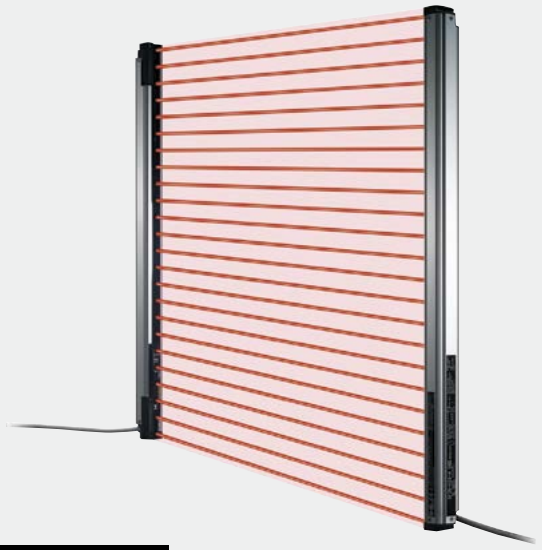
Safety Light Curtain Type 2
SF2B SERIES Ver.2

Related Information

■ General terms and conditions F-3
■ Selection guide ..... P.457~
■ SF-C11/C13 ..... P.663~
■ SF-C21 ..... P.647~
■ Glossary of terms ..... P.1549~
■ General precautions P.1595



Category 2 PLc SIL1

panasonic.net/id/pidsx/global

The control category differs depending on the configuration and wiring of the external circuit.

CE
cULus Listing
TÜV Certified
Conforming to OSHA / ANSI

Upgrade Guide

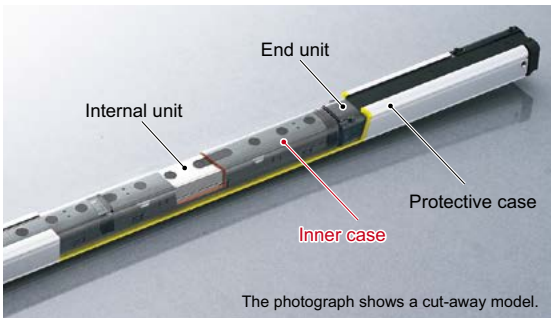
Upgraded to version 2.0 from January 2009 shipments.

Protection
Conventional: IP65 (IEC) <Previous>
↓
Ver.2: IP65 / IP67 (IEC, JIS) <New>

Type 2 safety solution
International regulations for safety measures at reasonable cost

Protective structure IP67* is achieved with a seamless structure that has reduced seams *Version 2.0 or later

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



Extensive 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.

Hand protection type SF2B-H□

Minimum sensing object
ø27 mm ø1.063 in
(20 mm 0.787 in beam pitch)

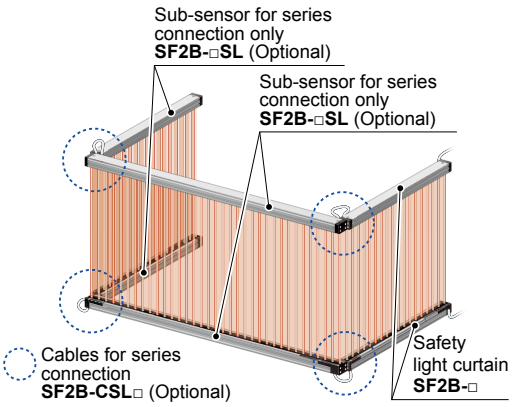
Arm / Foot protection type SF2B-A□

Minimum sensing object
ø47 mm ø1.850 in
(40 mm 1.575 in beam pitch)

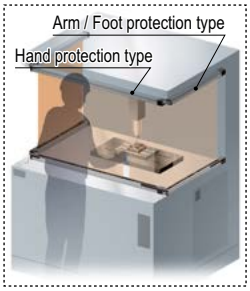
Series connection of up to three sets is possible

Sub-sensors for series connection (optional) can be used to connect up to three sets of safety light curtains (up to a total of 128 beam channels maximum; 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).

- The safety light curtains and the sub-sensors for serial connection (optional) have different models. When connecting safety 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 "**Series connection**" of "**PRECAUTIONS FOR PROPER USE**" (p.620~).



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

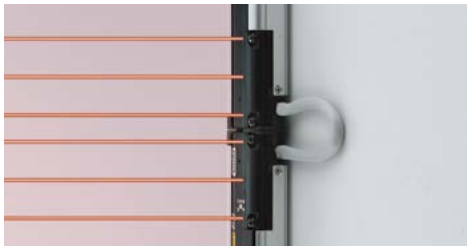


"ZERO" dead zone. Unit length = protective height, so mounting is possible with no dead zone New concept

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

SF2B

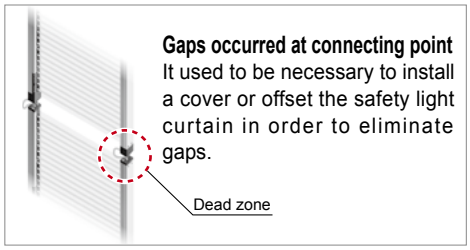
"ZERO" dead zone when using series mounting



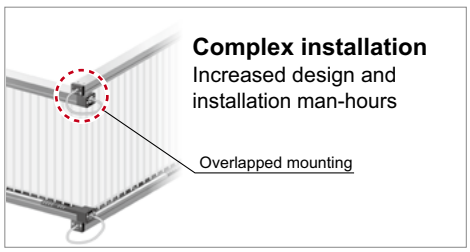
"ZERO" dead zone when using L-shaped mounting

Previous model

Dead zone when using series mounting



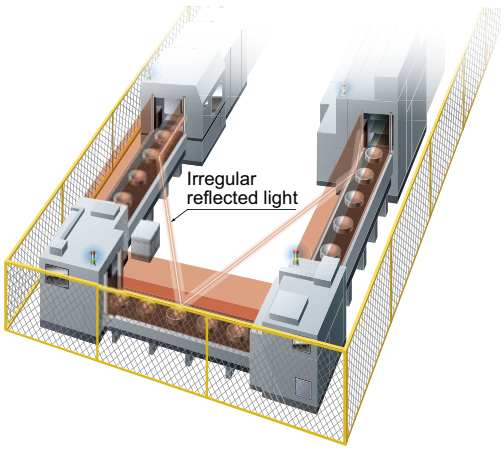
Overlapped mounting when using L-shaped mounting



Note: The **SF2B-H8-□** and **SF2B-A4-□** cannot connected in series. For details, refer to "**PRECAUTIONS FOR PROPER USE**" (p.620~).

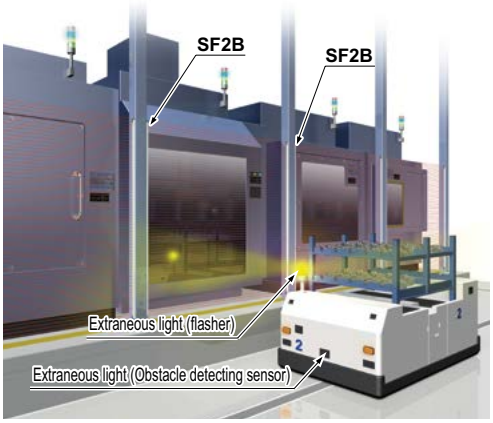
Mutual interference is reduced without need for interference prevention lines

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



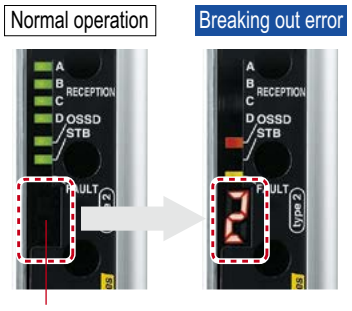
Reducing the number of malfunctions caused by extraneous light

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



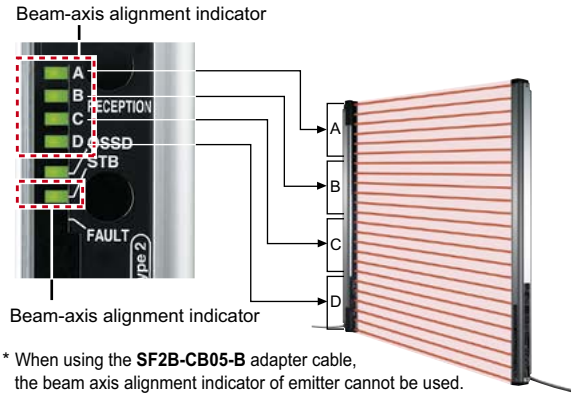
Equipped with a digital error indicator so that error details can be understood at a glance

The system constantly checks the safety light curtain for problems such as incorrect cable wiring, disconnection, short-circuits, internal circuit problems, and incoming light problems.
If a problem should occur, details of the error appear on the digital display. Therefore, smooth support is possible if problems occur at startup and during maintenance operations, even if assistance is given via telephone.



Beam-axis alignment indicators show the incident light position at a glance

Beam-axis alignment indicators display the beam channels of the safety light curtain in four blocks.
The blocks where the beam axes match will light up in red in turn. When all the beam axes receive light, all the LEDs light up green. Furthermore, a stability indicator (STB.) lights up when there is sufficient incoming light.



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

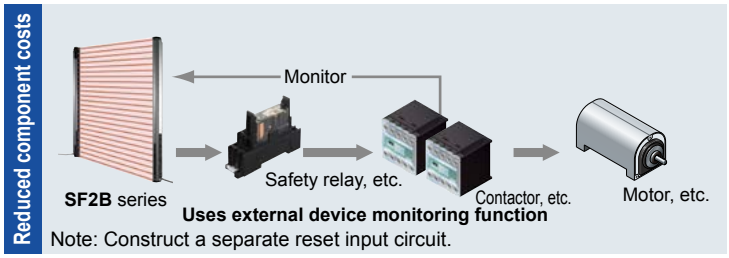
Adapter cables and adapter mounting brackets are available so that previous peripheral devices for safety light curtains can still be used

The safety light curtain **SF2-A** / **SF2-N** series (discontinued model), area sensor **NA40** series, and **SF1-N** series (discontinued model) can be replaced with the **SF2B** series using the current mounting holes and connection cables.

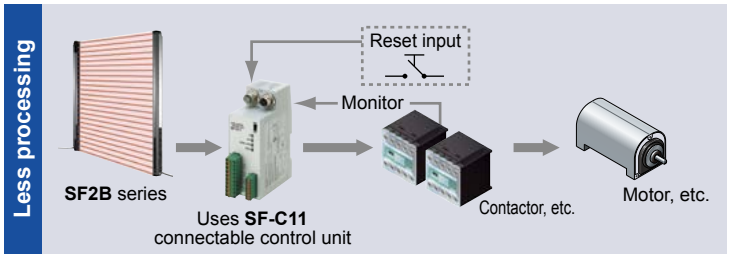
Selectable safety circuits

The safety light curtain unit has a built-in monitoring function for external devices (such as fused relay monitoring). This supports the construction of safety 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.

Utilizing safety light curtain functions

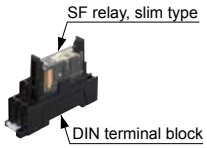


Utilizing connectable control unit



•Recommended safety relays

Panasonic Corporation
Model No.: SF relay, slim type

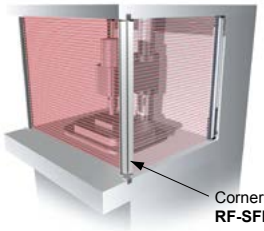


SF relay, slim type
SFS3-L-DC24V (AG1S132)
SFS4-L-DC24V (AG1S142)
DIN terminal block
SFS4-SFD (AG1S847) [4-poles type]
SFS6-SFD (AG1S867) [6-poles type]

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

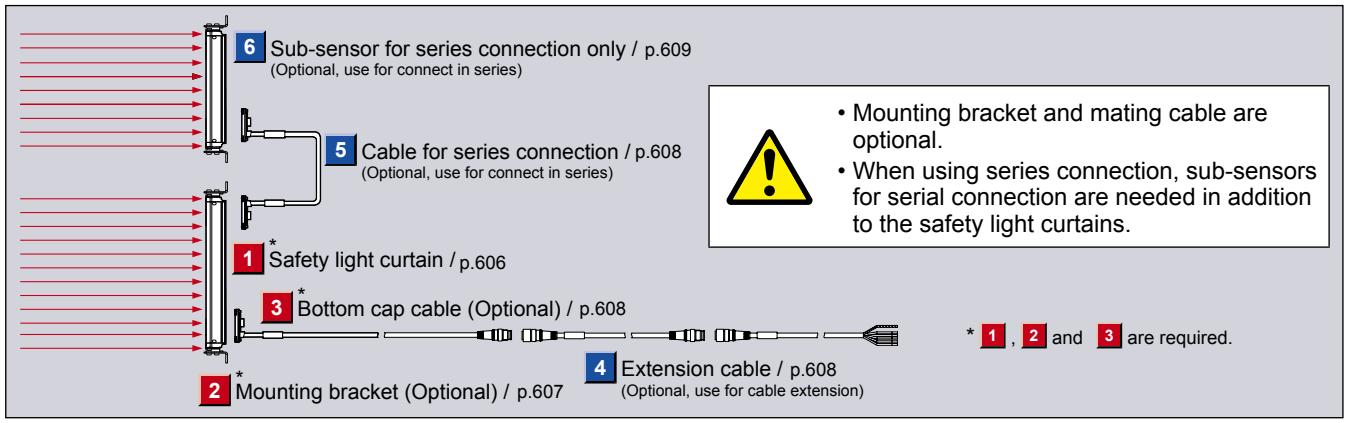
Significant cost reduction is achieved by using corner mirror

By using a single corner mirror, safety light curtain and peripheral safety circuit for one set are eliminated. Enables significant cost reduction and savings on wiring. The control category is unchanged.



