting is possible with no dead zone.

The sensing area contains no dead spaces. Even with serial connections, there are no dangerous openings at the interfaces between light curtains. This makes simpler and more compact installation possible.

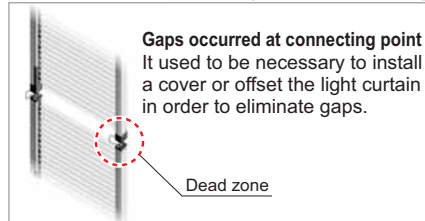
### SF2B

#### ● 'ZERO' dead zone when using series mounting



### Previous model

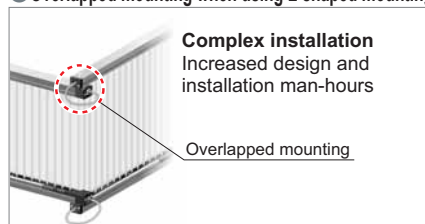
#### ● Dead zone when using series mounting



#### ● 'ZERO' dead zone when using L-shaped mounting



#### ● Overlapped mounting when using L-shaped mounting



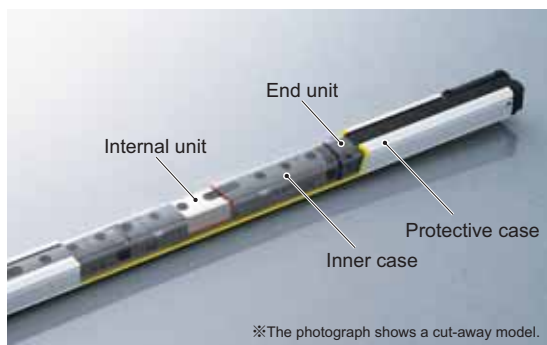
# Extraneous light, mutual interference and mists ... High reliability even under poor environmental conditions as these

**NEW**

Improved environmental stability

Adoption of inner case

**'Seamless structure'**



**Seamless structure with reduced seam area prevents intrusion of particles such as oil mists and dust.**

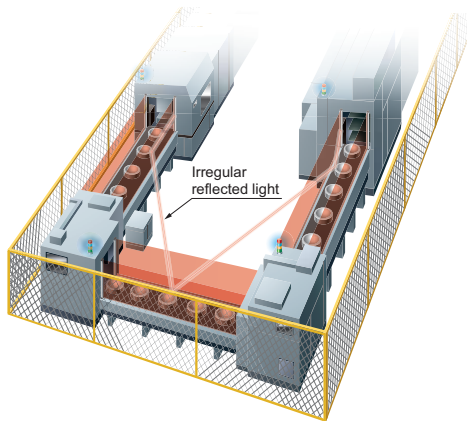
The inner unit is protected by a cylindrical inner case. The seams such as unit and lens surfaces have been greatly reduced, so that particles such as oil mists and dust are prevented from getting in.

[The protective structure is IP65 (IEC).]

The advanced \*ELCA function used in previous light curtains that has been widely acclaimed in the marketplace has been included again. It suppresses mutual interference and the effects of extraneous light. \*Extraneous Light Check & Avoid

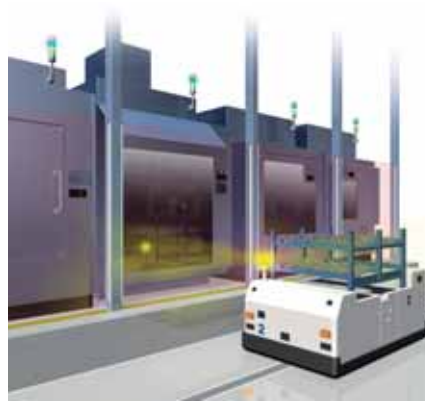
**Mutual interference is reduced without need for interference prevention lines**

The scan timing of the light curtain is automatically shifted in order to reduce mutual interference.



**Reducing the number of malfunctions caused by extraneous light**

A double scanning method and retry processing are new functions exclusive to SUNX that are effective in eliminating the effect of momentary extraneous light from peripheral equipment.



**Light curtain is protected to prevent problems**

**Front protection cover protects the sensing surfaces**

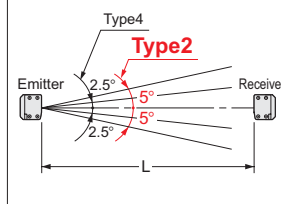
This can be used to protect the sensing surfaces even if the light curtain is set up in harsh environments such as places where oil and welding spatter occur (optional).



**International safety standard interference countermeasures**

**Beam axes are narrow to reduce interference**

The IEC 61496-2 international safety standard specifies a light opening angle of  $\pm 5^\circ$  or less (at  $L > 3\text{ m}$  9.843 ft) for Type 2 in order to improve the interference prevention performance of the light curtain.



# Greater convenience from starting up to repairs and maintenance

## Supports resolution of electrical problems when starting up lines

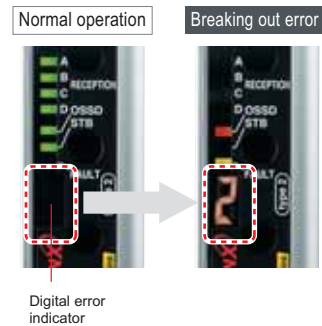
Equipped with a digital error indicator so that error details can be understood at a glance!

The system constantly checks the light curtain for problems such as incorrect cable wiring, disconnection and short-circuits, and also for internal circuit problems and incoming light problems. If a problem should occur, details of the error appear on the digital display. The error details can be checked at a glance without the inconvenience of the previous method of counting the number of LED blinks, so that smooth support is possible if problems occur at startup and during maintenance operations, even if assistance is given via telephone.

**Convenient**

Error number notification means

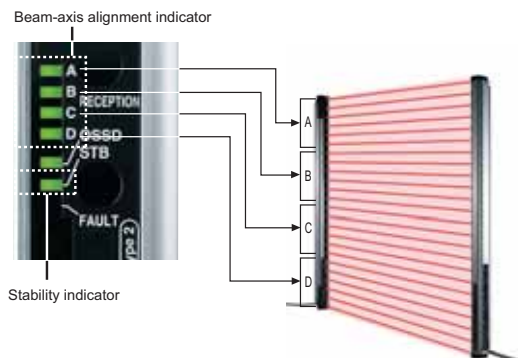
**Smooth support via telephone**



## Convenient tools make it easy to adjust beam axis alignment at startup

The beam-axis alignment indicators that incident light position can be seen at a glance

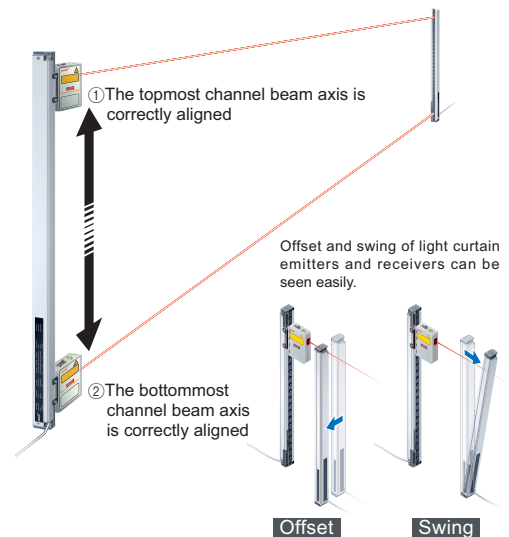
Beam-axis alignment indicators display the beam channels of the light curtain in four blocks. When the beam channel at the bottommost channel (or topmost channel) that is used as a reference for beam-axis alignments correctly aligned, the LED blinks red. After this, each block lights red as the beam axes successively become aligned, and when all channel beam axes are aligned, all LEDs light green. A stability indicator (STB.) which illuminates when there is sufficient incoming light has also been added so that setup can be carried out with greater stability.



\* When using the SF2B-CB05-B adapter cable, the beam axis alignment indicator cannot be used.

Alignment of beam axes can be performed prior to power-up

With the SF-LAT-2B laser alignment tool (optional), beam axis alignment can be quickly performed using an easy-to-see laser beam spot. Because the laser alignment tool is battery-operated, beam axis alignment can be performed before actual powering up of the light curtain itself.



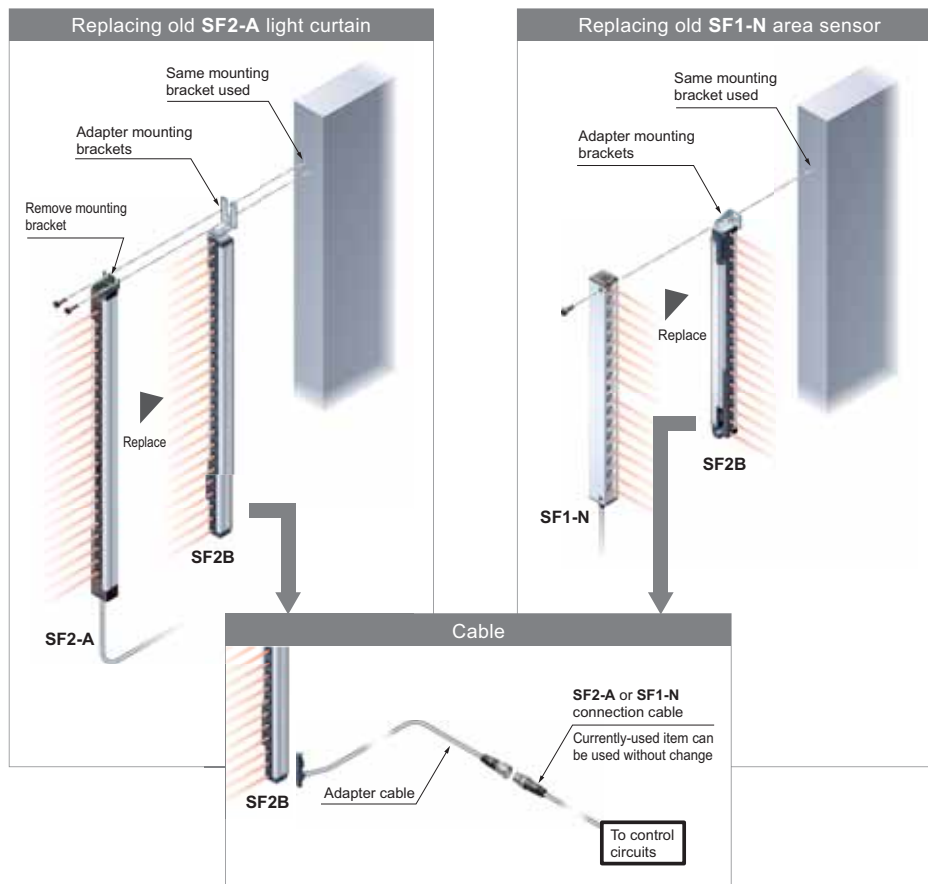


## Standardization of spare parts, regardless of whether line is old or new

Adapter cables and adapter mounting brackets are available so that previous peripheral devices for light curtains can still be used **New concept**

Adapter cables and adapter mounting brackets are available to make it much easier to replace the wiring when changing over from **SF2-A** series or **SF2-N** series light curtains or **NA40** series or **SF1-N** series area sensors to a new series (Note). Mounting holes and control circuit connector cables do not need to be changed. There is no need to use spare parts for previous models, so registration numbers can be reduced to **SF2B** series components only.

Note: For details, please contact our office.



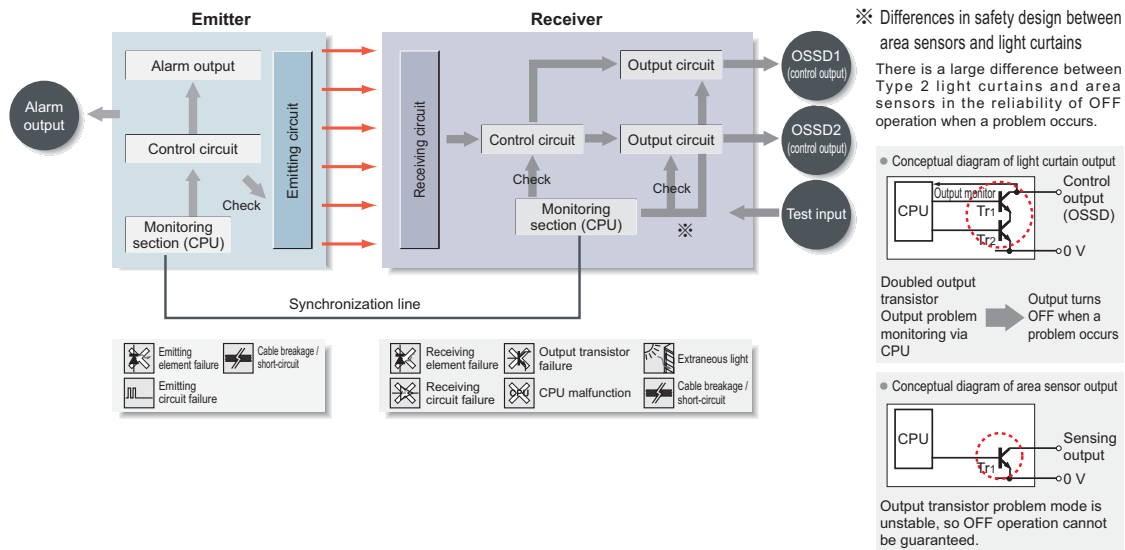
- If changing over from area sensors for an application that involves personal protection, it is necessary to carry out a risk assessment for the equipment in order to make sure that the design satisfies international safety standards, and so that the control circuits can be designed for safety in accordance with the type designation for the light curtain.
- If replacing the **SF2B** series with area sensors, beam synchronization occurs between the emitters and the receivers, so that the sensing ranges will be reduced by 0.2 to 5 m **0.656 to 16.404 ft**, and the ELCA function will not operate.

# Safety concepts for implementing Type 2 safety solutions

## International standard safety design

The SF2B series has a safety design which complies with the IEC 61496 international safety standard, and is also guaranteed by a third-party certification organization.

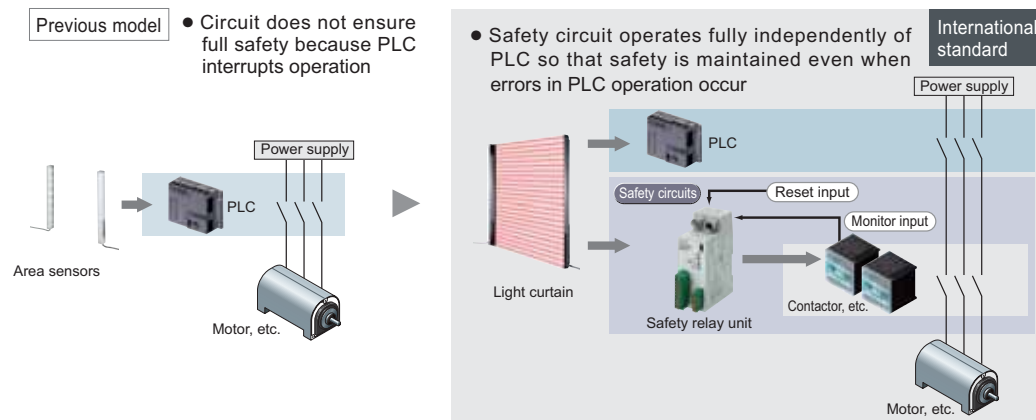
- The light curtain switches to the lockout mode when an error occurs, so that the OSSD (control output) and alarm output turn OFF.
- The output circuit is constantly monitored, so that the sensor also locks out if one of the transistors is short-circuited.
- Self-diagnosis using test input allows detailed checking such as overlapping emission light emitting amount, etc.



## Safety circuit design that satisfies international standards

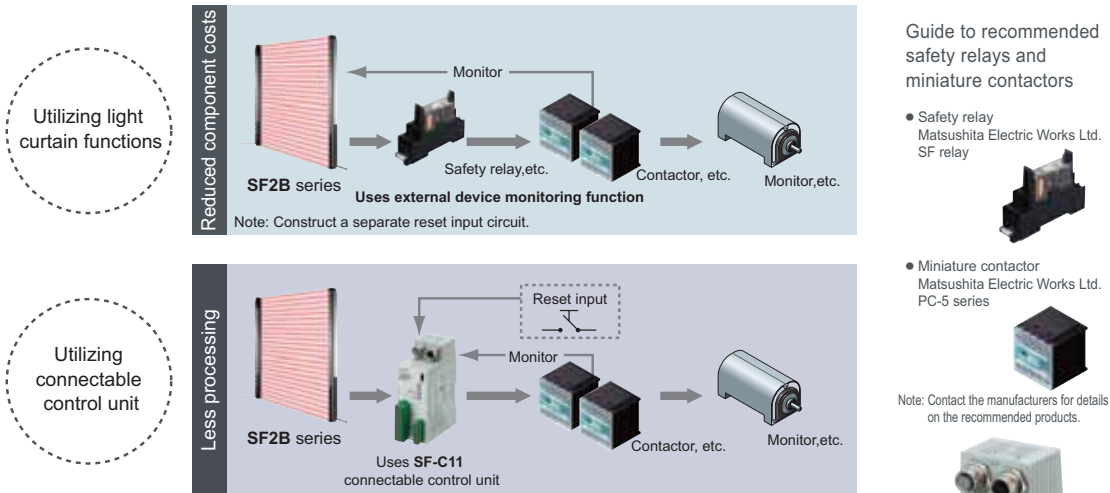
A system which satisfies Category 2 risk assessment is shown below.

- [Category 2 requirements]**
- Use of components with high reliability
  - System is checked at appropriate intervals



## Selectable safety circuits

The light curtain unit has a built-in monitoring function for external devices (such as fused relay monitoring). This supports the construction of light curtain peripheral safety circuits which do not use a safety relay unit, and contributes to reduced costs and a more compact control panel. In addition, a connectable control unit is used, so that a safety circuit that is easy to construct and easy to install can be selected.



## Exclusive control unit is available for easy design and construction of safety circuits

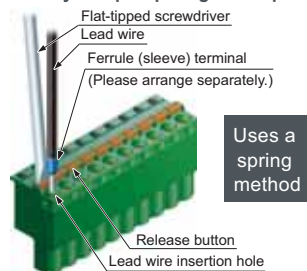
Light curtain peripheral safety circuits that are compatible with international safety standards are combined into a single unit. This reduces the work involved in constructing the circuits.