When setting up the safety light curtains in the L-shape or U-shape, usually two or three sets of the safety light curtains are required. However, using the corner mirror to reflect the laser light allows only one set of the safety light curtains to be set up at the L-shape or U-shape.

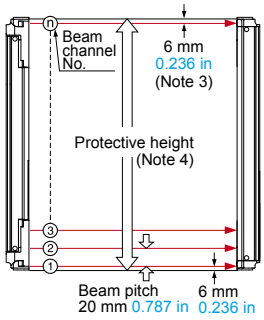
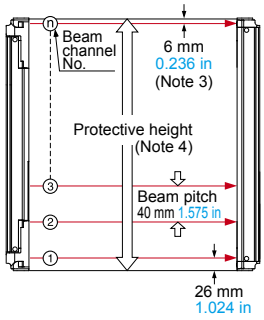
PRODUCT CONFIGURATION



ORDER GUIDE

1 Safety light curtains

Mounting bracket and bottom cap cable are not supplied with the safety light curtain. Be sure to order them separately.

Type	Appearance	Operating range (Note 1)	Model No. (Note 5) NPN output type	Model No. (Note 5) PNP output type	Number of beam channels	Protective height (mm in) (Note 4)
Hand protection type (Min. sensing object ø27 mm ø1.063 in (20 mm 0.787 in beam pitch))		0.2 to 13 m 0.656 to 42.651 ft When using the adapter cable **SF2B-CB05-B**: 0.2 to 5 m 0.656 to 16.404 ft	**SF2B-H8-N** (Note 2)	**SF2B-H8-P** (Note 2)	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 ø47 mm ø1.850 in (40 mm 1.575 in beam pitch))		0.2 to 13 m 0.656 to 42.651 ft When using the adapter cable **SF2B-CB05-B**: 0.2 to 5 m 0.656 to 16.404 ft	**SF2B-A4-N** (Note 2)	**SF2B-A4-P** (Note 2)	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

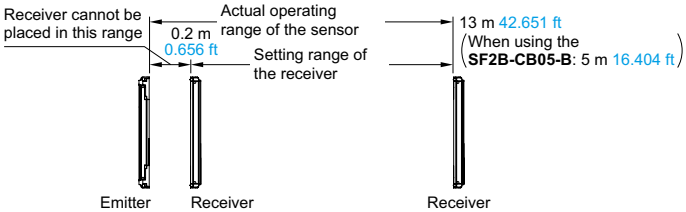
Notes: 1) The "operating range" is the possible setting distance between the emitter and the receiver.

2) The **SF2B-H8-□** and **SF2B-A4-□** cannot be connected in series because they do not include a connector for series connection. Refer to "**PRECAUTIONS FOR PROPER USE**" (p.620~) for details.

3) The distance between the tip of the safety light curtain and the last beam axis of the **SF2B-H8-□** and **SF2B-A4-□** is 22 mm 0.866 in.

4) Refer to "**Definition of sensing heights**" (p.645) for details of the protective height.

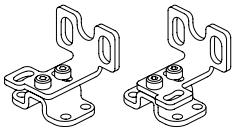
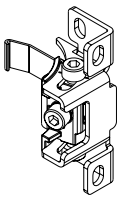
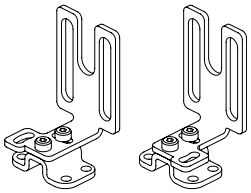
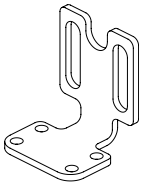
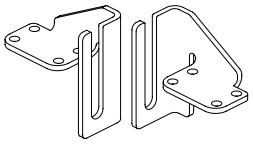
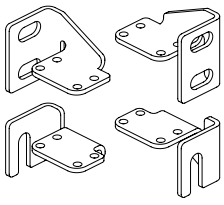
5) Models which have an "E EMITTER" symbol in the model No. on the name plate are emitters, and those with a "D RECEIVER" symbol are receivers.



ORDER GUIDE

2 Mounting brackets

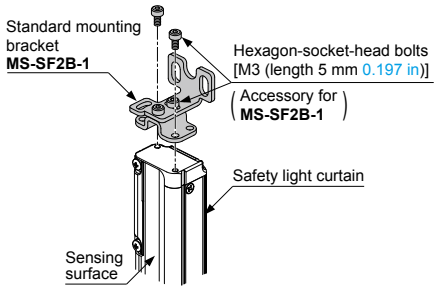
Mounting bracket is not supplied with the safety light curtain. Be sure to order it separately.

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

Note: **SF1-N**-compatible mounting bracket can also be used for **SF1-S** / **SF1-A** series products that are discontinued. The **NA40**-compatible mounting bracket can also be used for **NA40-S** / **NA40-B** series products that are discontinued.

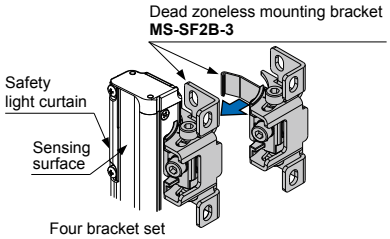
Standard mounting bracket

• MS-SF2B-1



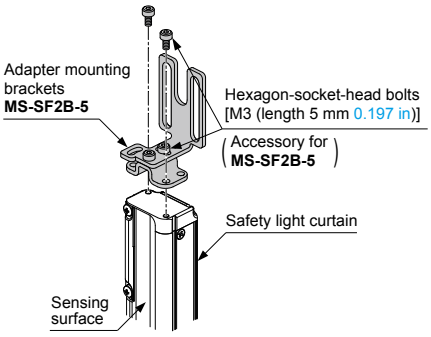
Four bracket set
M3 (length 5 mm 0.197 in) hexagon-socket-head bolts are attached.
(8 pcs. for safety light curtain mounting; 8 pcs. for beam axis adjustment)

• MS-SF2B-3



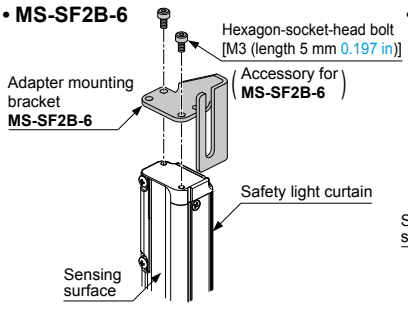
Four bracket set
Six spacers for the intermediate supporting bracket and twelve M5 (length 8 mm 0.315 in) hexagon-socket-head bolts are attached.

• MS-SF2B-5



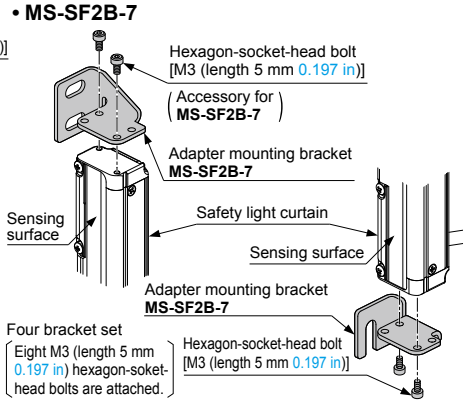
Four bracket set
M3 (length 5 mm 0.197 in) hexagon-socket-head bolts are attached.
(8 pcs. for safety light curtain mounting; 8 pcs. for beam axis adjustment)

• MS-SF2B-6



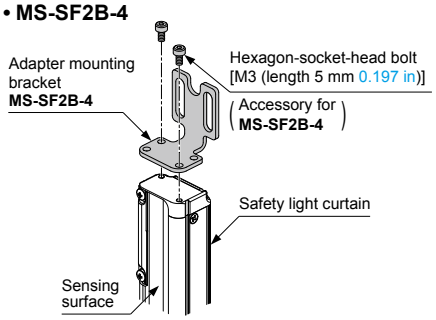
Four bracket set
Eight M3 (length 5 mm 0.197 in) hexagon-soket-head bolts are attached.

• MS-SF2B-7



Four bracket set
Eight M3 (length 5 mm 0.197 in) hexagon-soket-head bolts are attached.
Hexagon-socket-head bolt [M3 (length 5 mm 0.197 in)]

• MS-SF2B-4

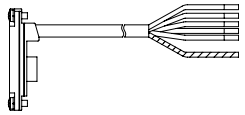
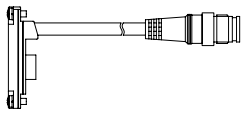
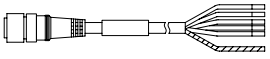
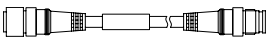
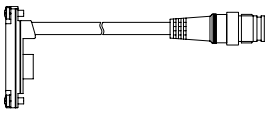
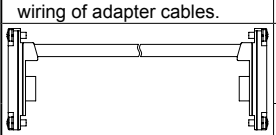


Four bracket set
Eight M3 (length 5 mm 0.197 in) hexagon-socket-head bolts are attached.

ORDER GUIDE

3 4 5 Bottom cap cable / Extension cable / Cables for series connection

Mating cable is not supplied with the safety light curtain. Be sure to order it separately.

Type			Appearance	Model No.	Description
8-core cable	3 Bottom cap cable	Discrete wire		**SF2B-CCB3**	Cable length: 3 m 9.843 ft Net weight: 370 g approx. (2 cables)
				SF2B-CCB7	Cable length: 7 m 22.966 ft Net weight: 820 g approx. (2 cables)
				SF2B-CCB10	Cable length: 10 m 32.808 ft Net weight: 1,160 g approx. (2 cables)
				SF2B-CCB15	Cable length: 15 m 49.213 ft Net weight: 1,720 g approx. (2 cables)
					Used for connecting to the safety light curtain and to other cables or the **SF-C13** control unit. Two cables per set for emitter and receiver Cable outer diameter: ø6 mm ø0.236 in Cable color: Gray (for emitter) Gray with black line (for receiver) The min. bending radius: R6 mm R0.236 in
		Connector		**SF2B-CB05**	Cable length: 0.5 m 1.640 ft Net weight: 95 g approx. (2 cables)
				SF2B-CB5	Cable length: 5 m 16.404 ft Net weight: 620 g approx. (2 cables)
				SF2B-CB10	Cable length: 10 m 32.808 ft Net weight: 1,200 g approx. (2 cables)
					Used for connecting to the safety light curtain and to an extension cable or the **SF-C11** control unit. Two cables per set for emitter and receiver Cable outer diameter: ø6 mm ø0.236 in Connector outer diameter: ø14 mm ø0.551 in 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 R0.236 in
	4 Extension cable	Discrete wire		**SFB-CC3**	Cable length: 3 m 9.843 ft Net weight: 380 g approx. (2 cables)
				SFB-CC10	Cable length: 10 m 32.808 ft Net weight: 1,200 g approx. (2 cables)
					Used for cable extension or connecting to the **SF-C13** control unit. Two cables per set for emitter and receiver Cable outer diameter: ø6 mm ø0.236 in Connector outer diameter: ø14 mm ø0.551 in max. Cable color: Gray (for emitter), Gray with black line (for receiver) The min. bending radius: R6 mm R0.236 in
		With connectors on both ends: For emitter		**SFB-CCJ10E**	Cable length: 10 m 32.808 ft Net weight: 580 g approx. (1 cable)
		With connectors on both ends: For receiver		**SFB-CCJ10D**	Cable length: 10 m 32.808 ft Net weight: 600 g approx. (1 cable)
					Used for cable extension or connecting to the **SF-C11** control unit. One each for emitter and receiver Cable outer diameter: ø6 mm ø0.236 in Connector outer diameter: ø14 mm ø0.551 in 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 R0.236 in
	* 3 Adapter cable (Bottom cap cable)	For **SF2-A / SF2-N**		**SF2B-CB05-A**	Cable length: 0.5 m 1.640 ft Net weight: 95 g approx. (2 cables)
					Used when replacing units in the **SF2-A** / **SF2-N** series (discontinued model). The **SF2N-CC**□ cable with connector can be used without change, so that replacement with **SF2B** series units can be done smoothly. Two cables per set for emitter and receiver Cable outer diameter: ø6 mm ø0.236 in Connector outer diameter: ø14 mm ø0.551 in 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 R0.236 in
4-core cable		For **SF1-N / NA40**	* Please contact our office for wiring of adapter cables.	**SF2B-CB05-B**	Cable length: 0.5 m 1.640 ft Net weight: 95 g approx. (2 cables)
					Used when replacing units in the **SF1-N** (discontinued model) / **NA40** series. The **SF1-CC**□ / **NA40-CC**□ cable with connector can be used without change, so that replacement with **SF2B** series units can be done smoothly. Two cables per set for emitter and receiver Cable outer diameter: ø6 mm ø0.236 in Connector outer diameter: ø14 mm ø0.551 in 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 R0.236 in
	5 Cable for series connection		 * Used in conjunction with sub-sensor for serial connection only.	**SF2B-CSL01**	Cable length: 0.1 m 0.328 ft Net weight: 70 g approx. (2 cables)
				SF2B-CSL05	Cable length: 0.5 m 1.640 ft Net weight: 120 g approx. (2 cables)
					Use when connecting the sub-sensor for series connection to the safety light curtain in series. Two cables per set for emitter and receiver (common for emitter and receiver) Cable outer diameter: ø6 mm ø0.236 in Cable color: Gray (common for emitter and receiver) The min. bending radius: R6 mm R0.236 in

* Interchangeability function

- This function is used for replacing other safety 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.

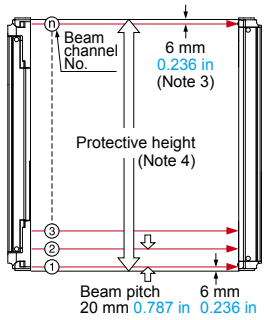
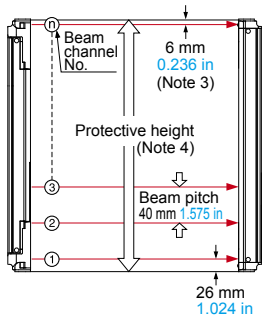
Models being replaced	Adapter cable	Adapter mounting bracket	Details of changes and points to note
SF2-A / SF2-N series (Discontinued product)	**SF2B-CB05-A**	**MS-SF2B-5**	• NPN output type: Connect the shielded wire to +V. PNP output type: Connect the shielded wire to 0 V. • Existing **SF2N-CC**□ connection cables (optional) can be used without change. • The interference prevention function (parallel connection) cannot be used.
SF1-N series (Discontinued product)	**SF2B-CB05-B**	When using the **MS-SF1-1**: **MS-SF2B-4** For direct mounting: **MS-SF2B-7**	• Emitter: Synchronization cable has changed to interference prevention cable.(Note 1) Receiver: Synchronization cable has changed to control output (OSSD 1).(Note 2)(Note 3) • Existing **SF1-CC**□**A** connection cables (optional) can be used without change. • The beam axis alignment indicator of emitter cannot be used.
NA40 series	**SF2B-CB05-B**	When using the **MS-NA40-1**: **MS-SF2B-4** For direct mounting: **MS-SF2B-6**	• Control output (OSSD 2) is equipped instead of self-diagnosis output.(Note 3) • Emission halt function cannot be used. • Existing **NA40-CC**□ connection cables (optional) can be used without change. • The ambient temperature for the **NA40-CC**□ connection cables (optional) is –10 to +50 °C +14 to +122 °F.

Notes: 1) Not used in case of simple replacement of the **SF1-N** series (interference prevention wire is unused), therefore perform wire insulation so that it will not touch other wires.
2) Not used in case of simple replacement of the **SF1-N** series (non-safety applications), therefore perform wire insulation so that it will not touch other wires.
3) When used in safety applications, both OSSD1 and OSSD2 must be used.

ORDER GUIDE

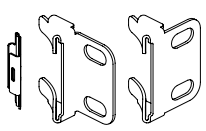
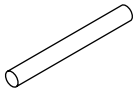
6 Sub-sensor for series connection only

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 safety light curtains.

Type	Appearance	Operating range (Note 1)	Model No. (Note 6)	Number of beam channels	Protective height (mm in) (Note 4)	Current consumption (Note 5)
Hand protection type — Min. sensing object ø27 mm ø1.063 in (20 mm 0.787 in beam pitch)		0.2 to 13 m 0.656 to 42.651 ft When using **SF2B-CB05-B** adapter cable at safety 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 Receiver: 25 mA or less
			SF2B-H12SL	12	232 9.134	
			SF2B-H16SL	16	312 12.283	Emitter: 20 mA or less Receiver: 35 mA or less
			SF2B-H20SL	20	392 15.433	
			SF2B-H24SL	24	472 18.583	Emitter: 30 mA or less Receiver: 45 mA or less
			SF2B-H28SL	28	552 21.732	
			SF2B-H32SL	32	632 24.882	Emitter: 30 mA or less Receiver: 55 mA or less
			SF2B-H36SL	36	712 28.031	
			SF2B-H40SL	40	792 31.181	Emitter: 40 mA or less Receiver: 65 mA or less
			SF2B-H48SL	48	952 37.480	
			SF2B-H56SL	56	1,112 43.779	Emitter: 45 mA or less Receiver: 85 mA or less
			SF2B-H64SL	64	1,272 50.079	
			SF2B-H72SL	72	1,432 56.378	Emitter: 50 mA or less Receiver: 105 mA or less
			SF2B-H80SL	80	1,592 62.677	
			SF2B-H88SL	88	1,752 68.976	Emitter: 60 mA or less Receiver: 125 mA or less
			SF2B-H96SL	96	1,912 75.275	
Arm / Foot protection type — Min. sensing object ø47 mm ø1.850 in (40 mm 1.575 in beam pitch)		0.2 to 13 m 0.656 to 42.651 ft When using **SF2B-CB05-B** adapter cable at safety 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 Receiver: 20 mA or less
			SF2B-A6SL	6	232 9.134	
			SF2B-A8SL	8	312 12.283	Emitter: 15 mA or less Receiver: 25 mA or less
			SF2B-A10SL	10	392 15.433	
			SF2B-A12SL	12	472 18.583	Emitter: 20 mA or less Receiver: 30 mA or less
			SF2B-A14SL	14	552 21.732	
			SF2B-A16SL	16	632 24.882	Emitter: 20 mA or less Receiver: 35 mA or less
			SF2B-A18SL	18	712 28.031	
			SF2B-A20SL	20	792 31.181	Emitter: 25 mA or less Receiver: 40 mA or less
			SF2B-A24SL	24	952 37.480	
			SF2B-A28SL	28	1,112 43.779	Emitter: 25 mA or less Receiver: 50 mA or less
			SF2B-A32SL	32	1,272 50.079	
			SF2B-A36SL	36	1,432 56.378	Emitter: 30 mA or less Receiver: 60 mA or less
			SF2B-A40SL	40	1,592 62.677	
			SF2B-A44SL	44	1,752 68.976	Emitter: 35 mA or less Receiver: 70 mA or less
			SF2B-A48SL	48	1,912 75.275	

Notes: 1) The "operating range" is the possible setting distance between the emitter and the receiver.
2) The **SF2B-H8SL** and **SF2B-A4SL** do not include a connector for series connection. Therefore, when connecting 3 sets in series, the sub-sensor can be used only for the third set. Refer to "**PRECAUTIONS FOR PROPER USE**" (p.620~) for details.
3) The distance between the tip of the safety light curtain and the top beam axis of the **SF2B-H8SL** and **SF2B-A4SL** is 22 mm 0.866 in.
4) Refer to "**Definition of sensing heights**" (p.645) for details of the protective height.
5) The specifications of the sub-sensor for series connection are the same as for the safety light curtain, except for the current consumption. However, the sub-sensor is not equipped with an output.
6) Models which have an "E EMITTER" symbol in the model No. on the name plate are emitters, and those with a "D RECEIVER" symbol are receivers.

Spare parts (Accessories for safety light curtain)

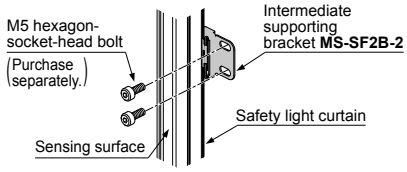
Designation	Appearance	Model No.	Description
Intermediate supporting bracket (Note)		**MS-SF2B-2**	Used to mount the safety light curtain on the intermediate position. Mounting is possible behind or at the side of the safety light curtain.
Test rod ø27		**SF2B-TR27**	Min. sensing object for regular checking (ø27 mm ø1.063 in), with hand protection type (min. sensing object ø27 mm ø1.063 in)

Note: Depending on the product, the required set number will vary as follows.
1 set: **SF2B-H**□…40 to 56 beam channels, **SF2B-A**□…20 to 28 beam channels
2 sets: **SF2B-H**□…64 to 80 beam channels, **SF2B-A**□…32 to 40 beam channels
3 sets: **SF2B-H**□…88 to 96 beam channels, **SF2B-A**□…44 to 48 beam channels

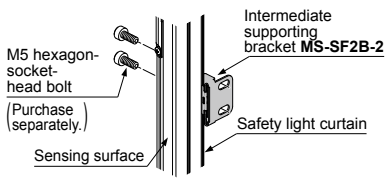
Intermediate supporting bracket

- **MS-SF2B-2**

<In case of rear mounting>

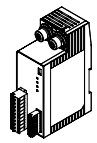
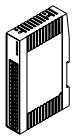


<In case of side mounting>



OPTIONS

Control units

Designation	Appearance	Model No.	Applicable cable	Description
Connector connection type control unit		**SF-C11**	**SF2B-CB□** **SFB-CCJ10□**	Use 8-core cable with connector to connect to the safety light curtain. Compatible with up to Control Category 4 (Control Category 2 when used together with the **SF2B** series).
Slim type control unit		**SF-C13**	**SF2B-CCB□** **SFB-CC□**	Use a discrete wire cable to connect to the safety light curtain. Compatible with up to Control Category 4 (Control Category 2 when used together with the **SF2B** series).

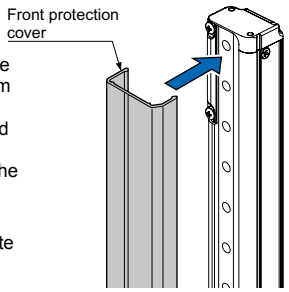
Note: Refer to **SF-C10** series pages (p.663~) for the control units.

Front protection cover

• **FC-SF2BH-□**

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

Material: Polycarbonate



Sensing range

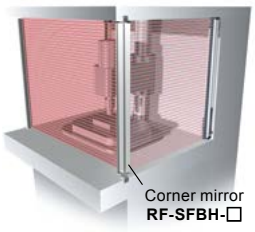
	Sensing range (Note)	
		When using the **SF2B-CB05-B**
Only emitter installed	0.2 to 11.5 m 0.656 to 37.730 ft	0.2 to 4.5 m 0.656 to 14.764 ft
Only receiver installed	0.2 to 11.5 m 0.656 to 37.730 ft	0.2 to 4.5 m 0.656 to 14.764 ft
Both emitter and receiver installed	0.2 to 10.0 m 0.656 to 32.808 ft	0.2 to 4.0 m 0.656 to 13.123 ft

Note: The “operating range” is the possible setting distance between the emitter and the receiver.

Corner mirror

• **RF-SFBH-□**

When setting up the safety light curtains in the L-shape or U-shape, usually two or three sets of the safety light curtains are required. However, using the corner mirror to reflect the laser light allows only one set of the safety light curtains to be set up at the L-shape or U-shape.



Specifications

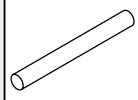
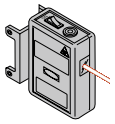
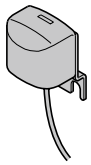
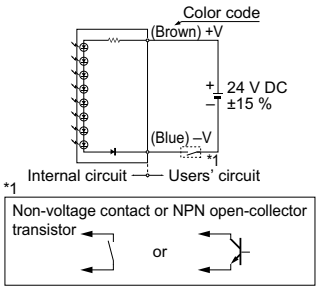
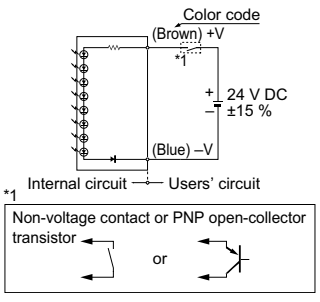
Item \ Type		Corner mirror
Item \ Model No.		**RF-SFBH-□**
Sensing range		With one corner mirror: declined to 90 %, With two corner mirrors: declined to 80 % (When used in combination with the **SF2B** series)
Environmental resistance	Ambient temperature	–10 to +55 °C +14 to +131 °F (No dew condensation or icing allowed), Storage: –25 to +70 °C –13 to +158 °F
	Ambient humidity	30 to 85 % RH, Storage: 30 to 95 % RH
	Vibration resistance	10 to 55 Hz frequency, 0.75 mm 2.953 in amplitude in X, Y and Z directions for two hours each
	Shock resistance	300 m/s^2 acceleration (30 G approx.) in X, Y and Z directions for three times each
Material		Enclosure: Aluminum, Mounting bracket: Stainless Steel, Mirror (rear surface mirror): Glass, Side cover: EPDM
Accessories		Intermediate supporting bracket: 1 set (**RF-SFBH-40/48/56/64**), 2 sets (**RF-SFBH-72/80/88/96**)

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

Designation / Applicable beam channels		Front protection cover	Corner mirror	
Hand	Arm / Foot	Model No.	Model No.	Dimensions of effective reflective surface
8	4	**FC-SF2BH-8**	**RF-SFBH-8**	173 × 72 mm 6.811 × 2.835 in
12	6	**FC-SF2BH-12**	**RF-SFBH-12**	236 × 72 mm 9.291 × 2.835 in
16	8	**FC-SF2BH-16**	**RF-SFBH-16**	316 × 72 mm 12.441 × 2.835 in
20	10	**FC-SF2BH-20**	**RF-SFBH-20**	396 × 72 mm 15.591 × 2.835 in
24	12	**FC-SF2BH-24**	**RF-SFBH-24**	476 × 72 mm 18.740 × 2.835 in
28	14	**FC-SF2BH-28**	**RF-SFBH-28**	556 × 72 mm 21.890 × 2.835 in
32	16	**FC-SF2BH-32**	**RF-SFBH-32**	636 × 72 mm 25.039 × 2.835 in
36	18	**FC-SF2BH-36**	**RF-SFBH-36**	716 × 72 mm 28.190 × 2.835 in
40	20	**FC-SF2BH-40**	**RF-SFBH-40**	796 × 72 mm 31.339 × 2.835 in
48	24	**FC-SF2BH-48**	**RF-SFBH-48**	956 × 72 mm 37.638 × 2.835 in
56	28	**FC-SF2BH-56**	**RF-SFBH-56**	1,116 × 72 mm 43.937 × 2.835 in
64	32	**FC-SF2BH-64**	**RF-SFBH-64**	1,276 × 72 mm 50.236 × 2.835 in
72	36	**FC-SF2BH-72**	**RF-SFBH-72**	1,436 × 72 mm 56.535 × 2.835 in
80	40	**FC-SF2BH-80**	**RF-SFBH-80**	1,596 × 72 mm 62.835 × 2.835 in
88	44	**FC-SF2BH-88**	**RF-SFBH-88**	1,756 × 72 mm 69.134 × 2.835 in
96	48	**FC-SF2BH-96**	**RF-SFBH-96**	1,916 × 72 mm 75.433 × 2.835 in