### ● Quick-connection



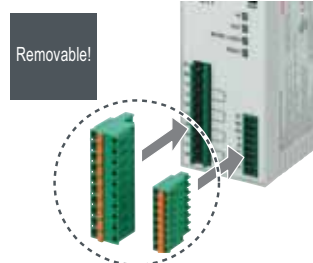
Connecting to the light curtain is done using plug-in connections, which shortens setup and replacement time.

### ● Easy setup requiring no torque control



A spring method is used for the terminal blocks for connections other than to the light curtain. There is no need to control tightening torques for these terminal blocks.

### ● Removable terminal blocks reduce maintenance time

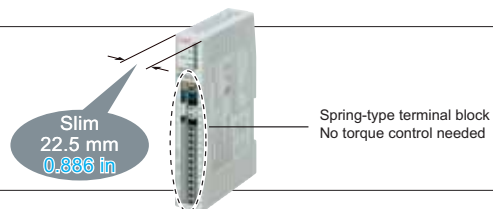


Removable terminal blocks are used. This reduces the work required for reconnecting wiring during maintenance.

### Slim type control unit SF-C13

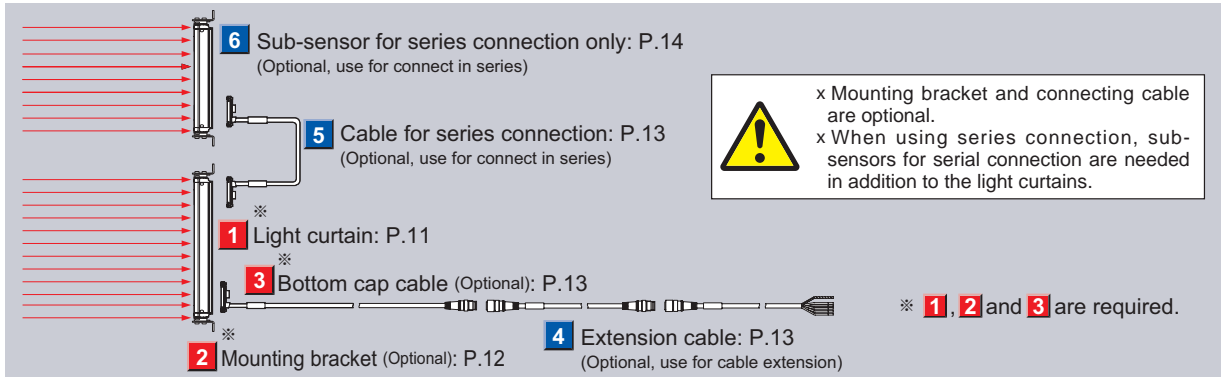
#### Slim design

22.5 mm 0.886 in thickness, so can be inserted even into narrow spaces inside panels.



# SF2B

## PRODUCT CONFIGURATION

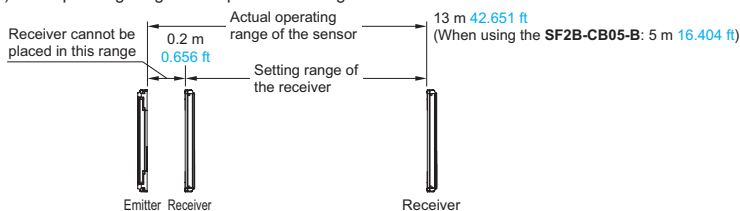


## ORDER GUIDE

**1 Light curtains** Mounting bracket and connecting cable are not supplied with the light curtain. It is sold separately, so be sure to purchase one.

Type	Appearance	Operating range (Note 1)	Model No.		Number of beam channels	Protective height (mm in)
			NPN output type	PNP output type		
Hand protection type Min. sensing object *27 mm *1.063 in (20 mm 0.787 in beam pitch)			SF2B-H8-N	SF2B-H8-P	8	168 6.614
			SF2B-H12-N	SF2B-H12-P	12	232 9.134
			SF2B-H16-N	SF2B-H16-P	16	312 12.283
			SF2B-H20-N	SF2B-H20-P	20	392 15.433
			SF2B-H24-N	SF2B-H24-P	24	472 18.583
			SF2B-H28-N	SF2B-H28-P	28	552 21.732
			SF2B-H32-N	SF2B-H32-P	32	632 24.882
			SF2B-H36-N	SF2B-H36-P	36	712 28.031
			SF2B-H40-N	SF2B-H40-P	40	792 31.181
			SF2B-H48-N	SF2B-H48-P	48	952 37.480
			SF2B-H56-N	SF2B-H56-P	56	1,112 43.779
			SF2B-H64-N	SF2B-H64-P	64	1,272 50.079
			SF2B-H72-N	SF2B-H72-P	72	1,432 56.378
			SF2B-H80-N	SF2B-H80-P	80	1,592 62.677
			SF2B-H88-N	SF2B-H88-P	88	1,752 68.976
			SF2B-H96-N	SF2B-H96-P	96	1,912 75.275
Arm / Foot protection type Min. sensing object *47 mm *1.850 in (40 mm 1.575 in beam pitch)			SF2B-A4-N	SF2B-A4-P	4	168 6.614
			SF2B-A6-N	SF2B-A6-P	6	232 9.134
			SF2B-A8-N	SF2B-A8-P	8	312 12.283
			SF2B-A10-N	SF2B-A10-P	10	392 15.433
			SF2B-A12-N	SF2B-A12-P	12	472 18.583
			SF2B-A14-N	SF2B-A14-P	14	552 21.732
			SF2B-A16-N	SF2B-A16-P	16	632 24.882
			SF2B-A18-N	SF2B-A18-P	18	712 28.031
			SF2B-A20-N	SF2B-A20-P	20	792 31.181
			SF2B-A24-N	SF2B-A24-P	24	952 37.480
			SF2B-A28-N	SF2B-A28-P	28	1,112 43.779
			SF2B-A32-N	SF2B-A32-P	32	1,272 50.079
SF2B-A36-N	SF2B-A36-P	36	1,432 56.378			
SF2B-A40-N	SF2B-A40-P	40	1,592 62.677			
SF2B-A44-N	SF2B-A44-P	44	1,752 68.976			
SF2B-A48-N	SF2B-A48-P	48	1,912 75.275			

Notes: 1) The 'operating range' is the possible setting distance between the emitter and the receiver. The light curtain can detect less than 0.2 m 0.656 ft away.



2) Models which have an 'E' symbol in the model No. on the name plate are emitters, and those with a 'D' symbol are receivers.



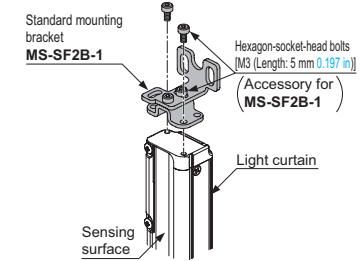
ORDER GUIDE

**2 Mounting brackets** Mounting bracket is not supplied with the light curtain. Be sure to order it separately.

Designation	Appearance	Model No.	Description
Standard mounting bracket		<b>MS-SF2B-1</b>	Used to mount the light curtain on the rear surface and side surface (4 pcs. per set for emitter and receiver)
Dead zoneless mounting bracket		<b>MS-SF2B-3</b> (Available soon)	Mounting of the light curtain is possible so that the mounting bracket does not project past the protective height (light curtain width). (4 pcs. per set for emitter and receiver)
Adapter mounting brackets	For SF2-A / SF2-N For rear and side mounting	<b>MS-SF2B-5</b>	Used when replacing units in the SF2-A / SF2-N series. (4 pcs. per set for emitter and receiver)
	For SF1-N / NA40 For rear mounting	<b>MS-SF2B-4</b>	Used when replacing units in the SF1-N / NA40 series which are using the MS-SF1-1 / MS-NA40-1 sensor mounting brackets. (4 pcs. per set for emitter and receiver)
	For NA40 For side mounting	<b>MS-SF2B-6</b>	Used when replacing units in the NA40 series which are side mounted (direct mounted). (4 pcs. per set for emitter and receiver)
	For SF1-N For side mounting	<b>MS-SF2B-7</b>	Used when replacing units in the SF1-N series which are side mounted (direct mounted). (4 pcs. per set for emitter and receiver)

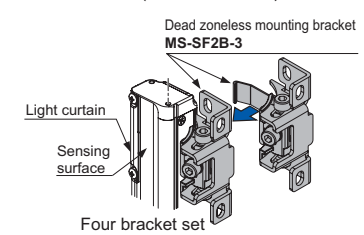
**Standard mounting bracket**

• **MS-SF2B-1**

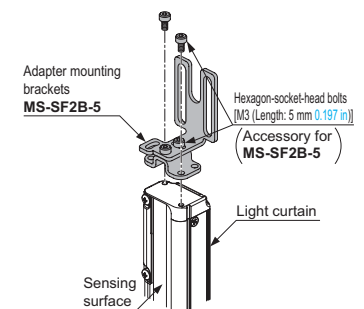


Four bracket set  
M3 (Length: 5 mm 0.197 in) hexagon-socket-head bolts are attached  
(8 pcs. for light curtain mounting;  
8 pcs. for beam axis adjustment)

• **MS-SF2B-3 (Available soon)**

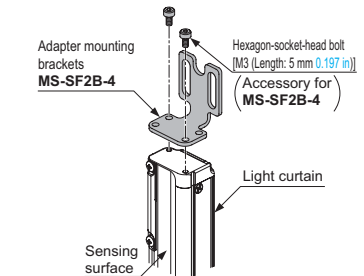


• **MS-SF2B-5**



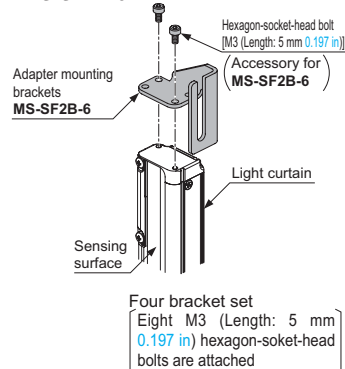
Four bracket set  
M3 (Length: 5 mm 0.197 in) hexagon-socket-head bolts are attached  
(8 pcs. for light curtain mounting;  
8 pcs. for beam axis adjustment)

• **MS-SF2B-4**

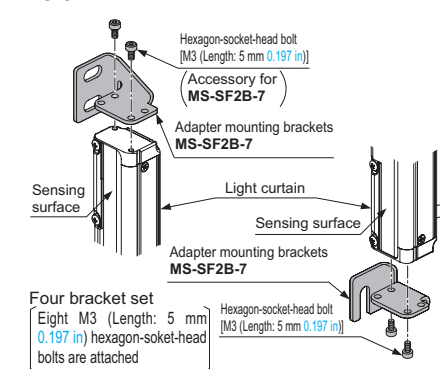


Four bracket set  
Eight M3 (Length: 5 mm 0.197 in) hexagon-socket-head bolts are attached

• **MS-SF2B-6**

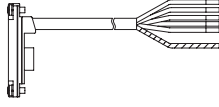
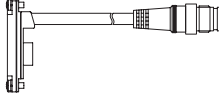
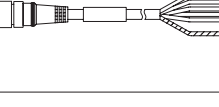
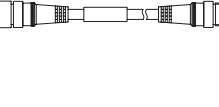
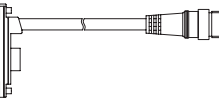



• **MS-SF2B-7**



## ORDER GUIDE

**3 4 5** Connecting cable / Extension cable / Cables for series connection Connecting cable is not supplied with the light curtain. Be sure to order it separately.

Type	Appearance	Model No.	Description		
8-core cable	<div style="display: flex; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); font-weight: bold; margin-right: 5px;">3 Bottom cap cable</div> <div style="margin-right: 10px;">Discrete wire</div>  </div>	<b>SF2B-CCB3</b>	Cable length: 3 m <b>9.843 ft</b> Net weight 370 g approx. (2 cables)	Used for connecting to the light curtain and to other cables or the <b>SF-C13</b> control unit. Two cables per set for emitter and receiver, Cable outer diameter: 6 mm <b>0.236 in</b> Cable color: Gray (for emitter), Gray with black line (for receiver) The min. bending radius: R6 mm <b>R0.236 in</b>	
		<b>SF2B-CCB7</b>	Cable length: 7 m <b>22.966 ft</b> Net weight 820 g approx. (2 cables)		
	<div style="display: flex; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); font-weight: bold; margin-right: 5px;">3 Connector</div>  </div>	<b>SF2B-CB05</b>	Cable length: 0.5 m <b>1.640 ft</b> Net weight 95 g approx. (2 cables)	Used for connecting to the light curtain and to an extension cable or the <b>SF-C11</b> control unit. Two cables per set for emitter and receiver, Cable outer diameter: 6 mm <b>0.236 in</b> Connector outer diameter: 14 mm <b>0.551 in</b> max. Cable color: Gray (for emitter), Gray with black line (for receiver) The min. bending radius: R6 mm <b>R0.236 in</b>	
		<b>SF2B-CB5</b>	Cable length: 5 m <b>16.404 ft</b> Net weight 620 g approx. (2 cables)		
		<b>SF2B-CB10</b>	Cable length: 10 m <b>32.808 ft</b> Net weight 1,200 g approx. (2 cables)		
	<div style="display: flex; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); font-weight: bold; margin-right: 5px;">4 Extension cable</div> <div style="margin-right: 10px;">Discrete wire</div>  </div>	<b>SFB-CC3</b>	Cable length: 3 m <b>9.843 ft</b> Net weight 380 g approx. (2 cables)	Used for connecting to an extension cable or the <b>SF-C13</b> control unit. Two cables per set for emitter and receiver, Cable outer diameter: 6 mm <b>0.236 in</b> Connector outer diameter: 14 mm <b>0.551 in</b> max. Cable color: Gray (for emitter), Gray with black line (for receiver) The min. bending radius: R6 mm <b>R0.236 in</b>	
		<b>SFB-CC10</b>	Cable length: 10 m <b>32.808 ft</b> Net weight 1,200 g approx. (2 cables)		
		<div style="display: flex; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); font-weight: bold; margin-right: 5px;">4 With connectors on both ends</div> <div style="margin-right: 10px;">For emitter</div>  </div>	<b>SFB-CCJ10E</b>	Cable length: 10 m <b>32.808 ft</b> Net weight 580 g approx. (1 cable)	Used for connecting to an extension cable or the <b>SF-C11</b> control unit. One each for emitter and receiver, Cable outer diameter: 6 mm <b>0.236 in</b> Connector outer diameter: 14 mm <b>0.551 in</b> max. 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 <b>R0.236 in</b>
			<b>SFB-CCJ10D</b>	Cable length: 10 m <b>32.808 ft</b> Net weight 600 g approx. (1 cable)	
	4-core cable	<div style="display: flex; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); font-weight: bold; margin-right: 5px;">3 Adapter cable (Bottom cap cable)</div> <div style="margin-right: 10px;">For SF2-A / SF2-N</div>  </div>	<b>SF2B-CB05-A</b>	Cable length: 0.5 m <b>1.640 ft</b> Net weight 95 g approx. (2 cables)	Used when replacing units in the <b>SF2-A / SF2-N</b> series. The <b>SF2N-CCM</b> cable with connector can be used without change, so that replacement with <b>SF2B</b> series units can be done smoothly. Two cables per set for emitter and receiver, Cable outer diameter: 6 mm <b>0.236 in</b> Connector outer diameter: 14 mm <b>0.551 in</b> max. 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 <b>R0.236 in</b>
<b>SF2B-CB05-B</b>			Cable length: 0.5 m <b>1.640 ft</b> Net weight 95 g approx. (2 cables)		
<div style="display: flex; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); font-weight: bold; margin-right: 5px;">5 Cable for series connection</div>  </div>	<b>SF2B-CSL01</b>	Cable length: 0.1 m <b>0.328 ft</b> Net weight 70 g approx. (2 cables)	Use when connecting the sub-sensor for series connection to the light curtain in series. Two cables per set for emitter and receiver (common for emitter and receiver) Cable outer diameter: 6 mm <b>0.236 in</b> Cable color: Gray (common for emitter and receiver) The min. bending radius: R6 mm <b>R0.236 in</b>		
	<b>SF2B-CSL05</b>	Cable length: 0.5 m <b>1.640 ft</b> Net weight 120 g approx. (2 cables)			

\* Please contact our office for information on adapter cables.

\* Used in conjunction with sub-sensor for serial connection only.

### \* Interchangeability function

x This function is used for replacing other light curtains or area sensors with these new units. The bottom cap cables and sensor mounting brackets used will vary depending on the models being replaced. Refer to the instruction manual for details on actual wiring and mounting.

Models being replaced	Adapter cable	Adapter mounting bracket	Details of changes and points to note
<b>SF2-A / SF2-N series</b>	<b>SF2B-CB05-A</b>	<b>MS-SF2B-5</b>	x NPN output type: Connect the shielded wire to `V. PNP output type: Connect the shielded wire to 0 V. x Existing <b>SF2N-CCM</b> connection cables (optional) can be used without change. x The interference prevention function (parallel connection) cannot be used.
<b>SF1-N series</b>	<b>SF2B-CB05-B</b>	When using the <b>MS-SF1-1: MS-SF2B-4</b> For direct mounting: <b>MS-SF2B-7</b>	x Emitter: Synchronization cable has changed to interference-prevention cable. Receiver: Synchronization cable has changed to control output (OSSD1). x Existing <b>SF1-CCMA</b> connection cables (optional) can be used without change.
<b>NA40 series</b>	<b>SF2B-CB05-B</b>	When using the <b>MS-NA40-1: MS-SF2B-4</b> For direct mounting: <b>MS-SF2B-6</b>	x Control output (OSSD2) is equipped instead of self-diagnosis output. x Emission halt function cannot be used. x Existing <b>NA40-CCM</b> connection cables (optional) can be used without change. x The ambient usage temperature for the <b>NA40-CCM</b> connection cables (optional) is 10 to 50 °C / 14 to 122 °F.