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. (Except for corner mirror)

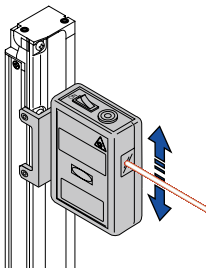
OPTIONS

Designation	Appearance	Model No.	Description
Test rod ø47		**SF2B-TR47**	Min. sensing object for regular checking (ø47 mm ø1.850 in), with Arm / Foot protection type (min. sensing object ø47 mm ø1.850 in)
Laser alignment tool		**SF-LAT-2B**	Allows easy beam axis alignment using easy-to-see laser beam **Specifications** • Supply voltage: 3 V • Battery: 1.5 V (AA size battery) × 2 pcs. (replaceable) (Note) • Battery lifetime: 30 hours approx. of continuous operation (Manganese battery, at +25 °C +77 °F ambient temperature) • Light source: Red semiconductor laser: class 2 (IEC / JIS / FDA) (Max. output: 1 mW, Peak emission wavelength: 650 nm 0.026 mil) • Ambient temperature: 0 to +40 °C +32 to +104 °F (No dew condensation) • Material: ABS (Enclosure) Aluminum (Mounting part:) • Weight: Net weight: 150 g approx. (without batteries)
Large display unit for safety light curtain		**SF-IND-2**	With the auxiliary output of the safety light curtain, the operation is easily observable from various directions. **Specifications** • Supply voltage: 24 V DC ±15 % • Current consumption: 12 mA or less • Indicators: Orange LED (8 pcs. used) [Light up when external contact is ON] • Ambient temperature: –10 to +55 °C +14 to +131 °F (No dew condensation or icing allowed) • Material: POM (Enclosure) Polycarbonate (Cover) Cold rolled carbon steel (SPCC) (Bracket) • Cable: 0.3 mm² 2-core cabtyre cable, 3 m 9.843 ft long • Net weight: 70 g approx. (including bracket) **I/O circuit diagrams** **<With NPN output type>**  **<With PNP output type>** 

(Note) : LR6 dry cell batteries are not provided with the product. Please purchase them separately.

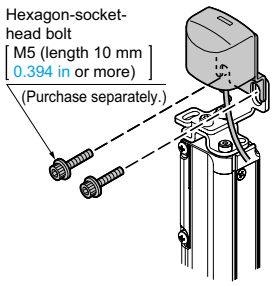
Laser alignment tool

• **SF-LAT-2B**



Large display unit for safety light curtain

• **SF-IND-2**



Attaches to top of safety light curtain.
Tighten together the mounting bracket provided with the safety light curtain (**MS-SF2B-1/4/5**) and the mounting bracket of **SF-IND-2**.

•Recommended safety relays

Panasonic Corporation
SF relay, slim type

SF relay, slim type
SFS3-L-DC24V (AG1S132)
SFS4-L-DC24V (AG1S142)

DIN terminal block
SFS4-SFD (AG1S847) [4-poles type]
SFS6-SFD (AG1S867) [6-poles type]

Note: Contact Panasonic Corporation for details on the recommended products.

SPECIFICATIONS

Individual specifications

SF2B-H□ Hand protection type

Item \ Model No.	Type	Min. sensing object ø27 mm ø1.063 in type (20 mm 0.787 in beam pitch)					
	NPN output	**SF2B-H8-N**	**SF2B-H12-N**	**SF2B-H16-N**	**SF2B-H20-N**	**SF2B-H24-N**	**SF2B-H28-N**
	PNP output	**SF2B-H8-P**	**SF2B-H12-P**	**SF2B-H16-P**	**SF2B-H20-P**	**SF2B-H24-P**	**SF2B-H28-P**
Number 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	
PFH_D	NPN output	6.24×10^{-9}	6.44×10^{-9}	6.58×10^{-9}	6.77×10^{-9}	6.91×10^{-9}	7.10×10^{-9}
	PNP output	6.04×10^{-9}	6.23×10^{-9}	6.37×10^{-9}	6.57×10^{-9}	6.71×10^{-9}	6.90×10^{-9}
$MTTF_D$		100 years or more					
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 ø27 mm ø1.063 in type (20 mm 0.787 in beam pitch)					
	NPN output	**SF2B-H32-N**	**SF2B-H36-N**	**SF2B-H40-N**	**SF2B-H48-N**	**SF2B-H56-N**	**SF2B-H64-N**
	PNP output	**SF2B-H32-P**	**SF2B-H36-P**	**SF2B-H40-P**	**SF2B-H48-P**	**SF2B-H56-P**	**SF2B-H64-P**
Number 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	
PFH_D	NPN output	7.24×10^{-9}	7.44×10^{-9}	7.58×10^{-9}	7.91×10^{-9}	8.24×10^{-9}	8.58×10^{-9}
	PNP output	7.04×10^{-9}	7.23×10^{-9}	7.37×10^{-9}	7.71×10^{-9}	8.04×10^{-9}	8.37×10^{-9}
$MTTF_D$		100 years or more					
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 ø27 mm ø1.063 in type (20 mm 0.787 in beam pitch)			
	NPN output	**SF2B-H72-N**	**SF2B-H80-N**	**SF2B-H88-N**	**SF2B-H96-N**
	PNP output	**SF2B-H72-P**	**SF2B-H80-P**	**SF2B-H88-P**	**SF2B-H96-P**
Number 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	
PFH_D	NPN output	8.91×10^{-9}	9.24×10^{-9}	9.58×10^{-9}	9.91×10^{-9}
	PNP output	8.71×10^{-9}	9.04×10^{-9}	9.37×10^{-9}	9.71×10^{-9}
$MTTF_D$		100 years or more			
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 an ambient temperature of +20 °C +68 °F.
PFH_D: Probability of dangerous failure per hour, $MTTF_D$: Mean time to dangerous failure (in years)

SPECIFICATIONS

SF2B-A□ Arm / Foot protection type

Item \ Model No.	Type	Min. sensing object ø47 mm ø1.850 in type (40 mm 1.575 in beam pitch)					
	NPN output	**SF2B-A4-N**	**SF2B-A6-N**	**SF2B-A8-N**	**SF2B-A10-N**	**SF2B-A12-N**	**SF2B-A14-N**
	PNP output	**SF2B-A4-P**	**SF2B-A6-P**	**SF2B-A8-P**	**SF2B-A10-P**	**SF2B-A12-P**	**SF2B-A14-P**
Number 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	
PFH$_D$	NPN output	6.11×10^{-9}	6.23×10^{-9}	6.30×10^{-9}	6.42×10^{-9}	6.49×10^{-9}	6.62×10^{-9}
	PNP output	5.90×10^{-9}	6.03×10^{-9}	6.10×10^{-9}	6.22×10^{-9}	6.29×10^{-9}	6.41×10^{-9}
MTTF$_D$		100 years or more					
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 ø47 mm ø1.850 in type (40 mm 1.575 in beam pitch)					
	NPN output	**SF2B-A16-N**	**SF2B-A18-N**	**SF2B-A20-N**	**SF2B-A24-N**	**SF2B-A28-N**	**SF2B-A32-N**
	PNP output	**SF2B-A16-P**	**SF2B-A18-P**	**SF2B-A20-P**	**SF2B-A24-P**	**SF2B-A28-P**	**SF2B-A32-P**
Number 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	
PFH$_D$	NPN output	6.69×10^{-9}	6.81×10^{-9}	6.88×10^{-9}	7.08×10^{-9}	7.27×10^{-9}	7.46×10^{-9}
	PNP output	6.48×10^{-9}	6.61×10^{-9}	6.68×10^{-9}	6.87×10^{-9}	7.07×10^{-9}	7.26×10^{-9}
MTTF$_D$		100 years or more					
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 ø47 mm ø1.850 in type (40 mm 1.575 in beam pitch)			
	NPN output	**SF2B-A36-N**	**SF2B-A40-N**	**SF2B-A44-N**	**SF2B-A48-N**
	PNP output	**SF2B-A36-P**	**SF2B-A40-P**	**SF2B-A44-P**	**SF2B-A48-P**
Number 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	
PFH$_D$	NPN output	7.66×10^{-9}	7.85×10^{-9}	8.05×10^{-9}	8.24×10^{-9}
	PNP output	7.46×10^{-9}	7.65×10^{-9}	7.84×10^{-9}	8.04×10^{-9}
MTTF$_D$		100 years or more			
Net weight (total of emitter and receiver)		1,900 g approx.	2,100 g approx.	2,300 g approx.	2,500 g approx.

Notes: Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +20 °C +68 °F.
PFH$_D$: Probability of dangerous failure per hour, MTTF$_D$: Mean time to dangerous failure (in years)

SPECIFICATIONS

Refer to p.667 for the specifications for the control unit.

Common specifications

Item \ Type		Min. sensing object ø27 mm ø1.063 in type (20 mm 0.787 in beam pitch)		Min. sensing object ø47 mm ø1.850 in type (40 mm 1.575 in beam pitch)	
		NPN output	PNP output	NPN output	PNP output
Model No.		**SF2B-H□-N**	**SF2B-H□-P**	**SF2B-A□-N**	**SF2B-A□-P**
Applicable standards (Note 2)	International standard	IEC 61496-1/2 (Type 2), ISO 13849-1 (Category 2, PLc), IEC 61508-1 to 7 (SIL1)			
	Japan	JIS B 9704-1/2 (Type 2), JIS B 9705-1 (Category 2), JIS C 0508 (SIL1)			
	Europe (EU)	EN 61496-1 (Type 2), EN 55011			
	North America	UL 61496-1/2 (Type 2), UL 508, UL 1998 (Class 1), CSA C22.2 No.14, CSA C22.2 No.0.8, OSHA 1910.212 (Note 3), OSHA 1910.217 (C) (Note 3), ANSI B11.1 to B11.19, ANSI/RIA 15.06			
CE marking directive compliance		Machinery Directive, EMC Directive, RoHS Directive			
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		ø27 mm ø1.063 in opaque object		ø47 mm ø1.850 in opaque object	
Effective aperture angle		±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 ±15 % Ripple P-P 10 % or less			
Control outputs (OSSD 1, OSSD 2)		<NPN output type> NPN open-collector transistor • Max. sink current: 200 mA • Applied voltage: same as supply voltage [between the control outputs (OSSD 1, OSSD 2) and 0 V] • 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 • Max. source current: 200 mA • Applied voltage: same as supply voltage [between the control outputs (OSSD 1, OSSD 2) and +V] • 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 safety 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 4)		<NPN output type> NPN open-collector transistor • Max. sink current: 60 mA • Applied voltage: same as supply voltage [between the auxiliary output and 0 V] • Residual voltage: 2.0 V or less (sink current 60 mA) (when using 30.5 m 100.066 ft length cable)		<PNP output type> PNP open-collector transistor • Max. source current: 60 mA • Applied voltage: same as supply voltage [between the auxiliary output and +V] • 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-CCB□** or **SF2B-CB□**: OFF when OSSD ON, ON when OSSD OFF When using **SF2B-CB05-A**: ON during normal operation, OFF when there is a problem with emitter operation or emission is halted			
	Protection circuit	Incorporated			
Synchronization method		Cable synchronization (optical synchronization when using **SF2B-CB05-B**)			
Interference prevention function		Incorporated • Series connection: 3 sets max. (Total 128 beam channels). (However, **SF2B-A□** 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 5) **SF2B-H□** and **SF2B-A□** can be used together. (Note 6) When using **SF2B-CB05-B** (optical synchronization): • Series connection: 3 sets max. (Total 128 beam channels). (However, **SF2B-A□** 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 5) • Parallel connection: 2 sets max. • Series and parallel mixed connection: Series connection of 3 sets max. and parallel connection of 2 sets max. are simultaneously possible. **SF2B-H□** and **SF2B-A□** can be used together. (Note 6)			
Emission halt function		Incorporated			
External device monitoring function		Incorporated			
Environmental resistance	Degree of protection	IP65 (IEC) (*IP67 is later than Ver.2)			
	Ambient temperature / Ambient humidity	–10 to +55 °C +14 to +131 °F (No dew condensation or icing allowed), Storage: –25 to +70 °C –13 to +158 °F / 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 double amplitude in X, Y and Z directions for two hours each / 300 m/s² acceleration (30 G approx.) in X, Y and Z directions 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: Aluminum, Upper and lower edges : Die-cast zinc alloy, Inner case: Polycarbonate · Polyester resin, Cap: PBT			
Accessories		**MS-SF2B-2** (Intermediate supporting bracket): (Note 7) **SF2B-TR27** (Test rod): 1 No.		**MS-SF2B-2** (Intermediate supporting bracket): (Note 7)	

Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +20 °C +68 °F.
2) Due to revisions of safety light curtain standards (Electro-sensitive protective equipment), type 2 safety light curtains are limited to PLc and SIL1 regarding PL and SIL standards.
3) Not compatible when using the bottom cap cable **SF2B-CB05-A**.
4) When using auxiliary output (AUX), the compatible cable **SF2B-CB05-B** (sold separately) cannot be used.
5) **SF2B-H8-□** and **SF2B-A4-□** cannot be connected in series. For more information, refer to "**PRECAUTIONS FOR PROPER USE**" (p.620~).
6) When making series connection mixing **SF2B-H□** and **SF2B-A□**, calculate by doubling the number of optical axes only for **SF2B-A□**, and make the total number of optical axes fall below 128 axes.
(e.g.) When making series connection with **SF2B-H36** and **SF2B-A44**, the total number of optical axes will be 124 axes. The number of optical axes for **SF2B-H36** + (number of optical axes for **SF2B-A44** × 2) = total number of optical axes. 36 optical axes + (44 optical axes × 2) = 124 optical axes.
7) Intermediate supporting bracket **MS-SF2B-2** is included with the following products. The number included varies as follows depending on the product.
1 set: **SF2B-H□**…40 to 56 beam channels, **SF2B-A□**…20 to 28 beam channels
2 sets: **SF2B-H□**…64 to 80 beam channels, **SF2B-A□**…32 to 40 beam channels
3 sets: **SF2B-H□**…88 to 96 beam channels, **SF2B-A□**…44 to 48 beam channels

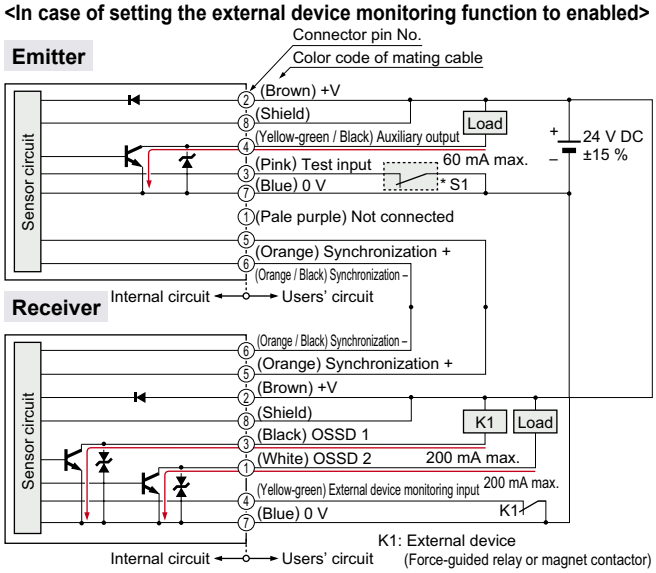
I/O CIRCUIT AND WIRING DIAGRAMS

NPN output type

When using a **SF2B-CCB□** or **SF2B-CB□** 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.

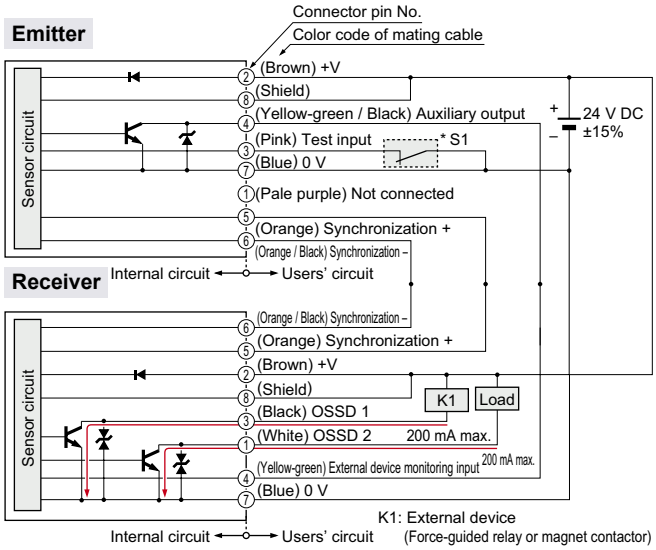
CAUTION
Construct the interlock (reset input) circuit separately.

* S1

Switch S1
- 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>

- 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.

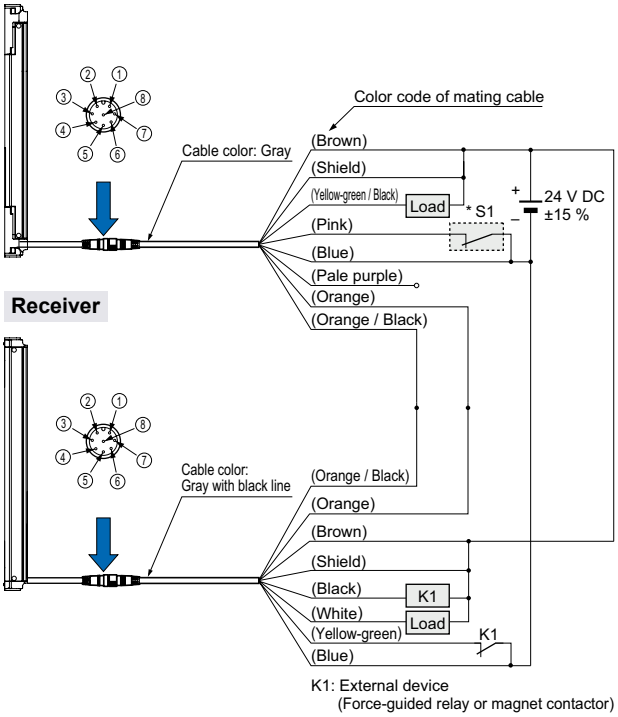
CAUTION
Construct the interlock (reset input) circuit separately.

* S1

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

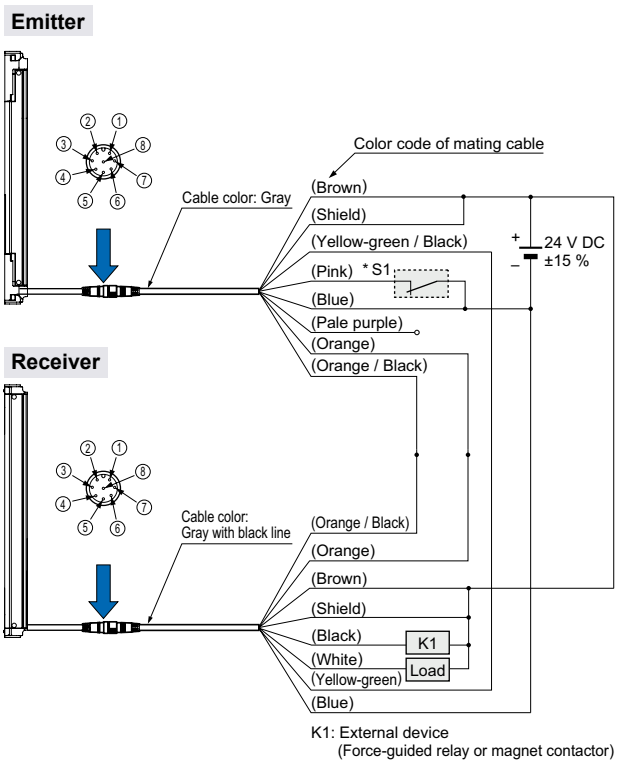
Wiring diagram

<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>



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

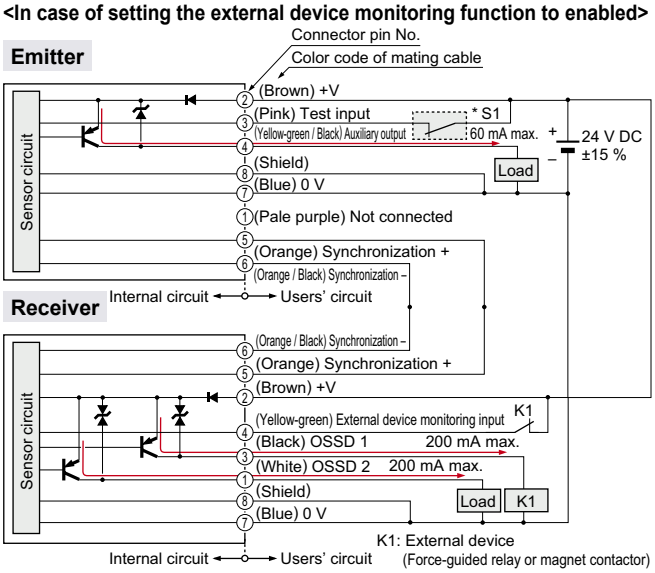
I/O CIRCUIT AND WIRING DIAGRAMS

PNP output type

When using a **SF2B-CCB□** or **SF2B-CB□** 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.

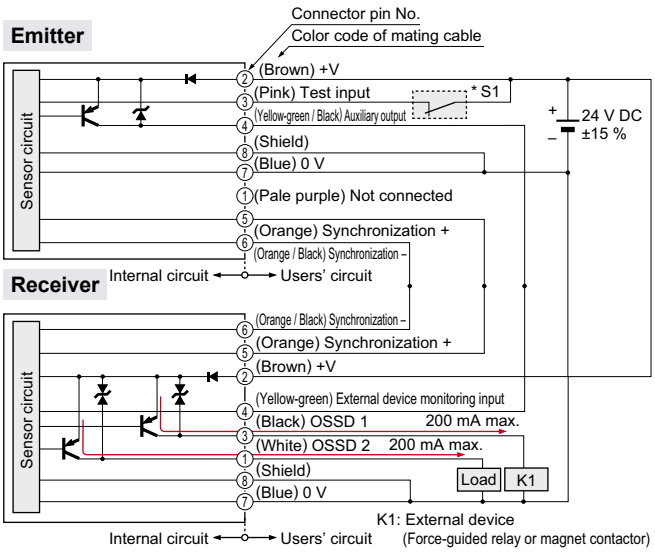
* S1

Switch S1
- Test input
  Open: Emission halt
  Vs to Vs – 2.5 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>

- 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.

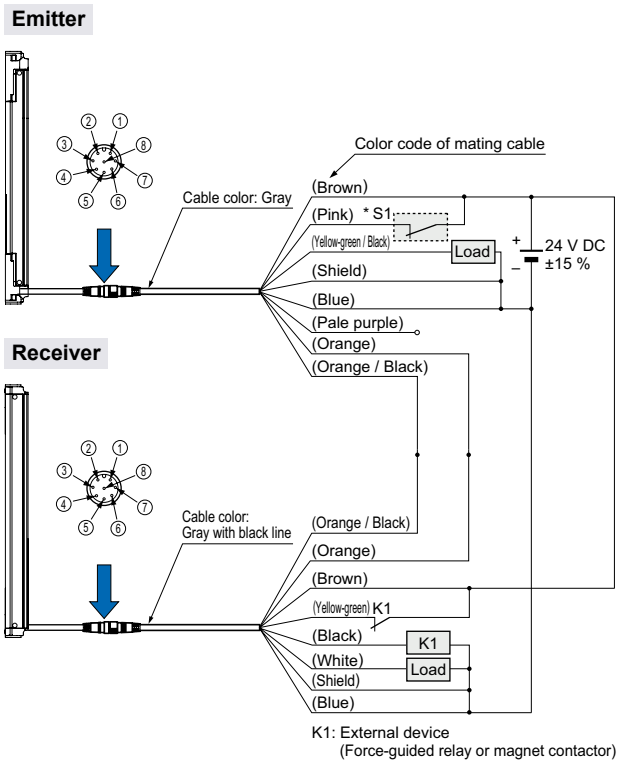
* S1

Switch S1
- Test input
  Open: Emission halt
  Vs to Vs – 2.5 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.

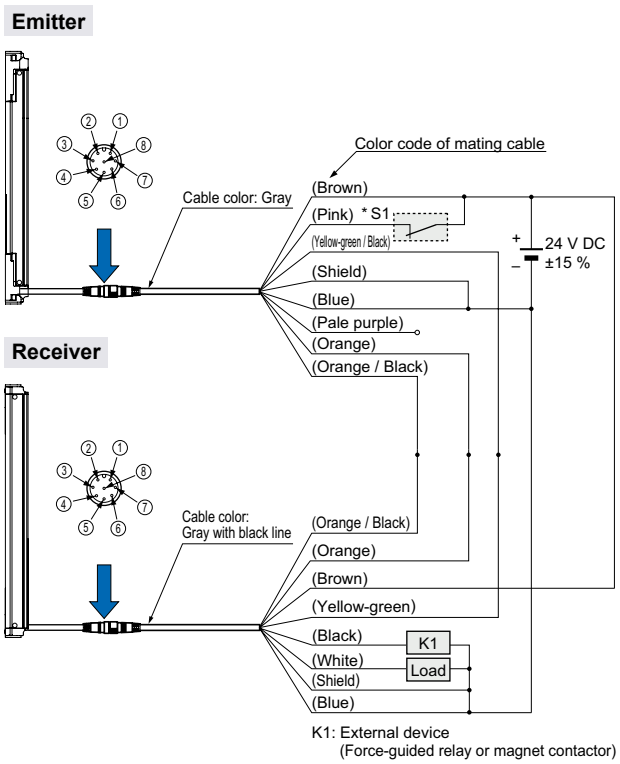
Wiring diagram

<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.