ORDER GUIDE

**6 Sub-sensor for series connection only** The sub-sensors for series connection are PNP / NPN types. Furthermore, they cannot simply be used by themselves. Always be sure to use them in combination with light curtains.

Type	Appearance	Operating range (Note 1)	Model No.	Number of beam channels	Protective height (mm in)	Current consumption (Note 3)
Hand protection type Min. sensing object "27 mm "1.063 in (20 mm 0.787 in pitch)		0.2 to 13 m 0.656 to 42.651 ft When using SF2B-CB05-B conversion cable at light curtain: 0.2 to 5 m 0.656 to 16.404 ft	SF2B-H8SL (Note 2)	8	168 6.614	Emitter: 20 mA or less
			SF2B-H12SL	12	232 9.134	Receiver: 25 mA or less
			SF2B-H16SL	16	312 12.283	Emitter: 20 mA or less
			SF2B-H20SL	20	392 15.433	Receiver: 35 mA or less
			SF2B-H24SL	24	472 18.583	Emitter: 30 mA or less
			SF2B-H28SL	28	552 21.732	Receiver: 45 mA or less
			SF2B-H32SL	32	632 24.882	Emitter: 30 mA or less
			SF2B-H36SL	36	712 28.031	Receiver: 55 mA or less
			SF2B-H40SL	40	792 31.181	Emitter: 40 mA or less
			SF2B-H48SL	48	952 37.480	Receiver: 65 mA or less
			SF2B-H56SL	56	1,112 43.779	Emitter: 45 mA or less
			SF2B-H64SL	64	1,272 50.079	Receiver: 85 mA or less
			SF2B-H72SL	72	1,432 56.378	Emitter: 50 mA or less
			SF2B-H80SL	80	1,592 62.677	Receiver: 105 mA or less
			SF2B-H88SL	88	1,752 68.976	Emitter: 60 mA or less
			SF2B-H96SL	96	1,912 75.275	Receiver: 125 mA or less
Arm / Foot protection type Min. sensing object "47 mm "1.850 in (40 mm 1.575 in pitch)		0.2 to 13 m 0.656 to 42.651 ft When using SF2B-CB05-B conversion cable at light curtain: 0.2 to 5 m 0.656 to 16.404 ft	SF2B-A4SL (Note 2)	4	168 6.614	Emitter: 15 mA or less
			SF2B-A6SL	6	232 9.134	Receiver: 20 mA or less
			SF2B-A8SL	8	312 12.283	Emitter: 15 mA or less
			SF2B-A10SL	10	392 15.433	Receiver: 25 mA or less
			SF2B-A12SL	12	472 18.583	Emitter: 20 mA or less
			SF2B-A14SL	14	552 21.732	Receiver: 30 mA or less
			SF2B-A16SL	16	632 24.882	Emitter: 20 mA or less
			SF2B-A18SL	18	712 28.031	Receiver: 35 mA or less
			SF2B-A20SL	20	792 31.181	Emitter: 25 mA or less
			SF2B-A24SL	24	952 37.480	Receiver: 40 mA or less
			SF2B-A28SL	28	1,112 43.779	Emitter: 25 mA or less
			SF2B-A32SL	32	1,272 50.079	Receiver: 50 mA or less
			SF2B-A36SL	36	1,432 56.378	Emitter: 30 mA or less
			SF2B-A40SL	40	1,592 62.677	Receiver: 60 mA or less
			SF2B-A44SL	44	1,752 68.976	Emitter: 35 mA or less
			SF2B-A48SL	48	1,912 75.275	Receiver: 70 mA or less

Notes: 1) The 'operating range' is the possible setting distance between the emitter and the receiver. The sensor can detect less than 0.3 m 0.984 ft away.  
 2) Serial connection connectors cannot be used with the SF2B-H8SL and SF2B-A4SL. If three sets are connected together in series, they also cannot be used in the middle position. For details, refer to 'PRECAUTIONS FOR PROPER USE' (P.26).  
 3) The specifications for the sub-sensors for serial connection are the same as for the light curtains except for the current consumption. However, they are not equipped with an output function.

Spare parts (Accessories for light curtain)

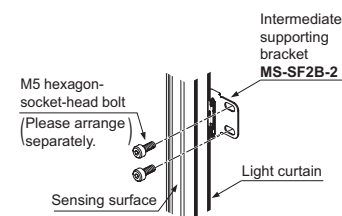
Designation	Appearance	Model No.	Description
Intermediate supporting bracket (Note)		MS-SF2B-2	Used to mount the light curtain on the intermediate position. Mounting is possible behind or at the side of the light curtain.
Test rod "14		SF2B-TR27	Min. sensing object for regular checking ("27 mm "1.063 in), with hand protection type (min. sensing object "27 mm "1.063 in)

Note: The number of sets required varies depending on the product. Refer to 'DIMENSIONS' on p. 31 for further details.

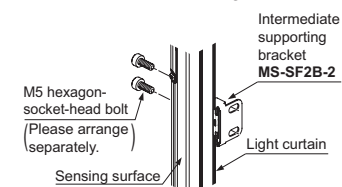
Intermediate supporting bracket

• MS-SF2B-2

<In case of rear mounting>



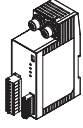
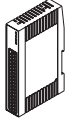
<In case of side mounting>



# SF2B

## OPTIONS

### Exclusive control units

Designation	Appearance	Model No.	Applicable cable	Description
Connector connection type control unit		<b>SF-C11</b>	<b>SF2B-CBM</b> <b>SFB-CCJ10M</b>	Use 8-core cable with connector to connect to the light curtain. Compatible with up to control category 4 (control category 2 when used together with the <b>SF2B</b> series).
Slim type control unit		<b>SF-C13</b>	<b>SF2B-CCBM</b> <b>SFB-CCM</b>	Use a discrete wire cable to connect to the light curtain. Compatible with up to control category 4 (control category 2 when used together with the <b>SF2B</b> series).

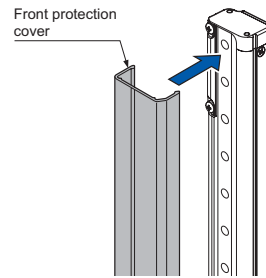
Designation		Front protection cover
Applicable beam channels		
Hand	Arm / Foot	Model No.
8	4	<b>FC-SF2BH-8</b>
12	6	<b>FC-SF2BH-12</b>
16	8	<b>FC-SF2BH-16</b>
20	10	<b>FC-SF2BH-20</b>
24	12	<b>FC-SF2BH-24</b>
28	14	<b>FC-SF2BH-28</b>
32	16	<b>FC-SF2BH-32</b>
36	18	<b>FC-SF2BH-36</b>
40	20	<b>FC-SF2BH-40</b>
48	24	<b>FC-SF2BH-48</b>
56	28	<b>FC-SF2BH-56</b>
64	32	<b>FC-SF2BH-64</b>
72	36	<b>FC-SF2BH-72</b>
80	40	<b>FC-SF2BH-80</b>
88	44	<b>FC-SF2BH-88</b>
96	48	<b>FC-SF2BH-96</b>

Note: The model Nos. given above denote a single unit, not a pair of units.  
2 units are required for use in mounting to the emitter / receiver.

### Front protection cover

#### • FC-SF2BH-M

This protects the sensing surfaces of the light curtain from flying objects such as welding spatter, oil and water.  
The operating range reduces when the front protection cover is used.



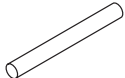
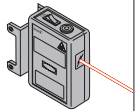
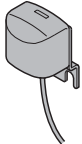
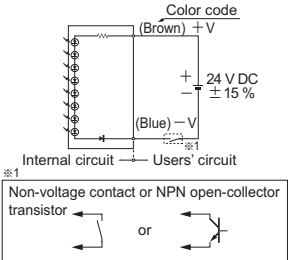
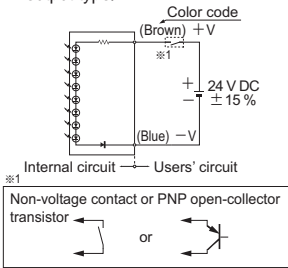
### Sensing range

	Sensing range	
		When using the <b>SF2B-CB05-B</b>
Only emitter installed	0.2 to 11.5 m <b>0.656 to 37.730 ft</b>	0.2 to 4.5 m <b>0.656 to 14.764 ft</b>
Only receiver installed	0.2 to 11.5 m <b>0.656 to 37.730 ft</b>	0.2 to 4.5 m <b>0.656 to 14.764 ft</b>
Both emitter and receiver installed	0.2 to 10.0 m <b>0.656 to 32.808 ft</b>	0.2 to 4.0 m <b>0.656 to 13.123 ft</b>

Note: The 'operating range' is the possible setting distance between the emitter and the receiver. The sensor can detect less than 0.2 m **0.656 ft** away.

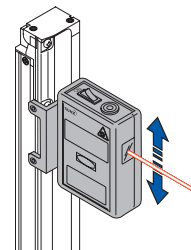


OPTIONS

Designation	Appearance	Model No.	Description
Test rod "14		SF2B-TR47	Min. sensing object for regular checking ("47 mm "1.850 in), with Arm / Foot protection type (min. sensing object "47 mm "1.850 in)
Laser alignment tool		SF-LAT-2B	Allows easy beam axis alignment using easy-to-see laser beam
Large display unit for light curtain		SF-IND-2	<p>With the auxiliary output of the light curtain, the operation is easily observable from various directions.</p> <p><b>Specifications</b></p> <ul style="list-style-type: none"> <li>x Supply voltage: 24 V DC 5 15 %</li> <li>x Current consumption: 12 mA or less</li> <li>x Indicators: Orange LED (8 pcs. used) [Light up when external contact is ON]</li> <li>x Ambient temperature: 10 to 55 °C 14 to 131 °F (No dew condensation or icing allowed)</li> <li>x Material: POM (Enclosure) Polycarbonate (Cover) Cold rolled carbon steel (SPCC) (Bracket)</li> <li>x Cable: 0.3 mm<sup>2</sup> 2-core cabtyre cable, 3 m 9.843 ft long</li> <li>x Weight: 70 g approx. (including bracket)</li> </ul> <p><b>I/O circuit diagrams</b></p> <p>&lt;With NPN output type&gt;</p>  <p>&lt;With PNP output type&gt;</p> 

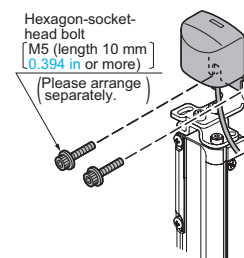
Laser alignment tool

- SF-LAT-2B



Large display unit for light curtain

- SF-IND-2



Attaches to top of light curtain. Tighten together the mounting bracket provided with the light curtain and the mounting bracket of SF-IND-2.

x Guide to recommended safety relays  
Matsushita Electric Works Ltd.  
Model No.: SF series



Note: Contact the manufacturers for details on the recommended products.

x Guide to recommended miniature contactors  
Matsushita Electric Works Ltd.  
Model No.: PC-5 series



Note: Contact the manufacturers for details on the recommended products.

# SF2B

## SPECIFICATIONS

### Individual specifications

#### SF2B-HM Hand protection type

Item	Model No.	Type	Min. sensing object "27 mm "1.063 in type (20 mm 0.787 in pitch)					
			NPN output	SF2B-H8-N	SF2B-H12-N	SF2B-H16-N	SF2B-H20-N	SF2B-H24-N
		PNP output	SF2B-H8-P	SF2B-H12-P	SF2B-H16-P	SF2B-H20-P	SF2B-H24-P	SF2B-H28-P
No. of beam channels			8	12	16	20	24	28
Beam pitch			20 mm 0.787 in					
Protective height			168 mm 6.614 in	232 mm 9.134 in	312 mm 12.283 in	392 mm 15.433 in	472 mm 18.583 in	552 mm 21.732 in
Current consumption			Emitter: 40 mA or less Receiver: 50 mA or less		Emitter: 40 mA or less Receiver: 60 mA or less		Emitter: 50 mA or less Receiver: 70 mA or less	
Net weight (total of emitter and receiver)			170 g approx.	280 g approx.	400 g approx.	510 g approx.	610 g approx.	720 g approx.

Item	Model No.	Type	Min. sensing object "27 mm "1.063 in type (20 mm 0.787 in pitch)					
			NPN output	SF2B-H32-N	SF2B-H36-N	SF2B-H40-N	SF2B-H48-N	SF2B-H56-N
		PNP output	SF2B-H32-P	SF2B-H36-P	SF2B-H40-P	SF2B-H48-P	SF2B-H56-P	SF2B-H64-P
No. of beam channels			32	36	40	48	56	64
Beam pitch			20 mm 0.787 in					
Protective height			632 mm 24.882 in	712 mm 28.031 in	792 mm 31.181 in	952 mm 37.480 in	1,112 mm 43.779 in	1,272 mm 50.079 in
Current consumption			Emitter: 50 mA or less Receiver: 80 mA or less		Emitter: 60 mA or less Receiver: 90 mA or less		Emitter: 65 mA or less Receiver: 110 mA or less	
Net weight (total of emitter and receiver)			830 g approx.	930 g approx.	1,000 g approx.	1,300 g approx.	1,500 g approx.	1,700 g approx.

Item	Model No.	Type	Min. sensing object "27 mm "1.063 in type (20 mm 0.787 in pitch)			
			NPN output	SF2B-H72-N	SF2B-H80-N	SF2B-H88-N
		PNP output	SF2B-H72-P	SF2B-H80-P	SF2B-H88-P	SF2B-H96-P
No. of beam channels			72	80	88	96
Beam pitch			20 mm 0.787 in			
Protective height			1,432 mm 56.378 in	1,592 mm 62.677 in	1,752 mm 68.976 in	1,912 mm 75.275 in
Current consumption			Emitter: 70 mA or less Receiver: 130 mA or less		Emitter: 80 mA or less Receiver: 150 mA or less	
Net weight (total of emitter and receiver)			1,900 g approx.	2,100 g approx.	2,300 g approx.	2,500 g approx.

Note: Where measurement conditions have not been specified precisely, the conditions used were ambient temperature `20 7C `68 7F.

#### SF2B-AM Arm / Foot protection type

Item	Model No.	Type	Min. sensing object "47 mm "1.850 in type (40 mm 1.575 in pitch)					
			NPN output	SF2B-A4-N	SF2B-A6-N	SF2B-A8-N	SF2B-A10-N	SF2B-A12-N
		PNP output	SF2B-A4-P	SF2B-A6-P	SF2B-A8-P	SF2B-A10-P	SF2B-A12-P	SF2B-A14-P
No. of beam channels			4	6	8	10	12	14
Beam pitch			40 mm 1.575 in					
Protective height			168 mm 6.614 in	232 mm 9.134 in	312 mm 12.283 in	392 mm 15.433 in	472 mm 18.583 in	552 mm 21.732 in
Current consumption			Emitter: 35 mA or less Receiver: 45 mA or less		Emitter: 35 mA or less Receiver: 50 mA or less		Emitter: 40 mA or less Receiver: 55 mA or less	
Net weight (total of emitter and receiver)			170 g approx.	280 g approx.	400 g approx.	510 g approx.	610 g approx.	720 g approx.

Item	Model No.	Type	Min. sensing object "47 mm "1.850 in type (40 mm 1.575 in pitch)					
			NPN output	SF2B-A16-N	SF2B-A18-N	SF2B-A20-N	SF2B-A24-N	SF2B-A28-N
		PNP output	SF2B-A16-P	SF2B-A18-P	SF2B-A20-P	SF2B-A24-P	SF2B-A28-P	SF2B-A32-P
No. of beam channels			16	18	20	24	28	32
Beam pitch			40 mm 1.575 in					
Protective height			632 mm 24.882 in	712 mm 28.031 in	792 mm 31.181 in	952 mm 37.480 in	1,112 mm 43.779 in	1,272 mm 50.079 in
Current consumption			Emitter: 40 mA or less Receiver: 60 mA or less		Emitter: 45 mA or less Receiver: 65 mA or less		Emitter: 50 mA or less Receiver: 75 mA or less	
Net weight (total of emitter and receiver)			830 g approx.	930 g approx.	1,000 g approx.	1,300 g approx.	1,500 g approx.	1,700 g approx.

Item	Model No.	Type	Min. sensing object "47 mm "1.850 in type (40 mm 1.575 in pitch)			
			NPN output	SF2B-A36-N	SF2B-A40-N	SF2B-A44-N
		PNP output	SF2B-A36-P	SF2B-A40-P	SF2B-A44-P	SF2B-A48-P
No. of beam channels			36	40	44	48
Beam pitch			40 mm 1.575 in			
Protective height			1,432 mm 56.378 in	1,592 mm 62.677 in	1,752 mm 68.976 in	1,912 mm 75.275 in
Current consumption			Emitter: 55 mA or less Receiver: 85 mA or less		Emitter: 60 mA or less Receiver: 95 mA or less	
Net weight (total of emitter and receiver)			1,900 g approx.	2,100 g approx.	2,300 g approx.	2,500 g approx.

Note: Where measurement conditions have not been specified precisely, the conditions used were ambient temperature `20 7C `68 7F.

## SPECIFICATIONS

## Common specifications

Item	Type	Min. sensing object "27 mm "1.063 in type (20 mm 0.787 in beam pitch)		Min. sensing object "47 mm "1.850 in type (40 mm 1.575 in beam pitch)	
		NPN output	PNP output	NPN output	PNP output
Model No.		SF2B-HM-N	SF2B-HM-P	SF2B-AM-N	SF2B-AM-P
Applicable standards		ISO 13849-1 (Category 2), EN 954-1 (Category 2), EN 61496-1 (Type 2), IEC 61496-1/2 (Type 2), UL 61496-1/2 (Type 2), UL 1998, JIS B 9704-1/2 (Type 2), JIS B 9705-1			
Operating range		0.2 to 13 m 0.656 to 42.651 ft (0.2 to 5 m 0.656 to 16.404 ft when using the SF2B-CB05-B adapter cable)			
Min. sensing object		"27 mm "1.063 in opaque object		"47 mm "1.850 in opaque object	
Effective aperture angle		5 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 5% Ripple P-P 10% or less			
Control output (OSSD1, OSSD2)		<NPN output type> NPN open-collector transistor x Max. sink current: 200 mA x Applied voltage: same as supply voltage [between the control output (OSSD1, OSSD2) and 0 V] x Residual voltage: 2.0 V or less (sink current 200 mA) (when using 30.5 m 100.066 ft length cable)		<PNP output type> PNP open-collector transistor x Max. source current: 200 mA x Applied voltage: same as supply voltage [between the control output (OSSD1, OSSD2) and `V] x Residual voltage: 2.5 V or less (sink current 200 mA) (when using 30.5 m 100.066 ft length cable)	
	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)			
	Protection circuit	Incorporated			
Response time		OFF response: 15 ms or less, ON response: 40 to 60 ms			
Auxiliary output (Aux) (Note 2)		<NPN output type> NPN open-collector transistor x Max. sink current: 60 mA x Applied voltage: same as supply voltage [between the control output (OSSD1, OSSD2) and 0 V] x Residual voltage: 2.0 V or less (sink current 60 mA) (when using 30.5 m 100.066 ft length cable)		<PNP output type> NPN open-collector transistor x Max. source current: 60 mA x Applied voltage: same as supply voltage [between the control output (OSSD1, OSSD2) and `V] x Residual voltage: 2.5 V or less (sink current 60 mA) (when using 30.5 m 100.066 ft length cable)	
	Operation mode	When using SF2B-CCBM or SF2B-CBM: OFF when OSSD ON, ON when OSSD OFF When using SF2B-CB05-A: ON during normal operation, OFF when there is a problem with light-emitting unit operation or light emitting is stopped			
	Protection circuit	Incorporated			
Synchronization method		Cable synchronization (light synchronization when using SF2B-CB05-B)			
Interference prevention function		Incorporated x Series connection: 3 sets max. (Total 128 beam channels). (However, SF2B-AM allows up to a total of 96 beam channels when two sets are connected, and up to 64 beam channels when three sets are connected). (Note 3) SF2B-HM and SF2B-AM can be used together (Note 4). [When using SF2B-CB05-B (optical synchronization): x Series connection: 3 sets max. (Total 128 beam channels). (However, SF2B-AM allows up to a total of 96 beam channels when two sets are connected, and up to 64 beam channels when three sets are connected). (Note 3) x Parallel connection: 2 sets max. x Series and parallel mixed connection: Series connection of 3 sets max. and parallel connection of 2 sets max. are simultaneously possible. SF2B-HM and SF2B-AM can be used together (Note 4).			
Emission halt function		Incorporated			
External device monitoring function		Incorporated			
Environmental resistance	Degree of protection	IP65(IEC)			
	Ambient temperature / Ambient humidity	110 to `55 7C `14 to `131 7F (No dew condensation or icing allowed), Storage: 125 to `70 7C`113 to `158 7F / 30 to 85 % RH, Storage: 30 to 95 % RH			
	Ambient illuminance	Incandescent light: 3,500 lx or less at the light-receiving face			
	Dielectric strength voltage / Insulation resistance	1,000 V AC for one min. between all supply terminals connected together and enclosure / 20 MΩ, or more, with 500 V DC megger between all supply terminals connected together and enclosure			
	Vibration resistance / Shock resistance	10 to 55 Hz frequency, 0.75 mm 0.030 in amplitude in X, Y and Z directions for two hours each / 300 m/s <sup>2</sup> acceleration (30 G approx.) in X, Y and Z directions for three times each			
Emitting element		Infrared LED (Peak emission wavelength: 870 nm 0.034 mil)			
Cable extension		Extension up to total 30.5 m 100.066 ft is possible for both emitter and receiver, with optional mating cables			
Connecting method		Connector			
Material		Enclosure: Aluminium, Upper and lower edges : Die-cast zinc alloy, Inner case: Polycarbonate x Polyester resin, Cap: PBT			
Accessories		MS-SF2B-2 (Intermediate supporting bracket): (Note 5) SF2B-TR27 (Test rod): 1 No.		MS-SF2B-2 (Intermediate supporting bracket): (Note 5)	

Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were ambient temperature `20 7C `68 7F.

2) When using auxiliary output (AUX), the SF2B-CB05-B adapter cable (optional) cannot be used.

3) The SF2B-H8-M and SF2B-A4-M cannot be connected in series. For details, refer to 'PRECAUTIONS FOR PROPER USE' (P.261).

4) If using the SF2B-HM and SF2B-AM together in a series connection, only the number of beam channels for the SF2B-AM must be doubled, and the total number of beam channels must be 128 or less.

Example: If using the SF2B-H36 and SF2B-A44 in a series connection, the total number of beam channels will be 124.

Number of SF2B-H36 beam channels ` (Number of SF2B-A44 beam channels)2)4)Total number of beam channels  
36 beam channels ` (44 beam channels)2)4)124 beam channels

5) The intermediate supporting bracket MS-SF2B-2 is enclosed with the following models. The quantity of the enclosed bracket differs depending on the model as follows:

1 set: SF2B-HM zzz Light curtain with 40 to 56 beam channels, SF2B-AM zzz Light curtain with 20 to 28 beam channels

2 sets: SF2B-HM zzz Light curtain with 64 to 80 beam channels, SF2B-AM zzz Light curtain with 32 to 40 beam channels

3 sets: SF2B-HM zzz Light curtain with 88 to 96 beam channels, SF2B-AM zzz Light curtain with 44 to 48 beam channels

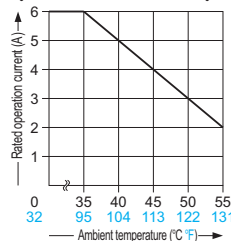
## SPECIFICATIONS

### Exclusive control unit

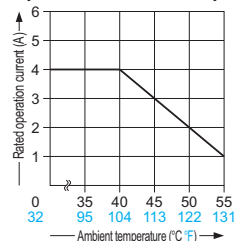
Item	Model No.	SF-C11	SF-C13
Connectable light curtains		SF4B / SF2B series	Light curtain manufactured by SUNX
Applicable standard		IEC 61496-1, UL 61496-1, JIS B 9704-1	
Control category		ISO 13849-1 (EN 954-1, JIS B 9705-1) compliance up to Category 4 standards	
Supply voltage		24 V DC 510 % Ripple P-P 10 % or less	
Current consumption		100 mA or less (without light curtain)	
Fuse (power supply)		Built-in electronic fuse, Triggering current: 0.5 A or more, Reset after power down	
Enabling path		NO contact23 (13-14, 23-24, 33-34)	NO contact23 (13-14, 23-24, 33-34)
Utilization category		AC-15, DC-13 (IEC 60947-5-1)	
Rated operation voltage (Ue) / Rated operation current (Ie)		30 V DC / 6 A, 230 V AC / 6 A, resistive load (For inductive load, during contact protection) Minute current: 10 mA or more (at 24 V DC)(Note 2)	30 V DC / 4 A, 230 V AC / 4 A, resistive load (For inductive load, during contact protection) Minute current: 10 mA or more (at 24 V DC)(Note 2)
Contact material / contacts		AgSnO, self cleaning, positively driven	AgSnO, self cleaning, positively driven
Contact resistance		100 mΩ or less (initial value)	
Contact protection fuse rated		6 A (slow blow)	4 A (slow blow)
Mechanical lifetime		10 million operations or more (switching frequency 180 operations/min.)(Note 3)	
Electrical lifetime		100,000 operations or more (switching frequency 20 operations/min., 230 V AC / 3 A resistive load)(Note 3)	
Pick-up delay (Auto reset / Manual reset)		80 ms or less / 90 ms or less	
Response time		10 ms or less	
Auxiliary output		Safety relay contact (NC contact) 21 (41-42)(Related to enabling path)	
Rated operation voltage / current		24 V DC / 2 A, Minute current: 10 mA or more (at 24 V DC)	
Contact protection fuse rated		2 A (slow blow)	
Semiconductor auxiliary output (AUX)		<Minus ground (Setting for PNP)> PNP open-collector transistor x Max. source current: 60 mA x Applied voltage: same as supply voltage (between the semiconductor auxiliary output and V) x Residual voltage: 2.3 V or less (at source current 60 mA) x Leakage current: 2 mA or less	<Plus ground (Setting for NPN)> NPN open-collector transistor x Max. sink current: 60 mA x Applied voltage: same as supply voltage (between the semiconductor auxiliary output and 0 V) x Residual voltage: 1.5 V or less (at sink current 60 mA) x Leakage current: 2 mA or less
Output operation		Related to auxiliary output of light curtain	On when the light curtain is interrupted
Excess voltage category		3	
Power supply (Ui)		Green LED (lights up when current flowing)	
Enabling path (OUT)		Green LED (lights up when enabling contacts are closed)	
Interlock (INTERLOCK)		Yellow LED (lights up when enabling contacts are opened)	
Fault (FAULT)		Yellow LED (blinks when fault occurs)	
External relay monitor function		Incorporated	
Trailing edge function		Incorporated	
Polarity selection function		Incorporated (Sliding switch allows selection of plus / minus ground) Minus ground: Correspond to PNP output light curtain Plus ground: Correspond to NPN output light curtain	Incorporated (Cable connection allows selection of plus / minus ground) Minus ground: Correspond to PNP output light curtain Plus ground: Correspond to NPN output light curtain
Pollution degree		2	
Protection		Enclosure: IP40, Terminal: IP20	
Ambient temperature		110 to 55 7C 14 to 131 7F (No dew condensation or icing allowed), Storage: 125 to 70 7C 113 to 158 7F	
Ambient humidity		30 to 85 %RH, Storage: 30 to 95 %RH	
Vibration resistance		10 to 55 Hz frequency, 0.35 mm 0.014 in amplitude in X, Y, and Z directions for twenty times each	
Connection terminal		Detachable-type spring gauge terminal	Spring gauge terminal
Enclosure material		ABS	
Net weight		320 g approx.	200 g approx.

- Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were ambient temperature 20 7C 68 7F.  
 2) If several SF-C11 or SF-C13 units are being used in line together, leave a space of 5 mm 0.197 in or more between each unit. If the units are touching each other, reduce the rated operating current for safety output in accordance with the ambient operating temperature as shown in the graphs at right.  
 3) Relay switching lifetime will vary depending on factors such as the type of load, the switching frequency, and ambient conditions.  
 4) The slide switch can be move to the PNP side for negative grounding and to the NPN side for positive grounding.

<Dilating when SF-C11 units are mounted close together>



<Dilating when SF-C13 units are mounted close together>





## SPECIFICATIONS

### Laser alignment tool

Item	Model No.	SF-LAT-2B
Supply voltage		3 V (AA size battery)22 pcs.)
Battery		1.5 V (AA size battery)22 pcs. (replaceable)
Battery lifetime		10 hours approx. of continuous operation (Manganese battery, at 25 °C / 77 °F ambient temperature)
Light source		Red semiconductor laser: class 2 (IEC / JIS)(Max. output: 1 mW, Peak emission wavelength: 650 nm 0.026 mil)
Spot diameter		10 mm 0.394 in approx. (at 5 m 16.404 ft distance)
Ambient temperature		0 to 40 °C / 32 to 104 °F (No dew condensation), Storage: 0 to 55 °C / 32 to 131 °F
Ambient humidity		35 to 85 % RH, Storage: 35 to 85 % RH
Material		Enclosure: ABS, Mounting part: Aluminum
Weight		Net weight: 200 g approx. (including batteries)
Accessories		AA size battery: 2 pcs.

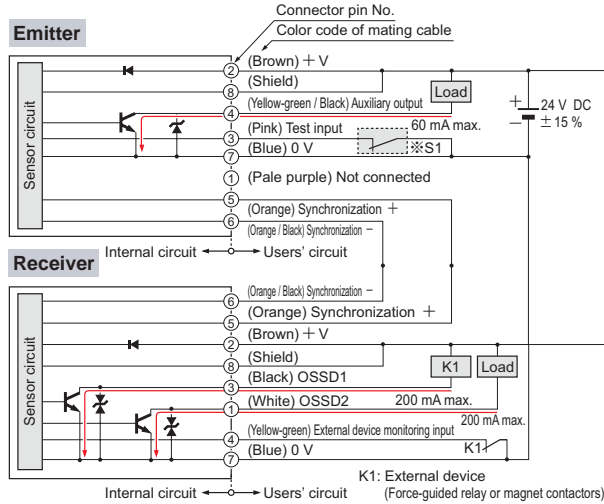
Note: Where measurement conditions have not been specified precisely, the conditions used were ambient temperature 20 °C / 68 °F.

## I/O CIRCUIT AND WIRING DIAGRAMS

**NPN Output type** When using a SF2B-CCBM or SF2B-CBM bottom cap cable

### I/O circuit diagram

<In case of setting the external device monitoring function to enabled>



Note: Unused wires must be insulated to ensure that they do not come into contact with wires already in use.

#### CAUTION

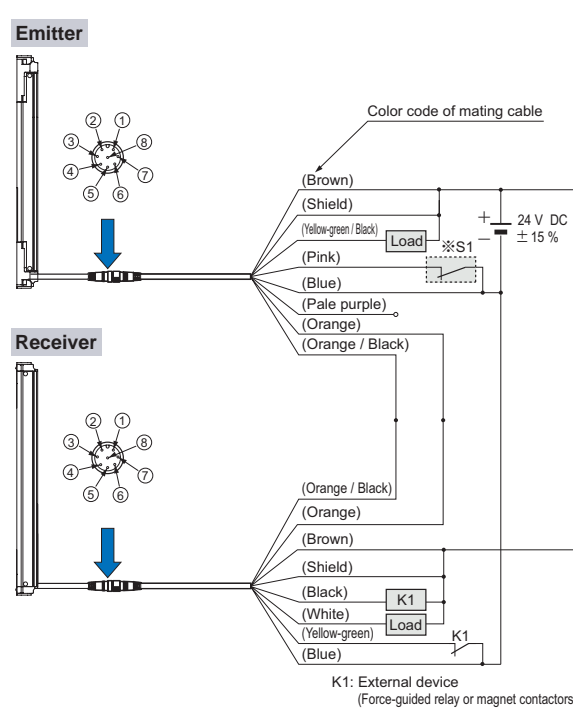
Construct the interlock (reset input) circuit separately.

mS1

Switch S1  
 x Test input  
 Open: Emission halt  
 0 to 1.5 V (source current 5 mA or less): Emission

### Wiring diagram

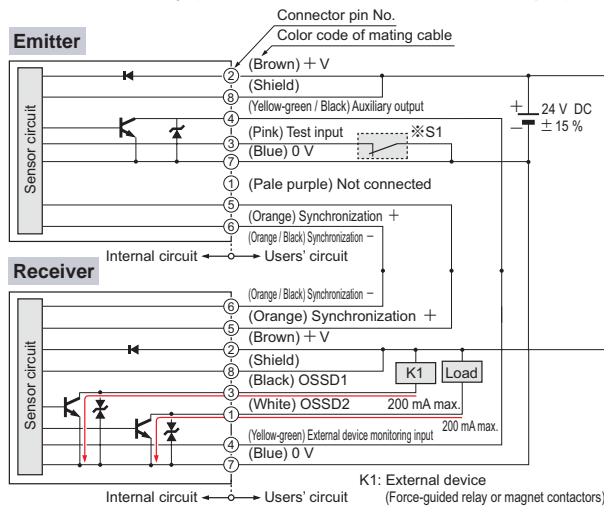
<In case of setting the external device monitoring function to enabled>



Note: Unused wires must be insulated to ensure that they do not come into contact with wires already in use.

<In case of setting the external device monitoring function to disabled>

x In order to disable the external device monitoring function, connect the auxiliary output and external device monitoring input. At such times, do not connect a load to the auxiliary output.



Note: Unused wires must be insulated to ensure that they do not come into contact with wires already in use.

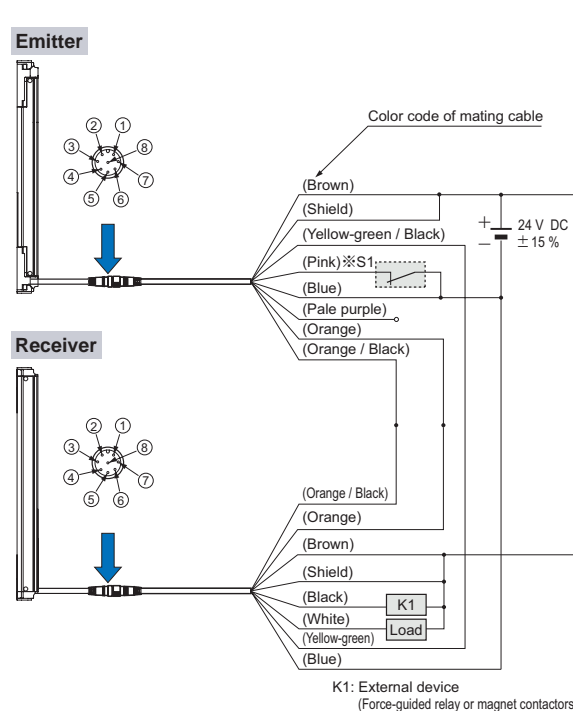
#### CAUTION

Construct the interlock (reset input) circuit separately.

mS1

Switch S1  
 x Test input  
 Open: Emission halt  
 0 to 1.5 V (source current 5 mA or less): Emission

<In case of setting the external device monitoring function to disabled>



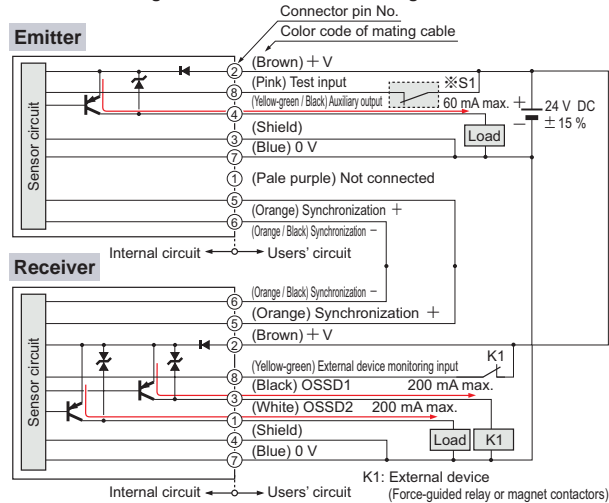
Note: Unused wires must be insulated to ensure that they do not come into contact with wires already in use.