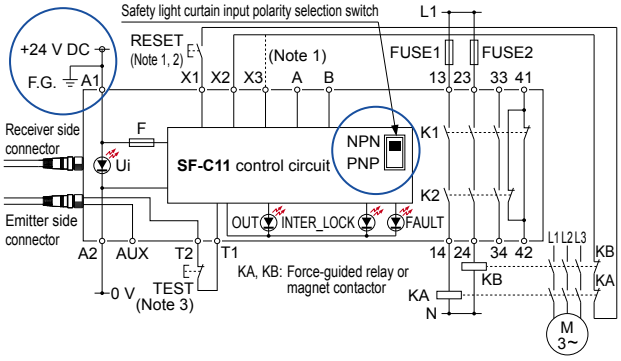
I/O CIRCUIT AND WIRING DIAGRAMS

SF-C11

SF2B series wiring diagram (Control category 2)

For NPN output (plus ground)

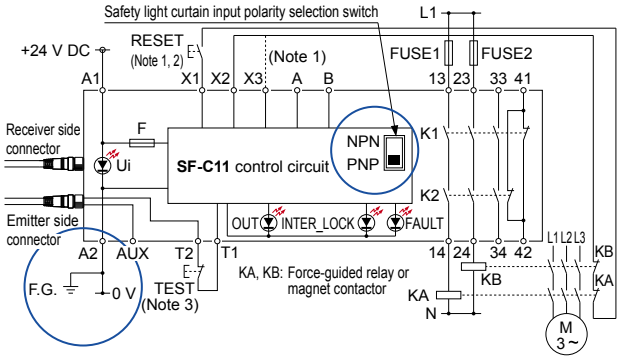
- Set the safety light curtain input polarity selection switch to the NPN side and ground the + side.



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 (RESET) button is not needed.
2) Use a momentary-type switch as the reset (RESET) button.
3) Emission halt occurs when the test (TEST) button is open, and emission occurs when the test (TEST) button is short-circuited. If not using the test (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.

For PNP output (minus ground)

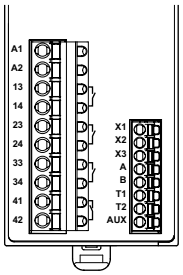
- Set the safety light curtain input polarity selection switch to the PNP side and ground the 0 V line.



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 (RESET) button is not needed.
2) Use a momentary-type switch as the reset (RESET) button.
3) Emission halt occurs when the test (TEST) button is open, and emission occurs when the test (TEST) button is short-circuited. If not using the test (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.

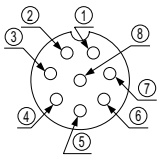
Be sure to use the following mating cables when connecting **SF-C11** to **SF2B** series.
SF2B-CB05 (cable length: 0.5 m 1.640 ft)
SF2B-CB5 (cable length: 5 m 16.404 ft)
SF2B-CB10 (cable length: 10 m 32.808 ft)
SFB-CCJ10E (for emitter, cable length: 10 m 32.808 ft)
SFB-CCJ10D (for receiver, cable length: 10 m 32.808 ft)

Terminal arrangement diagram



Terminal	Function
A1	+24 V DC
A2	0 V
13-14, 23-24, 33-34	Safety output (NO contact × 3)
41-42	Auxiliary output (NC contact × 1)
X1	Reset output terminal
X2	Reset input terminal (Manual)
X3	Reset input terminal (Automatic)
A	Not used
B	
T1	Test output terminal
T2	Test input terminal
AUX	Semiconductor auxiliary output

Pin layout for safety light curtain connectors



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

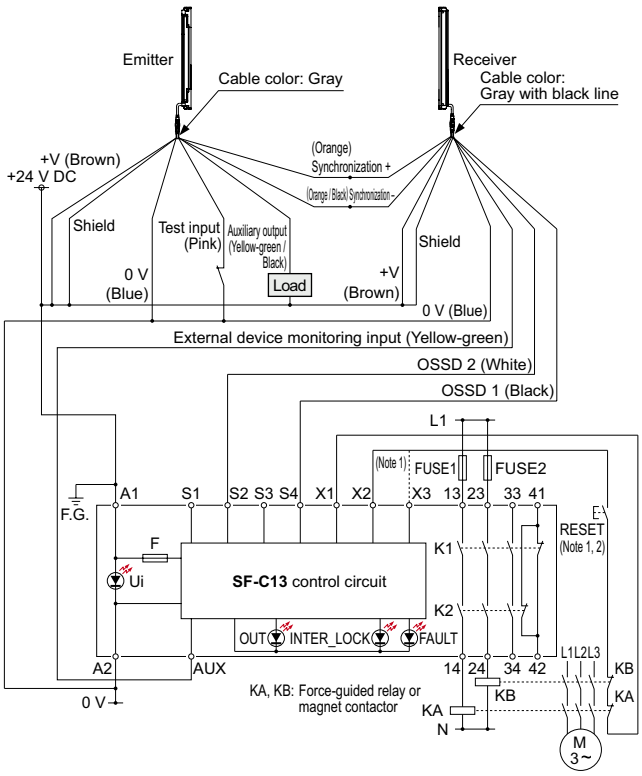
I/O CIRCUIT AND WIRING DIAGRAMS

SF-C13

SF2B series wiring diagram (Control category 2)

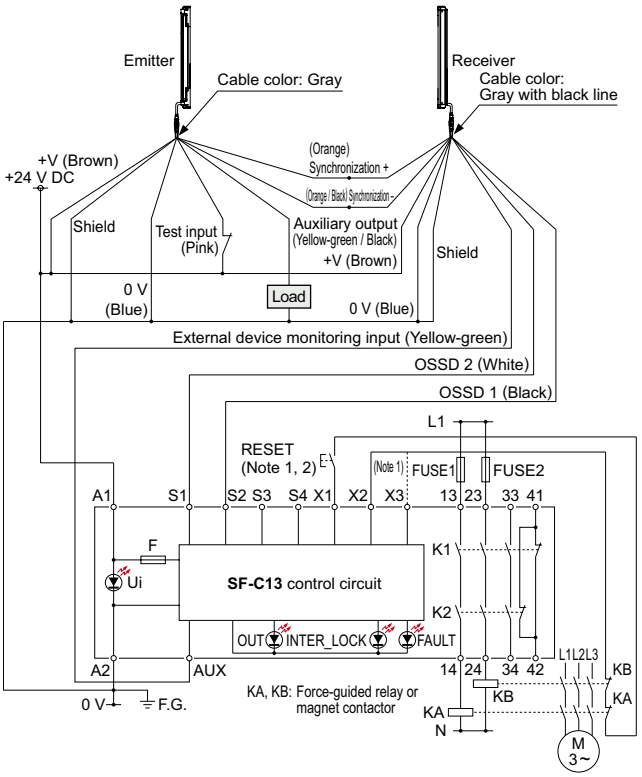
NPN output type

- Connect the safety light curtain control outputs OSSD 1 and OSSD 2 to S4 and S2 respectively and ground the + side.

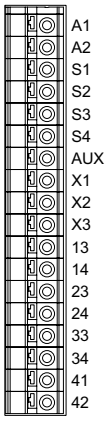


PNP output type

- Connect the safety light curtain control outputs OSSD 1 and OSSD 2 to S1 and S2 respectively.



Terminal arrangement diagram



Terminal	Function
A1	+24 V DC
A2	0 V
S1 to S4	Safety 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	Safety output (NO contact × 3)
41-42	Auxiliary output (NC contact × 1)

Use a separate terminal block to carry out wiring for safety 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 (RESET) button is not needed.
2) Use a momentary-type switch as the reset (RESET) button.

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 (RESET) button is not needed.
2) Use a momentary-type switch as the reset (RESET) button.

PRECAUTIONS FOR PROPER USE

Refer to the instruction manual for details.
The instruction manual can be downloaded from our website.

- This safety light curtain is a Type 2 electro-sensitive protective equipment. It is specified that this safety light curtain be utilized only within systems implementing control categories 2, 1 and B (safety-related categories for control systems), as determined by ISO 13849-1. This safety 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.
- 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 ISO 13855 as well. Observe your national and local requirements before installing this product.

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

- Make sure to carry out the test run before regular operation.
- 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

- This safety light curtain incorporates the self-diagnosis function. In case an abnormality is detected during self-diagnosis, the safety 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.623) and the instruction manual and remove the cause of the abnormality.

- In order to maintain safe condition of safety 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 safety light curtain, resulting in serious body injury or death.
- In order to check all abnormalities in the OSSD 1, OSSD 2 and auxiliary output, the beam interrupted status of device must be checked. Perform either of two below to inspect the device under beam interrupted status.
  - Emission halt by test input (Emission halt function)
  - Beam interrupting by test rod (Excluding the cable **SF2B-CB05-A**)

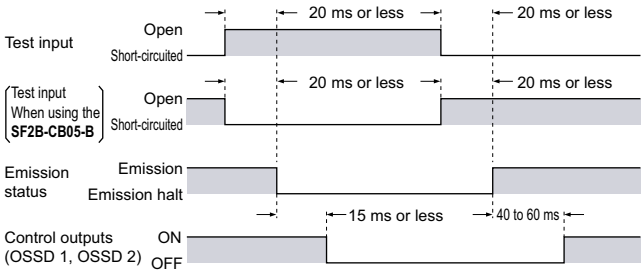
Emission halt function (Test input)

- 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

- During emission halt, the control outputs (OSSD 1, OSSD 2) become OFF status.
- By using this function, malfunction due to extraneous noise or abnormality in the control outputs (OSSD 1, OSSD 2) and the auxiliary output can be determined even from the 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.

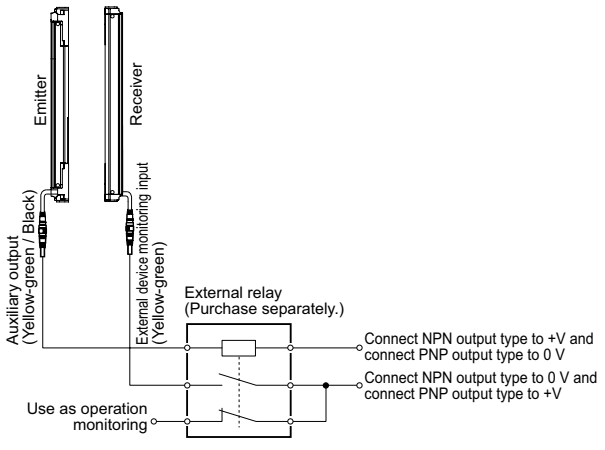
Auxiliary output

- 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 outputs (OSSD 1, OSSD 2) status		
		Beam received	Beam interrupted	
When using the **SF2B-CCB□ / SF2B-CB□**	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-CCB□ or SF2B-CB□ (optional) is used

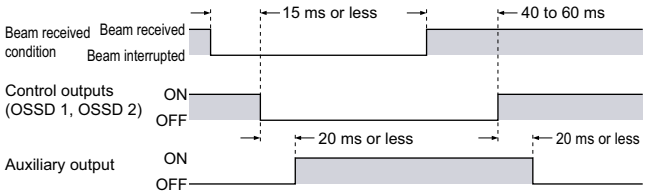
- The auxiliary output is incorporated in the emitter. It is OFF when the control outputs (OSSD 1,OSSD 2) are ON and vice versa.
- The auxiliary output can be used as an operation monitor of the device.
- When the external device monitor function is not used, connect the external device monitor input line to the auxiliary output line to disable the function.
  In this case, do not connect the load to the auxiliary output. For details, refer to "**External device monitoring function**" (p.620) and "**I/O CIRCUIT AND WIRING DIAGRAMS**" (p.615~).
- When the external device monitoring function is used to disable, do not directly use the auxiliary output as the operation monitor of this safety light curtain. When the external device monitor is used to disable and the auxiliary output is used to monitor the operation of safety light curtain, connect the auxiliary output and the external device monitoring input to the external relay (purchase separately) to use the external relay contacting point as an operation monitor of this safety light curtain.



PRECAUTIONS FOR PROPER USE

Refer to the instruction manual for details.
The instruction manual can be downloaded from our website.

<Time chart>

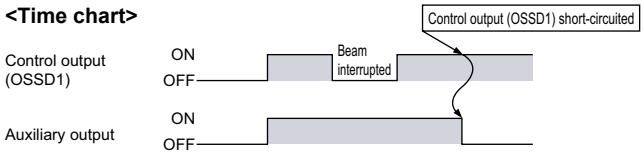


When bottom cap cable SF2B-CB05-A (optional) is used

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 cannot stop operation when an unexpected error occurs during control output (OSSD 1) failure, which may result in serious injury or death.

- The auxiliary output is incorporated in the emitter. It outputs ON at the normal operation of device. It outputs OFF in the following cases:
  - When an abnormality which needs emission halt status occurs [for example, the control output (OSSD 1) short-circuit and an error occurs.]
  - While test input has been input
- 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

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

External device monitoring function

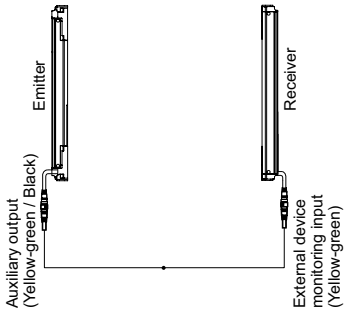
- This function is available when the bottom cap cable **SF2B-CCB**□ or **SF2B-CB**□ (optional) is used. This is the function for checking whether the external safety relay connected to the control outputs (OSSD 1, OSSD 2) performs normally in accordance with the control outputs (OSSD 1, OSSD 2) or not. 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 safety light curtain into lockout one, and turn OFF the control outputs (OSSD 1, OSSD 2).