I/O CIRCUIT AND WIRING DIAGRAMS

**PNP Output type** When using a SF2B-CCBM or SF2B-CBM bottom cap cable

**I/O circuit diagram**

<In case of setting the external device monitoring function to enabled>



**CAUTION**  
Construct the interlock (reset input) circuit separately.

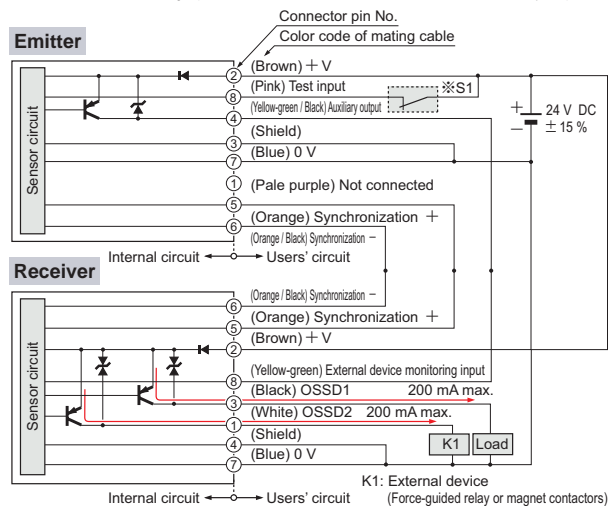
mS1

Switch S1  
x Test input  
Open: Emission halt  
Vs to Vs12.5 V (sink current 5 mA or less): Emission (Note 2)

Notes: 1) Unused wires must be insulated to ensure that they do not come into contact with wires already in use.  
2) Vs is the applying supply voltage.

<In case of setting the external device monitoring function to disabled>

x In order to disable the external device monitoring function, connect the auxiliary output and external device monitoring input. At such times, do not connect a load to the auxiliary output.



**CAUTION**  
Construct the interlock (reset input) circuit separately.

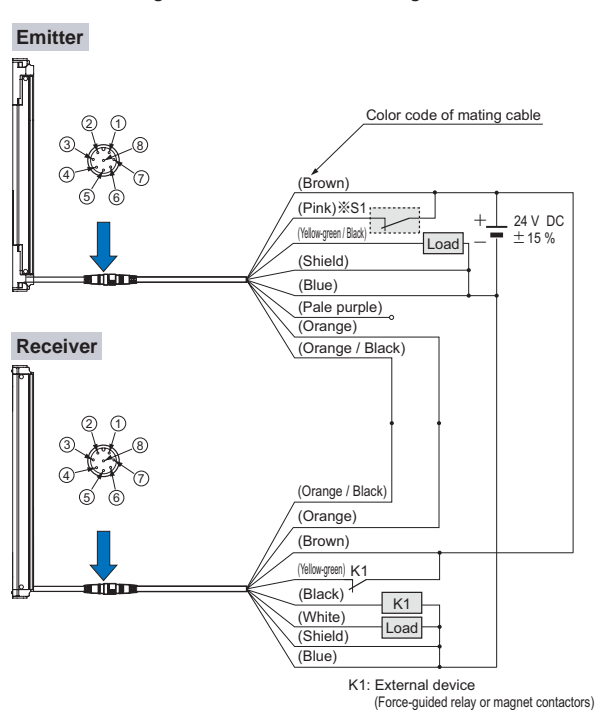
mS1

Switch S1  
x Test input  
Open: Emission halt  
Vs to Vs12.5 V (sink current 5 mA or less): Emission (Note 2)

Notes: 1) Unused wires must be insulated to ensure that they do not come into contact with wires already in use.  
2) Vs is the applying supply voltage.

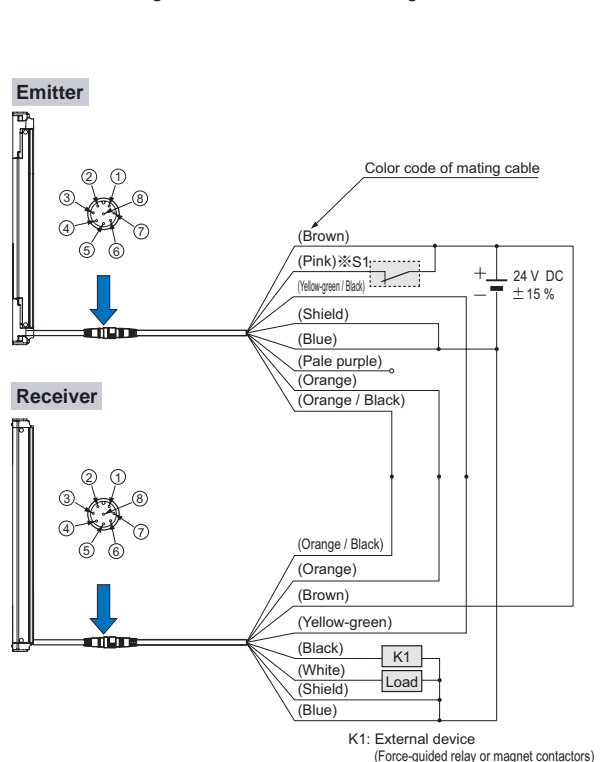
**Wiring diagram**

<In case of setting the external device monitoring function to enabled>



Note: Unused wires must be insulated to ensure that they do not come into contact with wires already in use.

<In case of setting the external device monitoring function to disabled>



Note: Unused wires must be insulated to ensure that they do not come into contact with wires already in use.

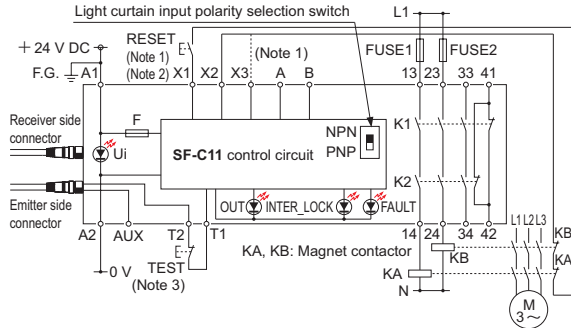
## I/O CIRCUIT AND WIRING DIAGRAMS

### SF-C11

#### SF2B series Wiring diagram (Control category 2)

##### NPN output type

Set the light curtain input polarity select switch to the NPN side and ground the ` side.

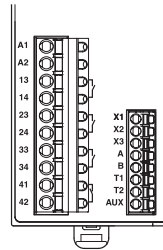


- Notes: 1) The above diagram is when using manual reset. If automatic reset is used, disconnect the lead from X2 and connect it to X3. In this case, a RESET switch is not needed.  
 2) Use a momentary-type switch as the reset button.  
 3) Emission halt occurs when the test button is open, and emission occurs when the test button is short-circuited. If not using the test button, short-circuit T1 and T2. However, use a test rod or similar to interrupt the light in order to carry out self-diagnosis separately.

Be sure to use the following connection cables when connecting SF-C11 to SF2B series.

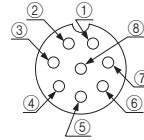
- SF2B-CB05 (cable length: 0.5 m 1.640 ft)
- SF2B-CB5 (cable length: 5 m 16.404 ft)
- SF2B-CB10 (cable length: 10 m 32.808 ft)
- SFB-CCJ10E (for emitter x cable length: 10 m 32.808 ft)
- SFB-CCJ10D (for receiver x cable length: 10 m 32.808 ft)

#### Terminal arrangement diagram



Terminal	Function
A1	24 V DC
A2	0 V
13-14, 23-24, 33-34	Enabling path (NO contact 23)
41-42	Auxiliary output (NC contact 21)
X1	Reset output terminal
X2	Reset input terminal (Manual)
X3	Reset input terminal (Automatic)
A	Not used
B	Not used
T1	Test output terminal
T2	Test input terminal
AUX	Semiconductor auxiliary output

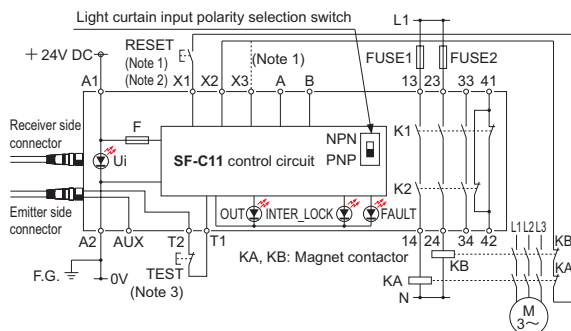
#### Pin layout for light curtain connectors



Connector pin No.	Emitter side connector	Receiver side connector
1	Not used	OSSD2
2	24 V DC	24V DC
3	Emission halt	OSSD1
4	Auxiliary output	EDM (External relay monitor)
5	Synchronization wire`	Synchronization wire`
6	Synchronization wire1	Synchronization wire1
7	0 V	0 V
8	Shielded wire	Shielded wire

##### NPN output type

Set the light curtain input polarity select switch to the PNP side and ground the 0 V line.



- Notes: 1) The above diagram is when using manual reset. If automatic reset is used, disconnect the lead from X2 and connect it to X3. In this case, a RESET switch is not needed.  
 2) Use a momentary-type switch as the reset button.  
 3) Emission halt occurs when the test button is open, and emission occurs when the test button is short-circuited. If not using the test button, short-circuit T1 and T2. However, use a test rod or similar to interrupt the light in order to carry out self-diagnosis separately.

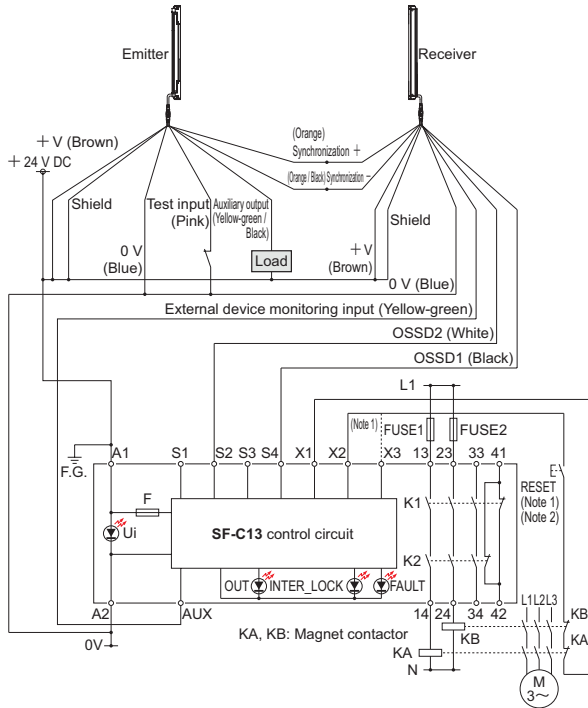
I/O CIRCUIT AND WIRING DIAGRAMS

SF-C13

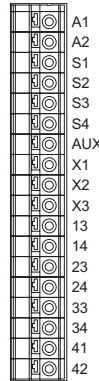
SF2B series Wiring diagram (Control category 2)

NPN output type

x Connect the light curtain control outputs OSSD1 and OSSD2 to S4 and S2 respectively and ground the 'side.



Terminal arrangement diagram



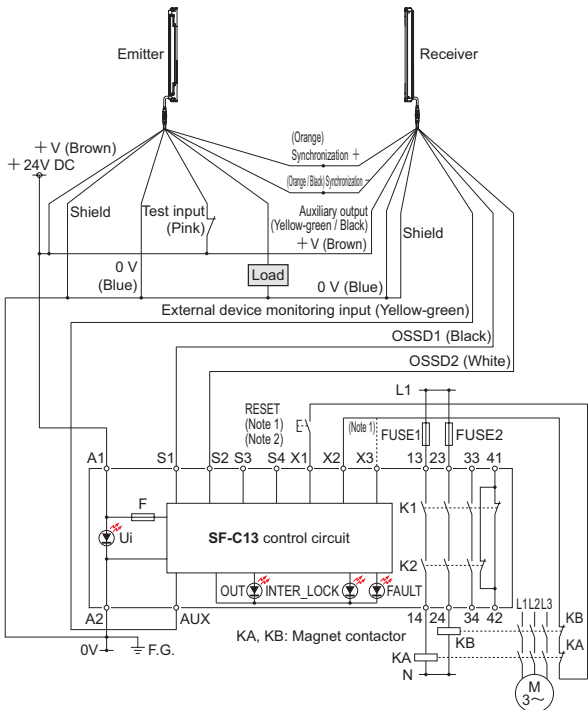
Terminal	Function
A1	~24 V DC
A2	0 V
S1 to S4	Light curtain control output (OSSD) input terminal
AUX	Semiconductor auxiliary output
X1	Reset output terminal
X2	Reset input terminal (Manual)
X3	Reset input terminal (Automatic)
13-14, 23-24, 33-34	Enabling path (NO contact 23)
13	
14	
41-42	Auxiliary output (NC contact 21)

Use a separate terminal block to carry out wiring for light curtains that cannot be connected to the SF-C13.

Notes: 1) The left diagram is when using manual reset. If automatic reset is used, disconnect the lead from X2 and connect it to X3. In this case, a RESET switch is not needed.  
2) Use a momentary-type switch as the reset button.

PNP output type

x Connect the light curtain control outputs OSSD1 and OSSD2 to S1 and S2 respectively.



Notes: 1) The left diagram is when using manual reset. If automatic reset is used, disconnect the lead from X2 and connect it to X3. In this case, a RESET switch is not needed.  
2) Use a momentary-type switch as the reset button.



## PRECAUTIONS FOR PROPER USE



- x When this light curtain is used in the 'PSDI mode', an appropriate control circuit must be configured between this device and the machinery. For details, be sure to refer to the standards or regulations applicable in each region or country.
- x This light curtain is a Type 2 electro-sensitive protective equipment. It is specified that this light curtain be utilized only within systems implementing control categories 2, 1 and B (safety-related categories for control systems), as determined by European Standard EN 954-1. This light curtain must never be utilized in any system that requires the usage of category 4 equipment, such as press machines; nor for systems requiring category 3 equipment.
- x To use this product in the U.S.A., refer to OSHA 1910. 212 and OSHA 1910. 217 for installation, and in Europe, refer to EN 999 as well. Observe your national and local requirements before installing this product.

- x This catalog is a guide to select a suitable product. Be sure to read instruction manual attached to the product prior to its use.
- x Both emitter and receiver are combined adjusted on 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. (The last 6 digits under the model represents the serial No.)

- x Make sure to carry out the test run before regular operation.
- x This safety system is for use only on machinery in which the dangerous parts can be stopped immediately, either by an emergency stop unit or by disconnecting the power supply. Do not use this system with machinery which cannot be stopped at any point in its operation cycle.

### Self-diagnosis function

- x This light curtain incorporates the self-diagnosis function. In case an abnormality is detected during self-diagnosis, the light curtain is put in the lockout state at that instant, and the control output (OSSD 1, OSSD 2) is fixed at the OFF state. Refer to 'Troubleshooting' (P. 29) and the instruction manual and remove the cause of the abnormality.



- x In order to maintain safe condition of light curtain, inspect the beam interrupted status of the device once a day or more. Failure to do so could delay the detection of unexpected abnormality and increase the degree of hazard, which may cause the malfunction of light curtain, resulting in serious body injury or death.
- x In order to check all abnormalities in the OSSD1, OSSD2 and auxiliary output, the beam interrupted status of device must be checked. Perform either of two below to inspect the device under beam interrupted condition.
  - x Emission halt by test input (Emission halt function)
  - x Beam interrupting by test rod (Excluding the cable SF2B-CB05-A)

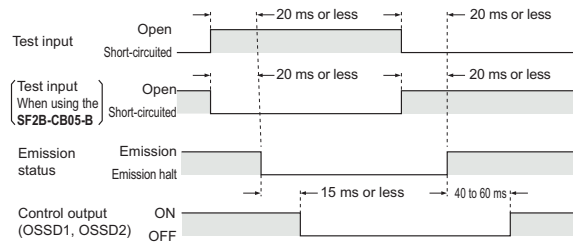
### Emission halt function (Test input)

- x This function stops the emission process of the emitter. You can select whether emission is on or halted by means of the connection status for the test input (pink).

Test input	Emission status	
	When using the SF2B-CB05-B	
Open	Emission halt	Emission
Connected to 0 V or V	Emission	Emission halt

- x During emission halt, the control output (OSSD1, OSSD2) becomes OFF status.
- x By using this function, malfunction due to extraneous noise or abnormality in the control output (OSSD1, OSSD2) and the auxiliary output can be determined even from the machinery side.

### <Time chart>



Do not use the emission halt function (test input) for the purpose of stopping the device. Failure to do so could result in serious injury or death.

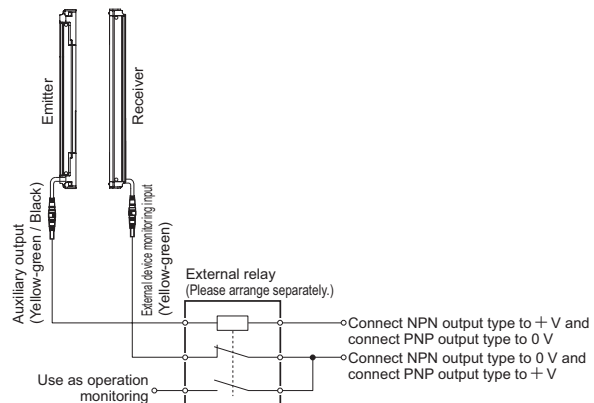
### Auxiliary output

- x Auxiliary output is incorporated into the emitter and its operation varies depending on the type of bottom cap cable (optional) to be used.

Bottom cap cable	Normal mode			Lockout
	Emission halt	Control output (OSSD1, OSSD2) status		
		Beam received	Beam interrupted	
When using the SF2B-CCBM / SF2B-CBM	ON	OFF	ON	ON
When using the SF2B-CB05-A	OFF	ON	ON	OFF
SF2B-CB05-B	Cannot be used.			

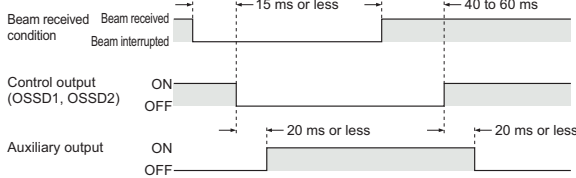
### When bottom cap cable SF2B-CCBM or SF2B-CBM (optional) is used

- x The auxiliary output is incorporated in the emitter. It is OFF when the control output (OSSD 1, OSSD 2) is ON and vice versa.
- x The auxiliary output can be used as an operation monitor of the device.
- x When the external device monitor function is not used, connect the external device monitor input line to the auxiliary output line to disable the function (except for SF2B-CB05-C).
- x In this case, do not connect the load to the auxiliary output. For details, refer to 'External device monitoring function' (P. 26) and 'I/O CIRCUIT AND WIRING DIAGRAMS' (P. 21).
- x When the external device monitor function is used to disable, do not directly use the auxiliary output as the operation monitor of this light curtain. When the external device monitor is used to disable and the auxiliary output is used to monitor the operation of light curtain, connect the auxiliary output and the external device monitor input to the external relay (please arrange separately) to use the external relay contacting point as an operation monitor of this light curtain.



**PRECAUTIONS FOR PROPER USE**

**<Time chart>**

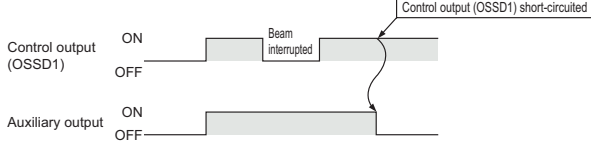


**When bottom cap cable SF2B-CB05-A (optional) is used**

Make sure to use the auxiliary output when using the bottom cap cable **SF2B-CB05-A** (optional). Set the device so the control machine can be stopped when either the control output (OSSD 1) or auxiliary output turns to OFF. If the auxiliary output is should not be used, the device can not stop operation when an unexpected error occurs during control output (OSSD 1) failure, which may result in serious injury or death.

- x The auxiliary output is incorporated in the emitter. It outputs ON at the normal operation of device. It outputs OFF in the following cases:
  - x When an abnormality which needs emission halt status occurs [for example, the control output (OSSD1) short-circuit and an error occurs.]
  - x While test input has been input
- x The error cannot be transmitted to the control machine. The alarm signal is output from the auxiliary output.

**<Time chart>**



**When bottom cap cable SF2B-CB05-B (optional) is used**

- x The auxiliary output cannot be utilized by using the bottom cap cable **SF2B-CB05-B** (optional).

**External device monitoring function**

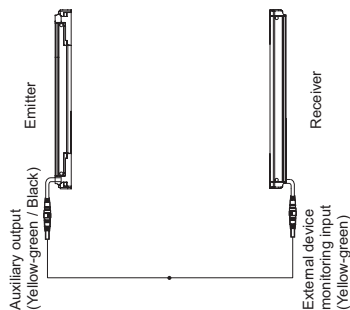
- x This function is available when the bottom cap cable **SF2B-CCBM** or **SF2B-CBM** (optional) is used. This is the function for checking whether the external safety relay connected to the control output (OSSD1, OSSD2) performs normally in accordance with the control output (OSSD1, OSSD2) or not. Monitor the b contact of the external safety relay, and if any abnormality such as deposit of the contacting point, etc. is detected, change the status of the light curtain into lockout one, and turn OFF the control output (OSSD1, OSSD2).

**In case of setting the external device monitoring function to enabled**

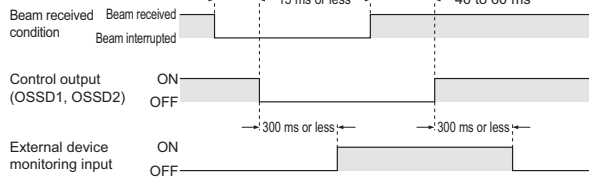
- x Connect the external device monitoring input (yellow-green) to the b contact of the external safety relay that is connected to the control output (OSSD1, OSSD2). Refer to p. 21 l for wiring diagrams.

**In case of not using the external device monitoring function**

- x Connect the external device monitoring input (yellow-green) to the auxiliary output (yellow-green / black).

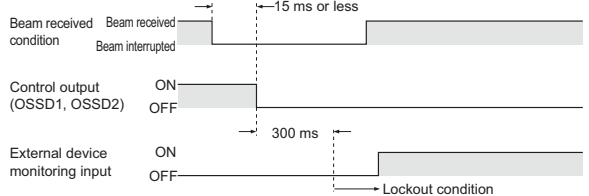


**<Time chart (normal)>**

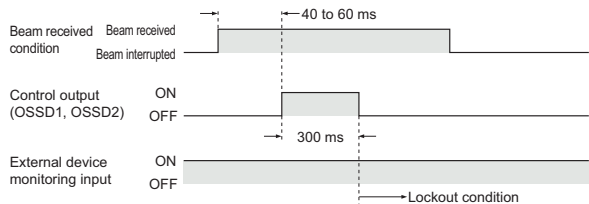


- x The time set for external device monitoring is 300 ms or less. Exceeding 300 ms turns the light curtain into lockout status.

**<Time chart (Error1)>**



**<Time chart (normal2)>**



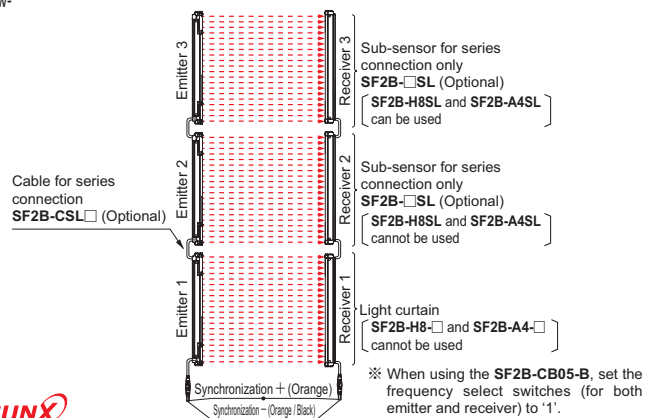
**Series connection**

**Connectable up to 3 sets of light curtains (however, 128 beam channels max.)(Note 1)(Note 2)**

- x This is the configuration for connecting multiple sets of emitters and receivers facing each other in series. It is used when the dangerous part can be entered from two or more directions. The control output (OSSD1, OSSD2) turns OFF if any of the light curtain is interrupted. For details, refer to the instruction manual.

- Notes 1): Series connection connectors cannot be used with the **SF2B-H8-M** and **SF2B-A4-M**, and so series connection is not possible. The **SF2B-H8SL** and **SF2B-A4SL** are not equipped with series connection connectors, so when connecting three sets in series, they cannot be used in the middle position.
- 2): The total number of beam axes for the **SF2B-AM** is a maximum of 96 when two sets are connected, and 64 when three sets are connected. When **SF2B-HM** and **SF2B-AM** are combined in series connection, double the number of the beam channels of **SF2B-AM** to calculate the total number of beam channels, which should be 128 or less.
- Example: The total no. of beam channel for **SF2B-H36** and **SF2B-A44** is 124.  
 The no. of beam channels of **SF2B-H36** (the No. of beam channels of **SF2B-A44**)  
 36 beam channels (44 beam channels)  
 4)124 beam

For serial connections, connect the emitter and receiver of the light curtain to the emitter and receiver respectively of the sub-sensors for series connection using the **SF2B-CSLM** special series connection cables. Wrong connection could generate the non-sensing area, resulting in serious injury or death.

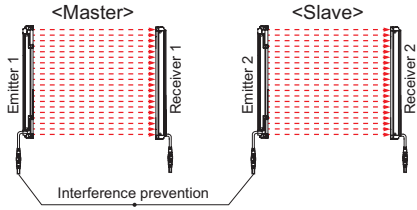


# SF2B

## PRECAUTIONS FOR PROPER USE

### Parallel connection

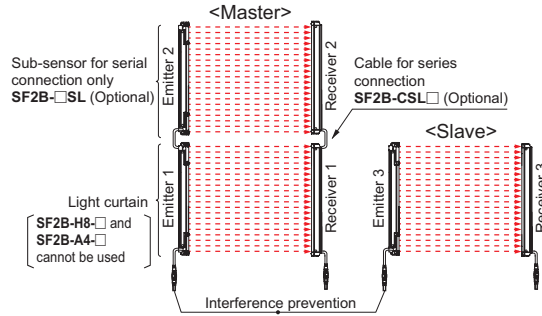
x Up to a maximum of two sets can be connected in parallel only when using the **SF2B-CB05-B** adapter cable (optional). For details, refer to the instruction manual.



※ Set the frequency select switches (for both emitter and receiver) to '1' at the master units, and set them to '2' at the slave units.

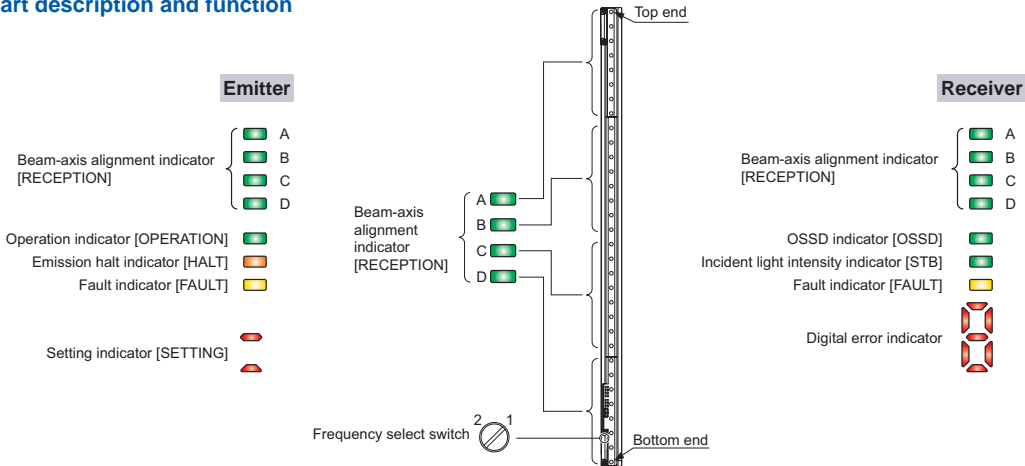
### Series and parallel mixed connection

x Up to a maximum of three sets can be connected in a mixture of series and parallel (For a total maximum number of 128 beam channels. However, the total number of beam channels for the **SF2B-AM** is a maximum of 96 when two sets are connected, and 64 when three sets are connected.) only when using the **SF2B-CB05-B** adapter cable (optional). For details, refer to the instruction manual.



※ Set the frequency select switches (for both emitter and receiver) to '1' at the master units, and set them to '2' at the slave units.

### Part description and function




Description	Function
Beam-axis alignment indicator (Red / Green) [RECEPTION]	A When all beam channels of light curtain top are receiving light: lights red When light curtain top end receives light: blinks in red When control output (OSSD1, OSSD2) is ON: lights up in green (always off when using the <b>SF2B-CB05-B</b> )
	B When all beam channels of light curtain upper middle are receiving light: lights red When control output (OSSD1, OSSD2) is ON: lights up in green (always off when using the <b>SF2B-CB05-B</b> )
	C When all beam channels of light curtain lower middle are receiving light: lights red When control output (OSSD1, OSSD2) is ON: lights up in green (always off when using the <b>SF2B-CB05-B</b> )
	D When all beam channels of light curtain bottom are receiving light: lights red When sensor bottom end receives light: blinks in red When control output (OSSD1, OSSD2) is ON: lights up in green (always off when using the <b>SF2B-CB05-B</b> )
Operation indicator (Red / Green) [OPERATION]	When control output (OSSD1, OSSD2) is OFF: lights up in red When control output (OSSD1, OSSD2) is ON: lights up in green (When using the <b>SF2B-CB05-B</b> When fault occurs in the emitter: light up in red When emitter is normal: light up in green)
Emission halt indicator (Orange) [HALT]	When light emission is halt: lights up When light is emitted: lights off
Fault indicator (Yellow) [FAULT]	When fault occurs in the sensor: lights up or blinks
Setting indicator (Red) [SETTING]	Always off (When using the <b>SF2B-CB05-B</b> One lights up when set to Frequency 1 Two light up when set to Frequency 2)
Frequency select switch	Used for switching between master and slave when using the <b>SF2B-CB05-B</b> . Set to '1' for master and '2' for slave.

Description	Function
Beam-axis alignment indicator (Red / Green) [RECEPTION]	A When all beam channels of light curtain top are receiving light: lights red When sensor top end receives light: blinks in red When control output (OSSD1, OSSD2) is ON: lights up in green
	B When all beam channels of light curtain upper middle are receiving light: lights red When control output (OSSD1, OSSD2) is ON: lights up in green
	C When all beam channels of light curtain lower middle are receiving light: lights red When control output (OSSD1, OSSD2) is ON: lights up in green
	D When all beam channels of light curtain bottom are receiving light: lights red When sensor bottom end receives light: blinks in red When control output (OSSD1, OSSD2) is ON: lights up in green
OSSD indicator (Red / Green) [OSSD]	When control output (OSSD1, OSSD2) is OFF: lights up in red When control output (OSSD1, OSSD2) is ON: lights up in green
Incident light intensity indicator (Orange / Green) [STB]	When sufficient light is received (incident light intensity: 130 % or more)(Note 1): lights up in green When stable light is received (incident light intensity: 115 to 130 %)(Note 1): OFF When unstable light is received (incident light intensity: 100 to 115 %)(Note 1): lights up in orange When light is interrupted: OFF (Note 2)
Fault indicator (Yellow) [FAULT]	When fault occurs in the sensor: lights up or blinks
Digital error indicator (Red)(Note 3)	When device is lockout: lights up for malfunction content (When using the <b>SF2B-CB05-B</b> Display shows fault contents during lockout. Center lights up when set to Frequency 1 Center and bottom lights up when set to Frequency 2)
Frequency select switch	Used for switching between master and slave when using the <b>SF2B-CB05-B</b> . Set to '1' for master and '2' for slave.

- Notes: 1) The threshold value where the control output changes from OFF to ON is applied as "100 % incident light intensity".  
2) The status 'when light is interrupted' refers to the status that the some obstacle is existed in the sensing area.  
3) For details, refer to '**Troubleshooting**' (P. 29) and the instruction manual which is included with the unit.  
4) The description given in [ ] is marked on the light curtain.

**PRECAUTIONS FOR PROPER USE**

**Wiring**




Refer to the applicable regulations for the region where this light curtain is to be used when setting up the light curtain. In addition, make sure that all necessary measures are taken to prevent possible dangerous operating errors resulting from earth faults.

- x Make sure to carry out the wiring in the power supply off condition.
- x Verify that the supply voltage variation is within the rating.
- x If power is supplied from a commercial switching regulator, ensure that the frame ground (F.G.) terminal of the power supply is connected to an actual ground.
- x In case noise generating equipment (switching regulator, inverter motor, etc.) is used in the vicinity of this sensor, connect the frame ground (F.G.) terminal of the equipment to an actual ground.
- x Do not run the wires together with high-voltage lines or power lines or put them in the same raceway. This can cause malfunction due to induction.

**Others**

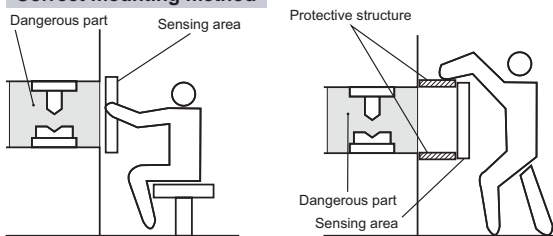
- x Do not use during the initial transient time (2 sec.) after the power supply is switched on.
- x Avoid dust, dirt and steam.
- x Take care that the light curtain does not come in direct contact with water, oil, grease, or organic solvents, such as, thinner, etc.
- x Take care that the light curtain 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.

**Sensing area**

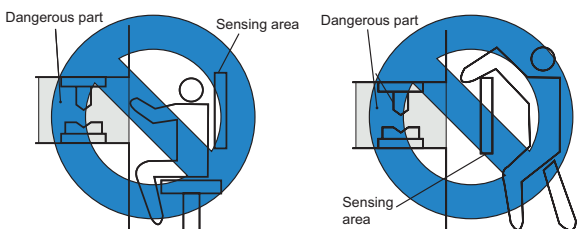


- x Make sure to install this product such that any part of the human body must pass through its sensing area in order to reach the dangerous parts of the machinery. If the human body is not detected, there is a danger of serious injury or death.
- x Do not use any reflective type or retroreflective type arrangement.
- x Emitter and receiver that face each other should be from the same model No. (with same beam axis pitch and number of beam channels) and aligned in the vertical direction. If units from different sets are connected together, it may cause blind spots in the sensing area, and death or serious injury may result.
- x Furthermore, facing several receivers towards one emitter, or vice versa, could produce a non-sensing area or cause mutual interference, which may result in serious injury or death.


**Correct mounting method**



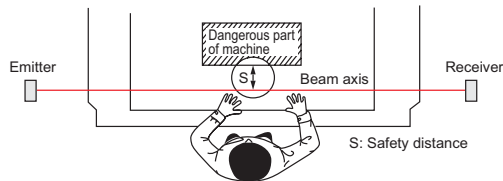
**Wrong mounting method**



**Safety distance**



- x 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.
- x Before designing the system, refer to the relevant standards of the region where this device is to be used and then install this device.



- x 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)**

**For intrusion direction perpendicular to the sensing area**

- x Equation 1  $S = 4K_2 T_m T_{SF2B} + C$
- S: Safety distance (mm)
- Minimum required distance between the sensing area surface and the dangerous parts of the machine
- K: Intrusion speed of operator's body or objects (mm/sec.)  
Normally, taken as **SF2B-HM** 2,000 (mm/sec.), **SF2B-AM** 1,600 (mm/sec.) for calculation.
- T: Response time of total equipment (sec.)  
 $T = 4T_m + T_{SF2B}$   
T<sub>m</sub>: Maximum halting time of machinery (sec.)  
T<sub>SF2B</sub>: Response time of the **SF2B** series 0.015 (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 0 or less.  
 $C = 482(d/114)$
- d: Minimum sensing object diameter  
**SF2B-HM**: d427 (mm) **1.063 (in)**, C4104 (mm) **4.094 (in)**  
For **SF2B-AM**, C4850 (mm) **33.465 (in)**(constant)

- x For calculating the safety distance S, there are the following five cases. First calculate by substituting the value K42,000 (mm/sec.) in the equation above. Then, classify the obtained value of S into three cases, 1) S≤100, 2) 100hSh500, and 3) S>500. For Case 3) S>500, recalculate by substituting the value K41,600 (mm/sec.). After that, classify the calculation result into two cases, 4) Sh500 and 5) S>500. For details, refer to the instruction manual enclosed with this product.
- x For calculating T<sub>m</sub> (maximum halt time of the machinery), use a special device called a 'brake monitor'.
- x When this device 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.