In case of setting the external device monitoring function to enabled

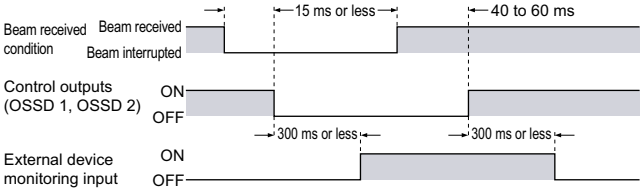
- Connect the external device monitoring input (yellow-green) to the b contact of the external safety relay that is connected to the control outputs (OSSD 1, OSSD 2).

In case of not using the external device monitoring function

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

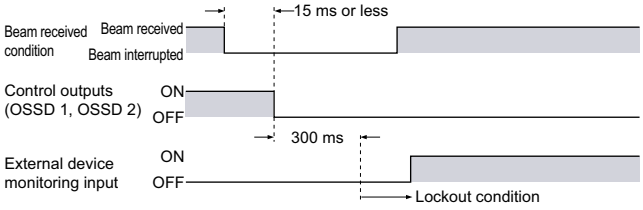


<Time chart (normal)>

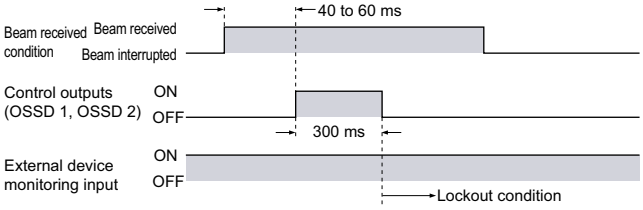


- The time set for external device monitoring is 300 ms or less. Exceeding 300 ms turns the safety light curtain into lockout condition.

<Time chart (Error ①)>



<Time chart (Error ②)>



Series connection

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

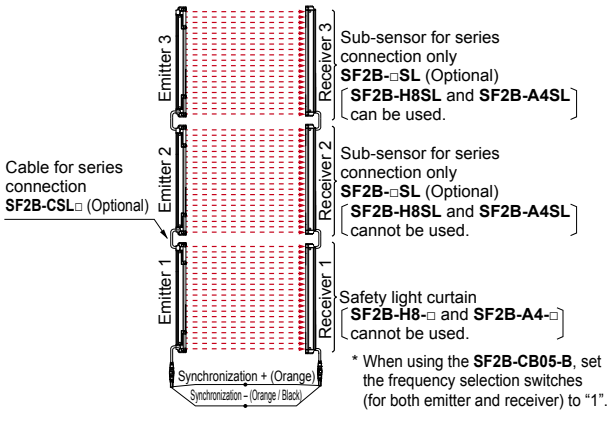
- This is the configuration for connecting multiple sets of emitters and receivers facing each other in series. It is used when the dangerous part can be entered from two or more directions. The control outputs (OSSD 1, OSSD 2) turns OFF if any of the safety light curtain is interrupted. For details, refer to the instruction manual.

Notes 1): Series connection connectors cannot be used with the **SF2B-H8-**□ and **SF2B-A4-**□, 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-A**□ is a maximum of 96 when two sets are connected, and 64 when three sets are connected. When **SF2B-H**□ and **SF2B-A**□ are combined in series connection, double the number of the beam channels of **SF2B-A**□ to calculate the total number of beam channels, which should be 128 or less.

Example: The total no. of beam channels for **SF2B-H36** and **SF2B-A44** is 124.
The no. of beam channels of **SF2B-H36** + (the No. of beam channels of **SF2B-A44** × 2) = Total no. of beam channels
36 beam channels + (44 beam channels × 2) = 124 beam channels

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

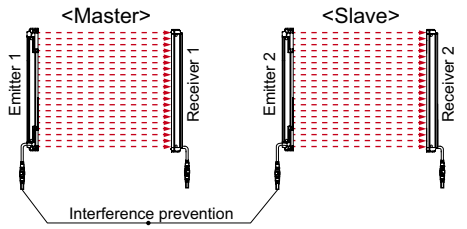


PRECAUTIONS FOR PROPER USE

Refer to the instruction manual for details.
The instruction manual can be downloaded from our website.

Parallel connection

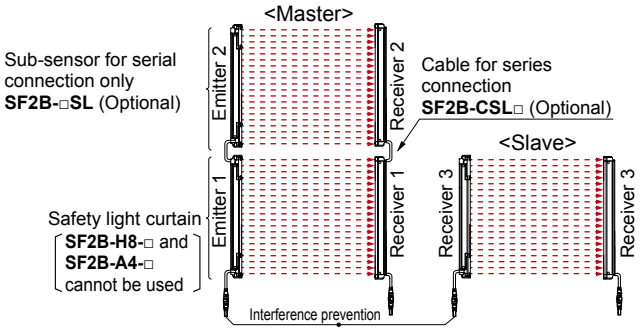
- Up to a maximum of two sets can be connected in parallel only when using the **SF2B-CB05-B** adapter cable (optional). For details, refer to the instruction manual.



* Set the frequency selection 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

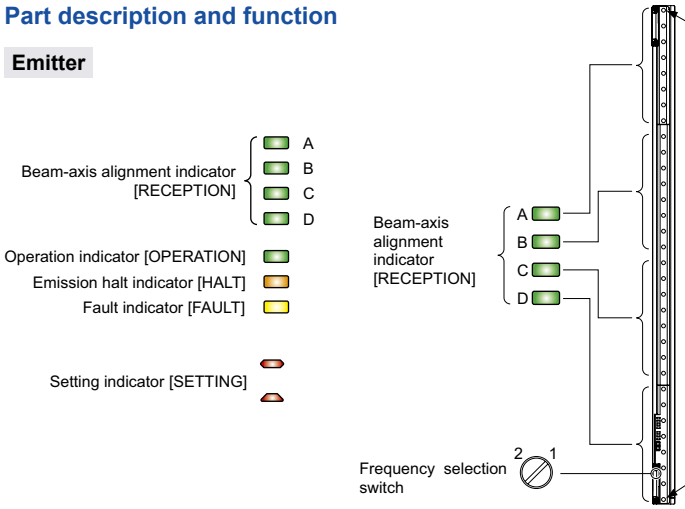
- Up to a maximum of three sets can be connected in a mixture of series and parallel (for a total maximum number of 128 beam channels. However, the total number of beam channels for the **SF2B-A**□ is a maximum of 96 when two sets are connected, and 64 when three sets are connected.) only when using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



* Set the frequency selection switches (for both emitter and receiver) to “1” at the master units, and set them to “2” at the slave units.

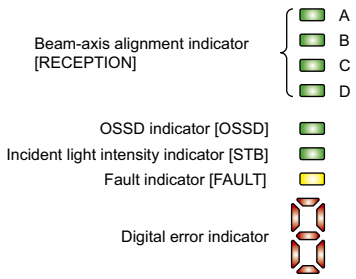
Part description and function

Emitter



Description		Function
Beam-axis alignment indicator (Red / Green) [RECEPTION]	A	When all beam channels of safety light curtain top are receiving light: lights up in red When safety light curtain top end receives light: blinks in red When control outputs (OSSD 1, OSSD 2) are ON: lights up in green (always off when using the **SF2B-CB05-B**)
	B	When all beam channels of safety light curtain upper middle are receiving light: lights up in red When control outputs (OSSD 1, OSSD 2) are ON: lights up in green (always off when using the **SF2B-CB05-B**)
	C	When all beam channels of safety light curtain lower middle are receiving light: lights up in red When control outputs (OSSD 1, OSSD 2) are ON: lights up in green (always off when using the **SF2B-CB05-B**)
	D	When all beam channels of safety light curtain bottom are receiving light: lights up in red When sensor bottom end receives light: blinks in red When control outputs (OSSD 1, OSSD 2) are ON: lights up in green (always off when using the **SF2B-CB05-B**)
Operation indicator (Red / Green) [OPERATION]		When control outputs (OSSD 1, OSSD 2) are OFF: lights up in red When control outputs (OSSD 1, OSSD 2) are ON: lights up in green (When using the **SF2B-CB05-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 **SF2B-CB05-B** One lights up when set to Frequency 1 Two light up when set to Frequency 2)
Frequency selection switch		Used for switching between master and slave when using the **SF2B-CB05-B**. Set to “1” for master and “2” for slave.

Receiver



Description		Function
Beam-axis alignment indicator (Red / Green) [RECEPTION]	A	When all beam channels of safety light curtain top are receiving light: lights up in red When sensor top end receives light: blinks in red When control outputs (OSSD 1, OSSD 2) are ON: lights up in green
	B	When all beam channels of safety light curtain upper middle are receiving light: lights up in red When control outputs (OSSD 1, OSSD 2) are ON: lights up in green
	C	When all beam channels of safety light curtain lower middle are receiving light: lights up in red When control outputs (OSSD 1, OSSD 2) are ON: lights up in green
	D	When all beam channels of safety light curtain bottom are receiving light: lights up in red When sensor bottom end receives light: blinks in red When control outputs (OSSD 1, OSSD 2) are ON: lights up in green
OSSD indicator (Red / Green) [OSSD]		When control outputs (OSSD 1, OSSD 2) are OFF: lights up in red When control outputs (OSSD 1, OSSD 2) are ON: lights up in green
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 **SF2B-CB05-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 selection switch		Used for switching between master and slave when using the **SF2B-CB05-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.623) and the instruction manual.
4) The description given in [ ] is marked on the safety light curtain.

PRECAUTIONS FOR PROPER USE

Refer to the instruction manual for details.
The instruction manual can be downloaded from our website.

Wiring

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

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

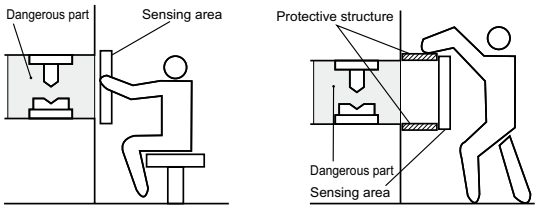
Others

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

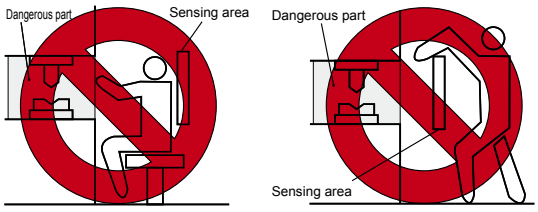
Sensing area

- 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.
- Do not use any reflective type or retroreflective type arrangement.
- 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.
- Do not connect facing several receivers towards one emitter.

Example of correct sensing area setup

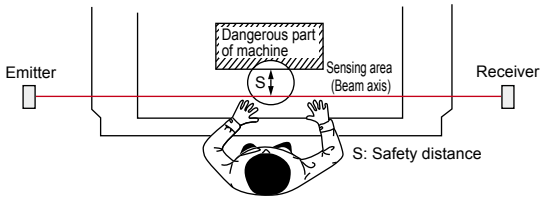


Example of incorrect sensing area setup



Safety distance

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



- Safety distance is calculated based on the following equation when a person moves perpendicular (normal intrusion) to the sensing area of the safety 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 based on EN ISO 13855 / ISO 13855 / JIS B 9715

For intrusion direction perpendicular to the sensing area

- Equation ① $S = K \times T + C$

S: Safety distance (mm)
Minimum required distance between the sensing area surface and the dangerous parts of the machine
K: Intrusion speed of operator's body or objects (mm/sec.)
Normally, taken as **SF2B-H□** 2,000 (mm/sec.),
SF2B-A□ 1,600 (mm/sec.) for calculation.
T: Response time of total equipment (sec.)
$T = T_m + T_{SF2B}$
T_m: Maximum halting time of machinery (sec.)
T_{SF2B}: Response time of the **SF2B** series 0.015 (sec.)
C: Additional distance calculated from the size of the minimum sensing object of the safety light curtain (mm)
However, the value of "C" cannot be 0 or less.
$C = 8 \times (d - 14)$
d: Minimum sensing object diameter
SF2B-H□: d= 27 (mm) 1.063 (in), C = 104 (mm) 4.094 (in)
For **SF2B-A□**, C = 850 (mm) 33.465 (in) (constant)

- For calculating the safety distance "S", there are the following five cases. First calculate by substituting the value K = 2,000 (mm/sec.) in the equation above.
Then, classify the obtained value of "S" into three cases, 1) S < 100, 2) 100 ≤ S ≤ 500, and 3) S > 500. For Case 3) S > 500, recalculate by substituting the value K = 1,600 (mm/sec.). After that, classify the calculation result into two cases, 4) S ≤ 500 and 5) S > 500. For details, refer to the instruction manual.