**For use in the United States of America (as per ANSI B11.19)**


- x Equation 2  $S = 4K_2(T_s + T_c + T_{SF2B} + T_{bm}) + D_{pf}$
- 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.) [1,600 (mm/sec.)])  
ANSI B11.19 does not define the intrusion velocity 'K'. When determining K, consider possible factors including physical ability of operators.
- T<sub>s</sub>: Halting time calculated from the operation time of the control element (air valve, etc.) (sec.)
- T<sub>c</sub>: Maximum response time of the control circuit required for functioning the brake (sec.)
- T<sub>SF2B</sub>: Response time of light curtain (sec.)
- T<sub>bm</sub>: Additional halting time tolerance for the brake monitor (sec.)  
 $T_{bm} = 4T_a + 1(T_s + T_c)$   
T<sub>bm</sub>: 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<sub>s</sub> + T<sub>c</sub>) is taken as additional halting time.
- D<sub>pf</sub>: Additional distance calculated from the size of the minimum sensing object of the sensor  
**SF2B-HM** D<sub>pf</sub>42.676 (inch)c68 (mm)  
**SF2B-AM** D<sub>pf</sub>45.355 (inch)c136 (mm)  
 $D_{pf} = 43.42(d/0.276)$ (inch)  
 $D_{pf} = 43.42(d/17)$ (mm)
- d: Minimum sensing object diameter 1.063 (inch)c27 (mm) **SF2B-HM**  
Minimum sensing object diameter 1.851 (inch)c47 (mm) **SF2B-AM**  
However, the value of D<sub>pf</sub> cannot be 0 or less.



# SF2B

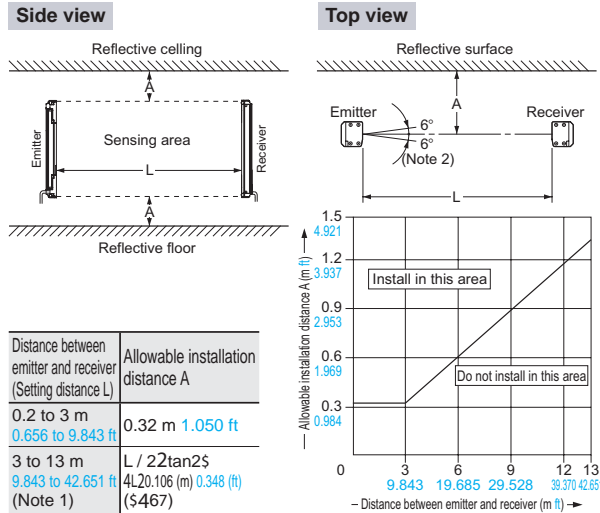
## PRECAUTIONS FOR PROPER USE

### Influence of reflective surfaces



Install the light curtain by considering the effect of nearby reflective surfaces, and take countermeasures such as painting, masking, or changing the material of the reflective surface, etc. Failure to do so may cause the light curtain not to detect, resulting in serious body injury or death.

x Keep the minimum distance given below, between the light curtain and a reflective surface.



Notes: 1) If using the SF2B-CB05-B, the sensing range is 0.3 to 5 m 0.984 to 16.404 ft.  
 2) The effective aperture angle for this device is 567 or less (when L.3 m 9.843 ft) as required by IEC 61496-2 / UL 61496-2. However, install this device away from reflective surfaces considering an effective aperture angle of 567 to take care of beam misalignment, etc. during installation.

### Troubleshooting

Symptoms	Cause	Remedy
All indicators are off.	Power is not being supplied.	Check that the power supply capacity is sufficient. Connect the power supply correctly.
	Supply voltage is out of the specified range.	Provide the supply voltage within the specified range.
	Connector is not connected securely.	Connect the connector securely.
Fault indicator (yellow) lights or blinks. [FAULT]	[Blinks once] Total light curtains No. / total beam channel No. error	Connect the end cap properly. Connect the cable for series connection correctly. Check the model (emitter / receiver) of sub-sensor for series connection. Set the No. of the light curtains in series connection, and a total No. of beam channels within the specification.
	[Blinks twice] Auxiliary output error	Connect the auxiliary output cable correctly.
	[Other than the above] Effect from noise / power supply or failure of internal circuit	Check the noise status around this light curtains. Check the wiring, supplied voltage and power supply capacity. Even if the error is not eliminated, contact our office.
Emission halt indicator (orange) lights up. [HALT]	Emission is in halt condition.	Connect the test input (emission halt input) wire correctly. The logic varies depending on the cable to be used.
	The synchronization wire error	Connect the synchronization wire correctly.
	The receiver does not work.	Check the operation of the receiver side.
	The interference prevention wire error (When using the SF2B-CB05-B. When set to slave)	Connect the interference prevention wire correctly.
	Master / slave setting error (When using the SF2B-CB05-B. When set to master)	Set the master / slave setting to 'master'.
	The master sensor does not work.	Check the master side light curtain.

Symptoms	Cause	Remedy
Operation indicator remains lit in red (light is not received). [OPERATION]	The beam channels of the emitter and the receiver are not correctly aligned.	Align the beam channels.

### Receiver Side

Symptoms	Cause	Remedy
All indicators are off.	Power is not being supplied.	Check that the power supply capacity is sufficient. Connect the power supply correctly.
	Supply voltage is output of the specified range.	Set the supply voltage correctly.
	Connector is not connected securely.	Connect the connector securely.
Fault indicator (yellow) lights or blinks. [FAULT]	[Digital error indicator 1] Total light curtain No. / total beam channel No. error	Connect the end cap properly. Connect the cable for series connection correctly. Check the model (emitter / receiver) of sub sensor for series connection. Check that the number of light curtains / number of beam axes is within the specification value.
	[Digital error indicator 2] Control output (OSSD 1, OSSD 2) error	Connect the control output (OSSD1, OSSD2) correctly.
	[Digital error indicator 4] Extraneous light error	Prevent any extraneous light from entering the receiver.
	[Digital error indicator 7] External device monitoring error	Connect the external device monitor input wire correctly. Replace the replay unit. Replace the relay unit having appropriate response time.
	[Digital error indicator 5] Bottom connector error	Check the type of the bottom connector. Cable of the emitter: Grey (with black stripe)
	[Other than the above] Effect from noise / power supply or failure of internal circuit	Check the noise status around this light curtain. Check the wiring, supplied voltage and power supply capacity. Even if the error is not eliminated, contact our office.
Stable indicator lights up (Orange) [STB]	The beam channels of the emitter and the receiver are not correctly aligned.	Align the beam channels.
OSSD indicator remains lit in red (light is not received). [OSSD]	The beam channels of the emitter and the receiver are not correctly aligned.	Align the beam channels.
	Total unit No. / total beam channel No. error	Set the same value to the Nos. of emitter and receiver.
	The master / slave setting is different. (When using with the SF2B-CB05-B)	Set the setting identically.



**DIMENSIONS (Unit: mm in)**

The CAD data in the dimensions can be downloaded from the SUNX website: <http://www.sunx.co.jp/>  
The CAD data is available in 2-D (dx) and 3-D (IGES, STEP and Parasolid) formats.

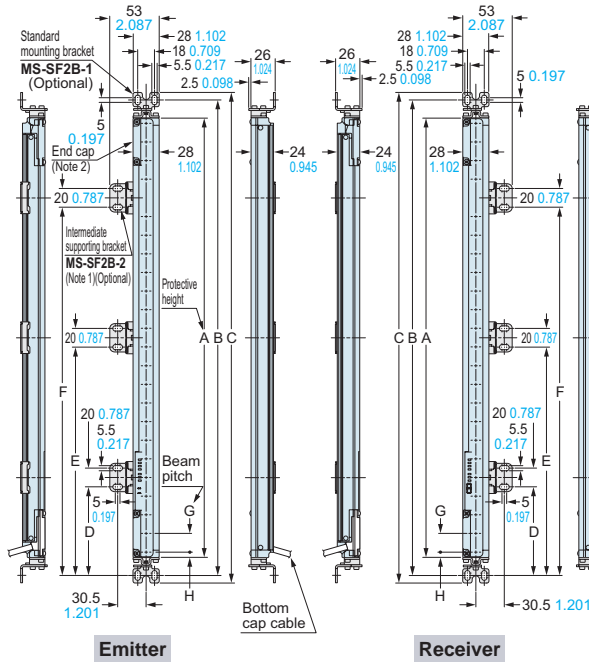
**SF2B-M**

Light curtain

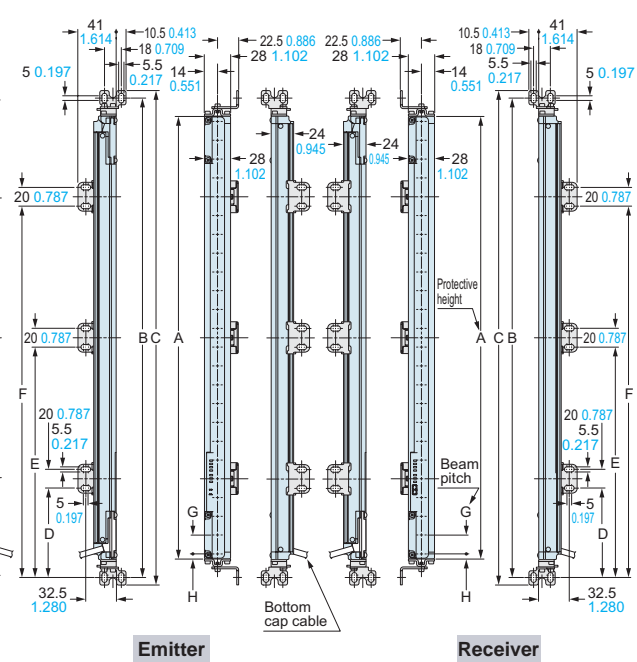
**Assembly dimensions**

Mounting drawing for the light curtain on which the standard mounting brackets **MS-SF2B-1** (optional) and the intermediate supporting brackets **MS-SF2B-2** are mounted.

**<Back mounting>**



**<Side mounting>**



Notes: 1) The **MS-SF2B-2** intermediate supporting bracket is provided as an accessory with this product. The number of accessories provided varies depending on the product.  
2) An end cap is not provided for the **SF2B-H8-M** and **SF2B-A4-M** or for the **SF2B-H8SL** and **SF2B-A4SL**.

Model No.	A	B	C	D	E	F
SF2B-H8(SL)(-M) / SF2B-A4(SL)(-M)	168 6.614	207 8.150	223 8.780	1	1	1
SF2B-H12(SL)(-M) / SF2B-A6(SL)(-M)	232 9.134	270 10.630	286 11.260	1	1	1
SF2B-H16(SL)(-M) / SF2B-A8(SL)(-M)	312 12.283	350 13.780	366 14.409	1	1	1
SF2B-H20(SL)(-M) / SF2B-A10(SL)(-M)	392 15.433	430 16.929	446 17.559	1	1	1
SF2B-H24(SL)(-M) / SF2B-A12(SL)(-M)	472 18.583	510 20.079	526 20.709	1	1	1
SF2B-H28(SL)(-M) / SF2B-A14(SL)(-M)	552 21.732	590 23.228	606 23.858	1	1	1
SF2B-H32(SL)(-M) / SF2B-A16(SL)(-M)	632 24.882	670 26.378	686 27.008	1	1	1
SF2B-H36(SL)(-M) / SF2B-A18(SL)(-M)	712 28.031	750 29.528	766 30.157	1	1	1
SF2B-H40(SL)(-M) / SF2B-A20(SL)(-M)	792 31.181	830 32.677	846 33.307	390 15.354	1	1
SF2B-H48(SL)(-M) / SF2B-A24(SL)(-M)	952 37.480	990 38.976	1,006 39.606	470 18.504	1	1
SF2B-H56(SL)(-M) / SF2B-A28(SL)(-M)	1,112 43.779	1,150 45.276	1,166 45.905	550 21.654	1	1
SF2B-H64(SL)(-M) / SF2B-A32(SL)(-M)	1,272 50.079	1,310 51.575	1,326 52.205	418 16.457	842 33.150	1
SF2B-H72(SL)(-M) / SF2B-A36(SL)(-M)	1,432 56.378	1,470 57.874	1,486 58.504	472 18.583	948 37.323	1
SF2B-H80(SL)(-M) / SF2B-A40(SL)(-M)	1,592 62.677	1,630 64.173	1,646 64.803	525 20.669	1,055 41.535	1
SF2B-H88(SL)(-M) / SF2B-A44(SL)(-M)	1,752 68.976	1,790 70.472	1,806 71.102	433 17.047	870 34.252	1,308 51.496
SF2B-H96(SL)(-M) / SF2B-A48(SL)(-M)	1,912 75.275	1,950 76.772	1,966 77.401	473 18.622	950 37.402	1,428 56.220

Model No.	G	H
SF2B-HM	20 0.787	6 0.236
SF2B-AM	40 1.575	26 1.024

# SF2B

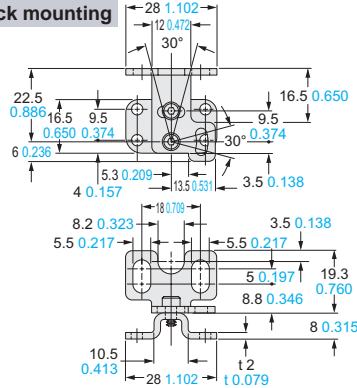
## DIMENSIONS (Unit: mm in)

The CAD data in the dimensions can be downloaded from the SUNX website: <http://www.sunx.co.jp/>  
The CAD data is available in 2-D (dxf) and 3-D (IGES, STEP and Parasolid) formats.

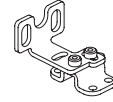
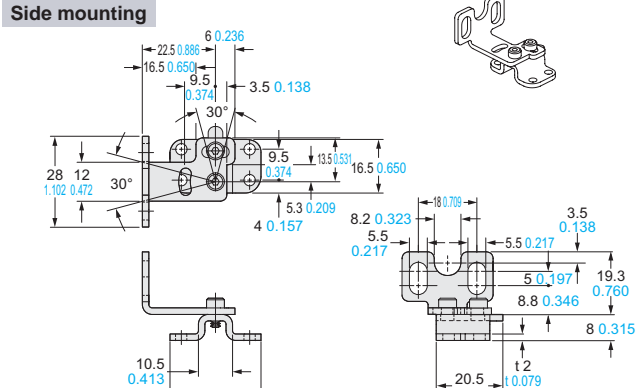
### MS-SF2B-1 Standard mounting bracket (Optional)

#### <MS-SF2B-1(R)>

##### Back mounting

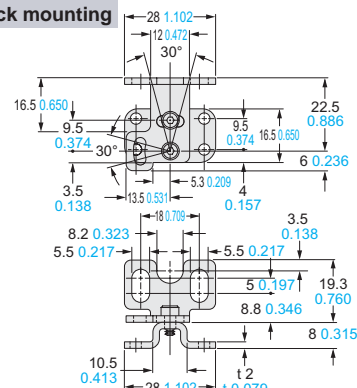


##### Side mounting

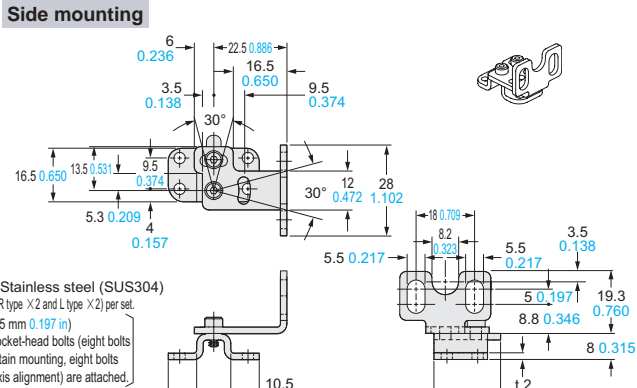


#### <MS-SF2B-1(L)>

##### Back mounting



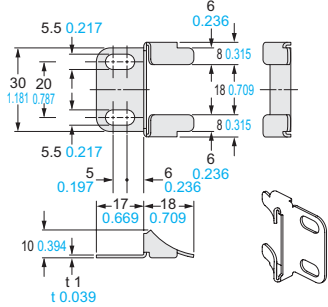
##### Side mounting



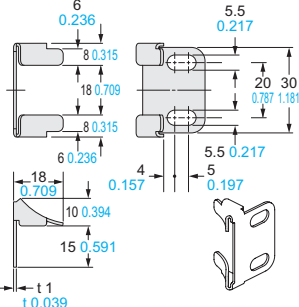
Material: Stainless steel (SUS304)  
Four brackets (R type X2 and L type X2) per set.  
M3 (length 5 mm 0.197 in) hexagon-socket-head bolts (eight bolts for light curtain mounting, eight bolts for beam axis alignment) are attached.

### MS-SF2B-2 Intermediate supporting bracket (Accessory for light curtain)

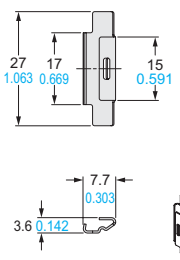
#### <Back mounting>



#### <Side mounting>

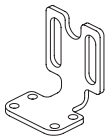
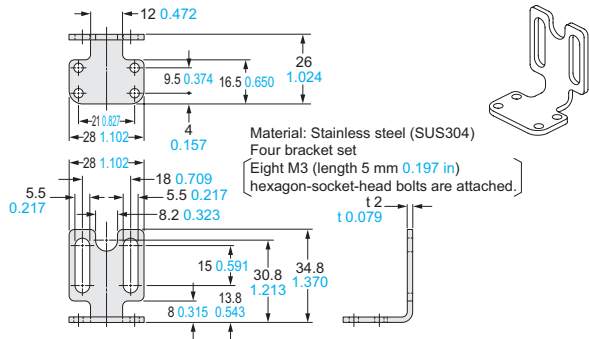


#### <For main unit mounting>



Material: Stainless steel (SUS304)  
Two main unit mounting brackets per set (for rear mounting and side mounting) (Note)

### MS-SF2B-4 SF1-N / NA40 adapter mounting bracket (Optional)



Material: Stainless steel (SUS304)  
Four bracket set  
Eight M3 (length 5 mm 0.197 in) hexagon-socket-head bolts are attached.

Note: The intermediate supporting bracket MS-SF2B-2 is enclosed with the following products. The quantity differs depending on the product as shown below:

- 1 set: SF2B-HM zzz Light curtain with 40 to 56 beam channels
- SF2B-AM zzz Light curtain with 20 to 28 beam channels
- 2 sets: SF2B-HM zzz Light curtain with 64 to 80 beam channels
- SF2B-AM zzz Light curtain with 32 to 40 beam channels
- 3 sets: SF2B-HM zzz Light curtain with 88 to 96 beam channels
- SF2B-AM zzz Light curtain with 44 to 48 beam channels

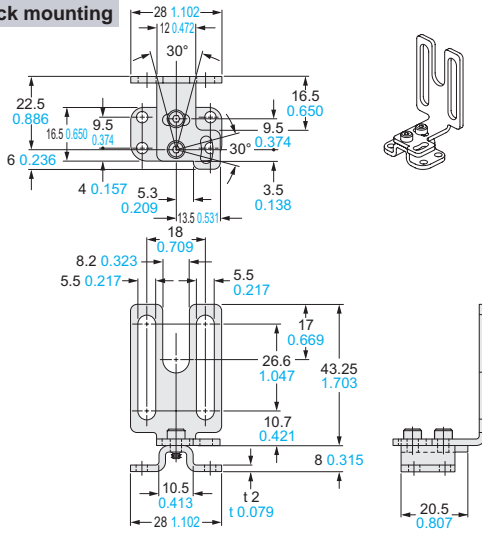
**DIMENSIONS (Unit: mm in)**

The CAD data in the dimensions can be downloaded from the SUNX website: <http://www.sunx.co.jp/>  
The CAD data is available in 2-D (dxf) and 3-D (IGES, STEP and Parasolid) formats.

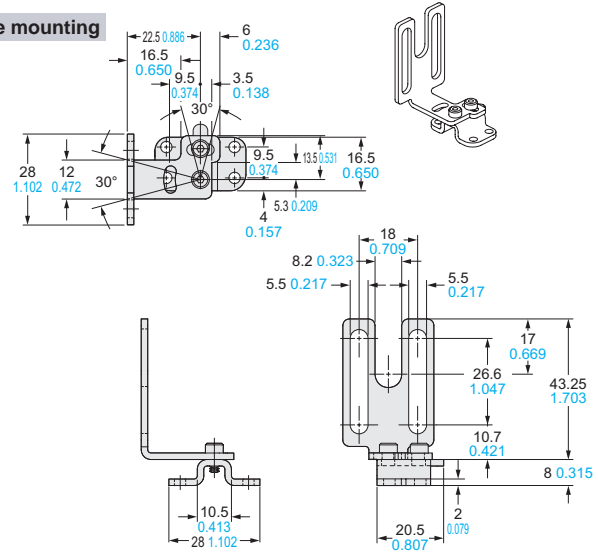
**MS-SF2B-5 SF2-A / SF2-N adapter mounting bracket (Optional)**

**<MS-SF2B-5(R)>**

**Back mounting**

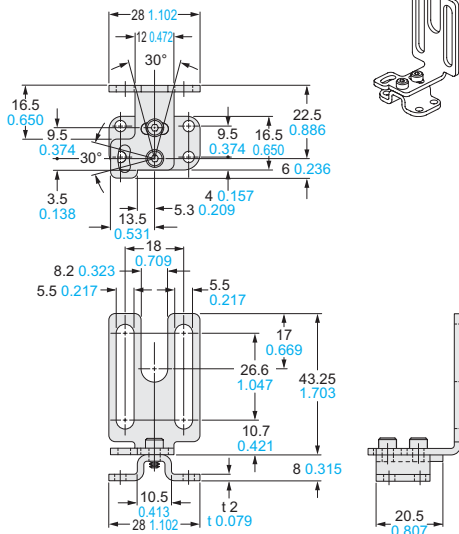


**Side mounting**

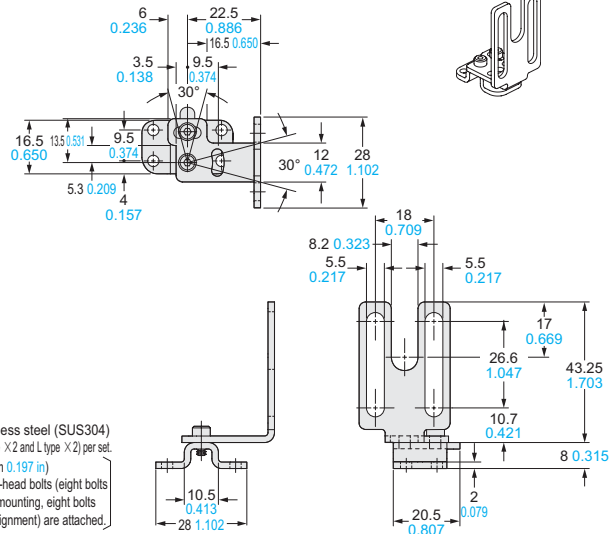


**<MS-SF2B-5(L)>**

**Back mounting**



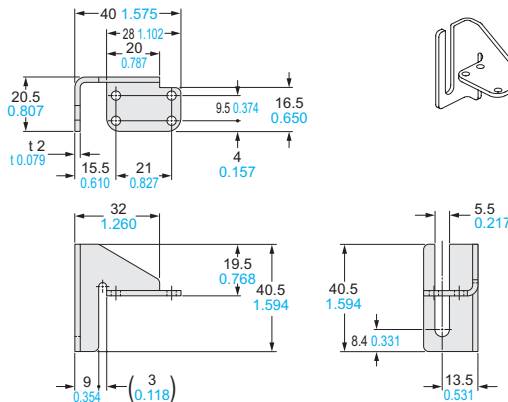
**Side mounting**



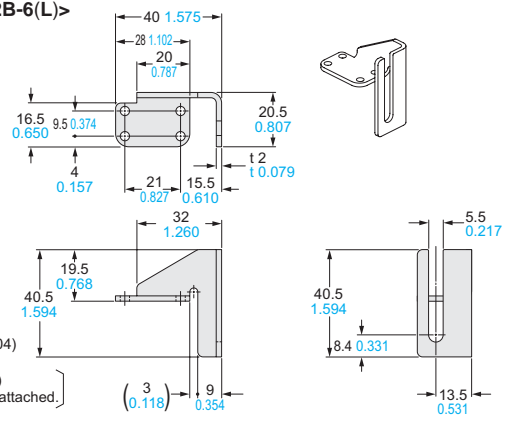
Material: Stainless steel (SUS304)  
Four brackets (R type X2 and L type X2) per set.  
M3 (length 5 mm 0.197 in) hexagon-socket-head bolts (eight bolts for light curtain mounting, eight bolts for beam axis alignment) are attached.

**MS-SF2B-6 NA40 adapter mounting bracket (Optional)**

**<MS-SF2B-6(R)>**



**<MS-SF2B-6(L)>**



Material: Stainless steel (SUS304)  
Four bracket set  
Eight M3 (length 5 mm 0.197 in) hexagon-socket-head bolts are attached.

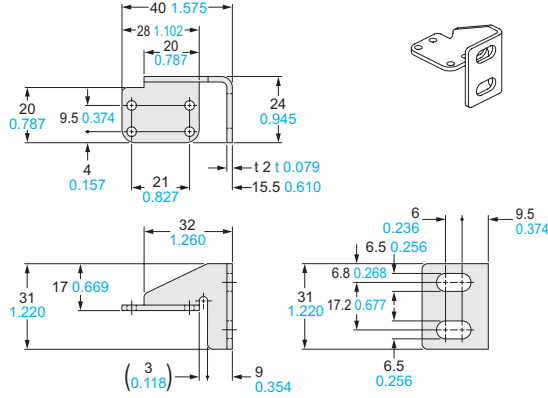
# SF2B

## DIMENSIONS (Unit: mm in)

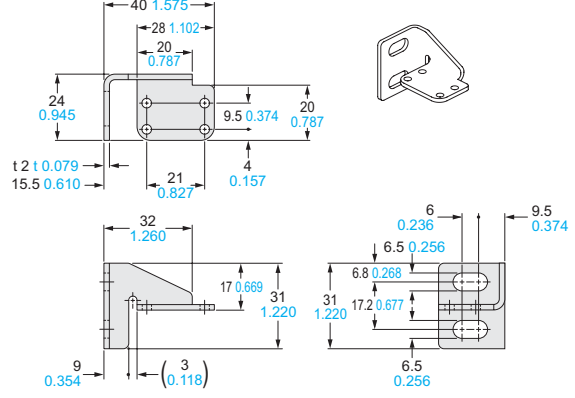
The CAD data in the dimensions can be downloaded from the SUNX website: <http://www.sunx.co.jp/>  
The CAD data is available in 2-D (dxf) and 3-D (IGES, STEP and Parasolid) formats.

### MS-SF2B-7 Adapter bracket for SF1-N (Optional)

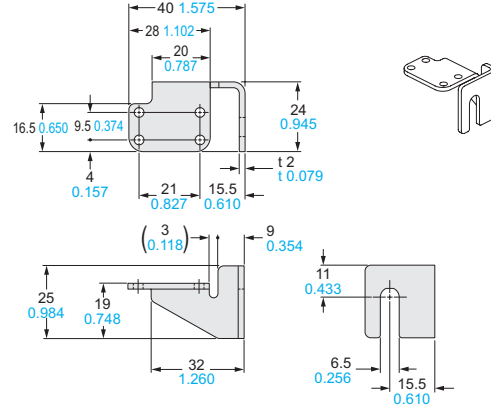
<For upper-right surface mounting>



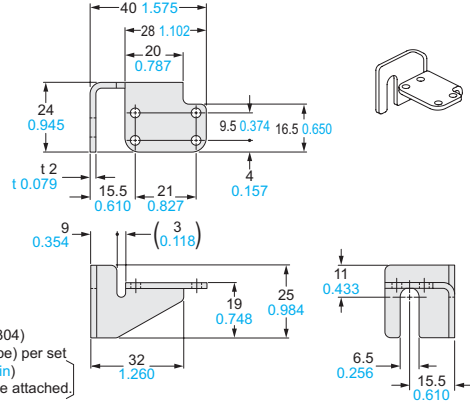
<For upper-left surface mounting>



<For lower-right surface mounting>

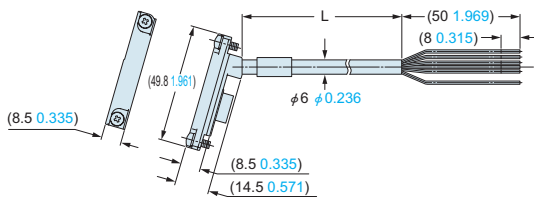


<For lower-left surface mounting>



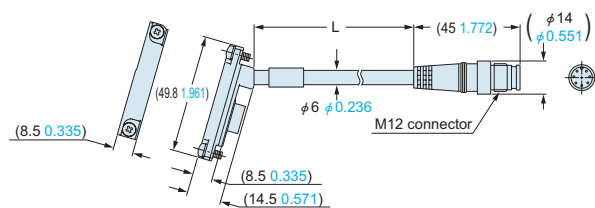
Material: Stainless steel (SUS304)  
Four brackets (one of each type) per set  
[Eight M3 (length 5 mm 0.197 in)  
hexagon-socket-head bolts are attached]

### SF2B-CCB3 SF2B-CCB7 Bottom cap cable (Optional)



Model No.	L
SF2B-CCB3	3,000 118.110
SF2B-CCB7	7,000 275.590

### SF2B-CBM Bottom cap cable (Optional)

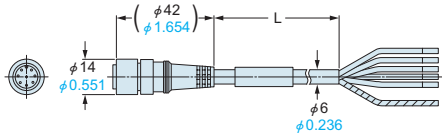


Model No.	L
SF2B-CB05	500 19.685
SF2B-CB5	5,000 196.850
SF2B-CB10	10,000 393.700

**DIMENSIONS (Unit: mm in)**

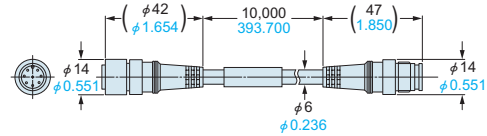
The CAD data in the dimensions can be downloaded from the SUNX website: <http://www.sunx.co.jp/>  
The CAD data is available in 2-D (dxf) and 3-D (IGES, STEP and Parasolid) formats.

**SFB-CC3  
SFB-CC10** Extension cable (Optional)

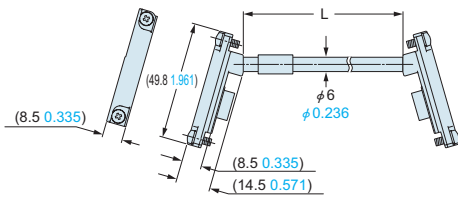


Model No.	L
<b>SFB-CC3</b>	3,000 118.110
<b>SFB-CC10</b>	10,000 393.700

**SFB-CCJ10E  
SFB-CCJ10D** Extension cable (Optional)

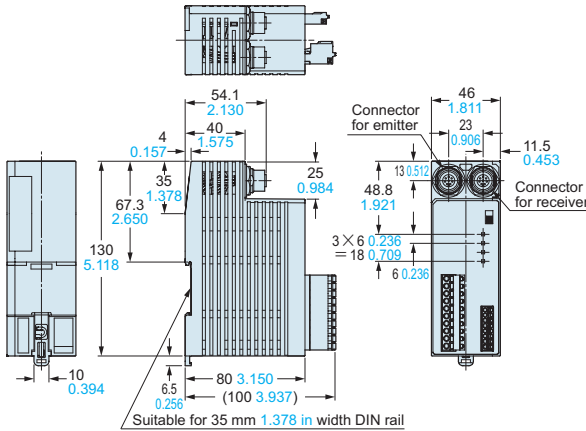


**SF2B-CSL01  
SF2B-CSL05** Cable for series connection (Optional)

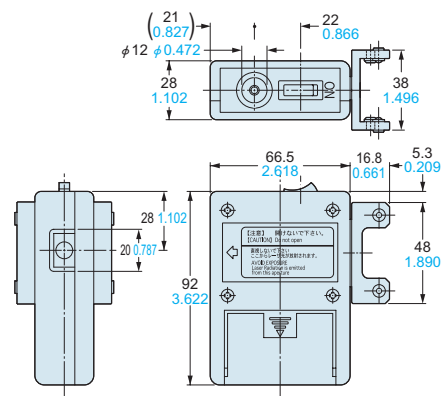


Model No.	L
<b>SF2B-CSL01</b>	100 3.937
<b>SF2B-CSL05</b>	500 19.685

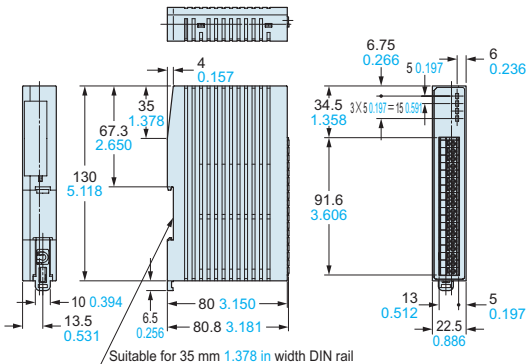
**SF-C11** Control unit (Optional)



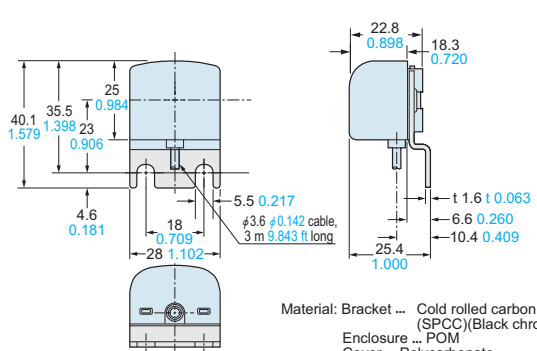
**SF-LAT-2B** Laser alignment tool (Optional)



**SF-C13** Control unit (Optional)



**SF-IND-2** Large display unit for light curtain (Optional)



Material: Bracket ... Cold rolled carbon steel (SPCC)(Black chromate)  
Enclosure ... POM  
Cover ... Polycarbonate



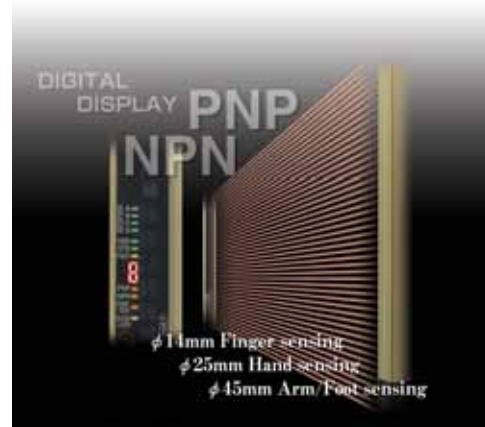
## Light curtains with international safety standard compatibility

LIGHT CURTAIN **Type4**

### SF4B SERIES

#### New concept that aims to combine safety and productivity

- A shorter safety distance means that units can be more compact.
- 'ZERO' dead zone. Unit length = protective height, so mounting is no dead zone.
- Built-in muting control circuit.
- Withstands mutual interference and extraneous light.
- NPN output and PNP output in a single model.



All information is subject to change without prior notice.



<http://www.sunx.co.jp/>

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