For use based on ANSI B11.19

- Equation ② $S = K \times (T_s + T_c + T_{SF2B} + T_{bm}) + D_{pf}$

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_s: Halting time calculated from the operation time of the control element (air valve, etc.) (sec.)
T_c: Maximum response time of the control circuit required for functioning the brake (sec.)
T_{SF2B}: Response time of safety light curtain 0.015 (sec.)
T_{bm}: Additional halting time tolerance for the brake monitor (sec.)
$T_{bm} = T_a - (T_s + T_c)$
T_a: Setting time of brake monitor (sec.)
When the machine is not equipped with a brake monitor, it is recommended that 20 % or more of
$(T_s + T_c)$ is taken as additional halting time.
D_{pf}: Additional distance calculated from the size of the minimum sensing object of the safety light curtain
SF2B-H□ D_{pf} = 2.676 (inch) ≈ 68 (mm)
SF2B-A□ D_{pf} = 5.355 (inch) ≈ 136 (mm)

$D_{pf} = 3.4 \times (d - 0.276)$ (inch)
$D_{pf} \approx 3.4 \times (d - 7)$ (mm)
d: Minimum sensing object diameter 1.063 (inch) ≈ 27 (mm) **SF2B-H□**
Minimum sensing object diameter 1.851 (inch) ≈ 47 (mm) **SF2B-A□**

PRECAUTIONS FOR PROPER USE

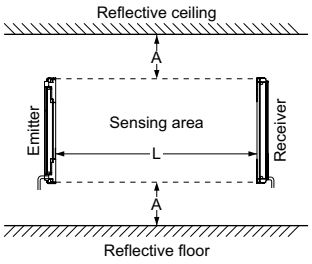
Refer to the instruction manual for details.
The instruction manual can be downloaded from our website.

Influence of reflective surfaces

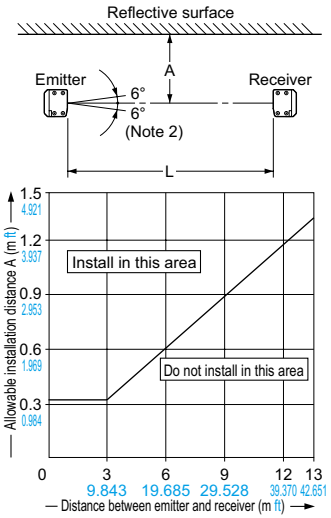
Install the safety light curtain by considering the effect of nearby reflective surfaces, and take countermeasures such as painting, masking, or changing the material of the reflective surface, etc. Failure to do so may cause the safety light curtain not to detect, resulting in serious body injury or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

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

Side view



Top view



Distance between emitter and receiver (Setting distance L)	Allowable installation distance A
0.2 to 3 m 0.656 to 9.843 ft	0.32 m 1.050 ft
3 to 13 m 9.843 to 42.651 ft (Note 1)	L/2 × tan2θ ≒ L × 0.106 (m) 0.348 (ft) (θ = 6°)

Notes: 1) If using the **SF2B-CB05-B**, the operating range is 0.3 to 5 m 0.984 to 16.404 ft.
2) The effective aperture angle for this device is ±5° 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 ±6° to take care of beam misalignment, etc. during installation.

Troubleshooting

Emitter side

Phenomenon	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.
Operation indicator remains lit up in red (beam is not received). [OPERATION]	The beam channels of the emitter and the receiver are not correctly aligned.	Align the beam channels.
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 safety light curtain.
Fault indicator (yellow) lights up or blinks. [FAULT] or	[Blinks once] Total safety 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 safety 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 safety light curtains. Check the wiring, supplied voltage and power supply capacity. Even if the error is not eliminated, contact our office.

Receiver side

Phenomenon	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.
OSSD indicator remains lit up in red (beam 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.
Stable indicator lights up (Orange) [STB]	The beam channels of the emitter and the receiver are not correctly aligned.	Align the beam channels.
Fault indicator (yellow) lights up or blinks. [FAULT] or	[Digital error indicator 1] Total safety 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 safety light curtains / number of beam axes is within the specification value.
	[Digital error indicator 2] Control outputs (OSSD 1, OSSD 2) error	Connect the control outputs (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 8] Bottom connector error	Check the type of the bottom connector. Cable of the emitter: Gray (with black stripe)
	[Other than the above] Effect from noise / power supply or failure of internal circuit	Check the noise status around this safety light curtain. Check the wiring, supplied voltage and power supply capacity. Even if the error is not eliminated, contact our office.

Corner mirror

- Be sure to carry out maintenance while referring to the instruction manual for the **SF2B** series of safety light curtains.
- Do not use if dirt, water, or oil, etc. is attached to the reflective surface of this product. Appropriate sensing range may not be maintained due to diffusion or refraction.
- Make sure that you have read the instruction manual for the corner mirror thoroughly before setting up the corner mirrors and safety light curtains, and follow the instructions given. If the equipment is not set up correctly as stipulated in the instruction manual, incident light errors may result in unexpected situations which may result in serious injury or death.
- Please download the instruction manuals from our website.
- Safety light curtain **SF2B** series cannot be used as a retroreflective type. Avoid installing the safety light curtain as a retroreflective type when this product is applied.
- The mirror part of this product is made of glass. Note that if it is broken, the glass shards may fly apart.

DIMENSIONS (Unit: mm in)

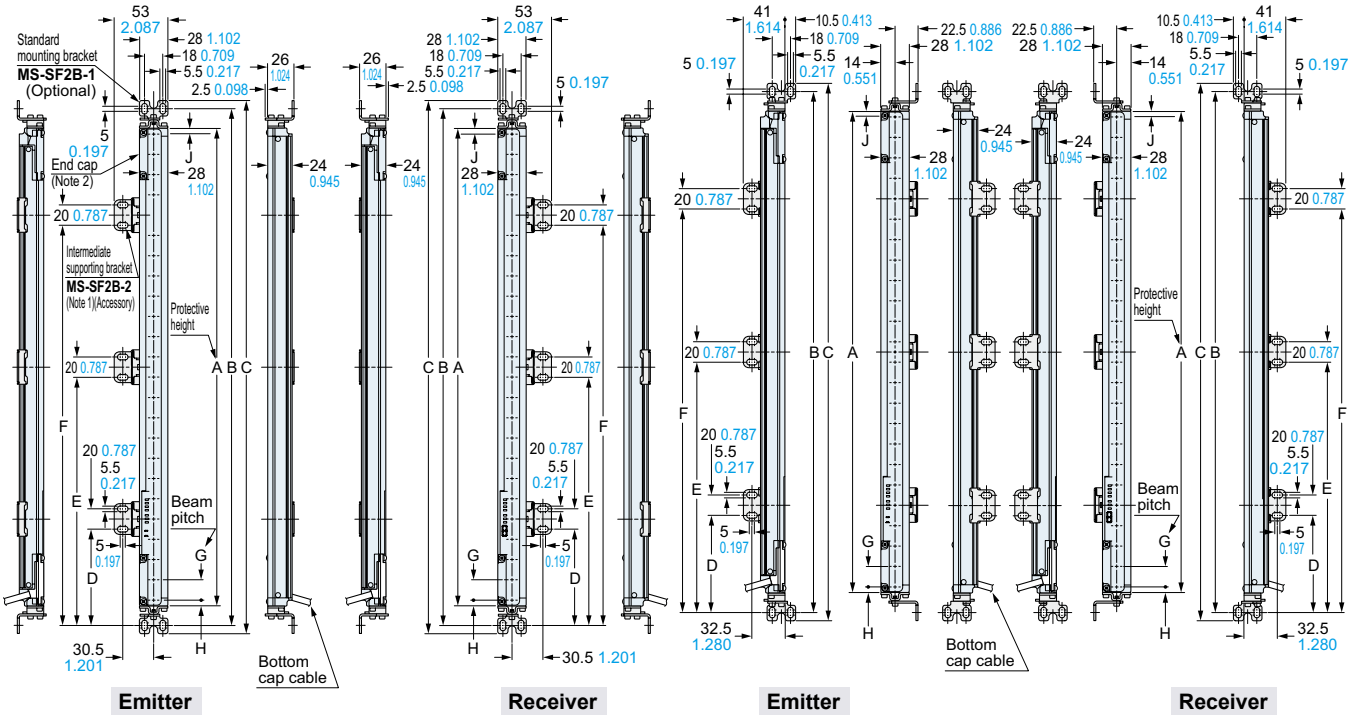
The CAD data can be downloaded from our website.

SF2B-□ SF2B-□SL Safety light curtain, Sub-sensor for series connection only

Assembly dimensions

Mounting drawing for the safety light curtains using the standard mounting brackets **MS-SF2B-1** (optional) and the intermediate supporting brackets **MS-SF2B-2** (accessory for safety light curtain).

<Rear 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 (connector for series connection) is not provided for the **SF2B-H8(SL)(-□)** and **SF2B-A4(SL)(-□)**.

Model No.		A	B	C	D	E	F
SF2B-H8(SL)(-□)	**SF2B-A4(SL)(-□)**	168 6.614	207 8.150	223 8.780	—	—	—
SF2B-H12(SL)(-□)	**SF2B-A6(SL)(-□)**	232 9.134	270 10.630	286 11.260	—	—	—
SF2B-H16(SL)(-□)	**SF2B-A8(SL)(-□)**	312 12.283	350 13.780	366 14.409	—	—	—
SF2B-H20(SL)(-□)	**SF2B-A10(SL)(-□)**	392 15.433	430 16.929	446 17.559	—	—	—
SF2B-H24(SL)(-□)	**SF2B-A12(SL)(-□)**	472 18.583	510 20.079	526 20.709	—	—	—
SF2B-H28(SL)(-□)	**SF2B-A14(SL)(-□)**	552 21.732	590 23.228	606 23.858	—	—	—
SF2B-H32(SL)(-□)	**SF2B-A16(SL)(-□)**	632 24.882	670 26.378	686 27.008	—	—	—
SF2B-H36(SL)(-□)	**SF2B-A18(SL)(-□)**	712 28.031	750 29.528	766 30.157	—	—	—
SF2B-H40(SL)(-□)	**SF2B-A20(SL)(-□)**	792 31.181	830 32.677	846 33.307	390 15.354	—	—
SF2B-H48(SL)(-□)	**SF2B-A24(SL)(-□)**	952 37.480	990 38.976	1,006 39.606	470 18.504	—	—
SF2B-H56(SL)(-□)	**SF2B-A28(SL)(-□)**	1,112 43.779	1,150 45.276	1,166 45.905	550 21.654	—	—
SF2B-H64(SL)(-□)	**SF2B-A32(SL)(-□)**	1,272 50.079	1,310 51.575	1,326 52.205	418 16.457	842 33.150	—
SF2B-H72(SL)(-□)	**SF2B-A36(SL)(-□)**	1,432 56.378	1,470 57.874	1,486 58.504	472 18.583	948 37.323	—
SF2B-H80(SL)(-□)	**SF2B-A40(SL)(-□)**	1,592 62.677	1,630 64.173	1,646 64.803	525 20.669	1,055 41.535	—
SF2B-H88(SL)(-□)	**SF2B-A44(SL)(-□)**	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)(-□)	**SF2B-A48(SL)(-□)**	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	J (Note)
SF2B-H□	20 0.787	6 0.236	6 0.236
SF2B-A□	40 1.575	26 1.024	6 0.236

Note: The distance between the tip of the safety light curtain and the last beam axis of the **SF2B-H8(SL)(-□)** and **SF2B-A4(SL)(-□)** is 22 mm 0.866 in.

DIMENSIONS (Unit: mm in)

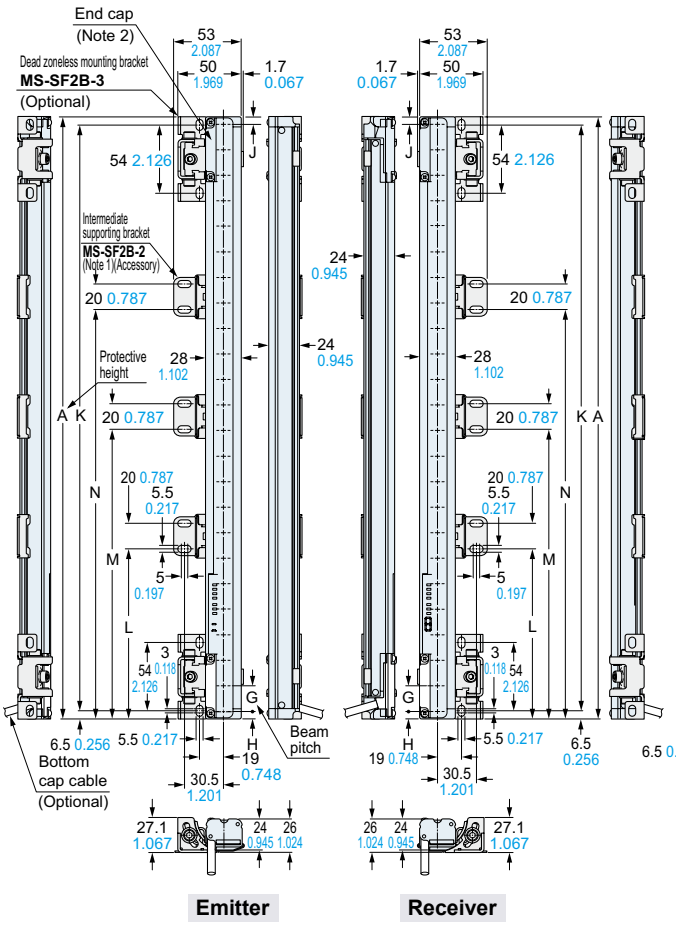
The CAD data can be downloaded from our website.

SF2B-□ SF2B-□SL — Safety light curtain, Sub-sensor for series connection only

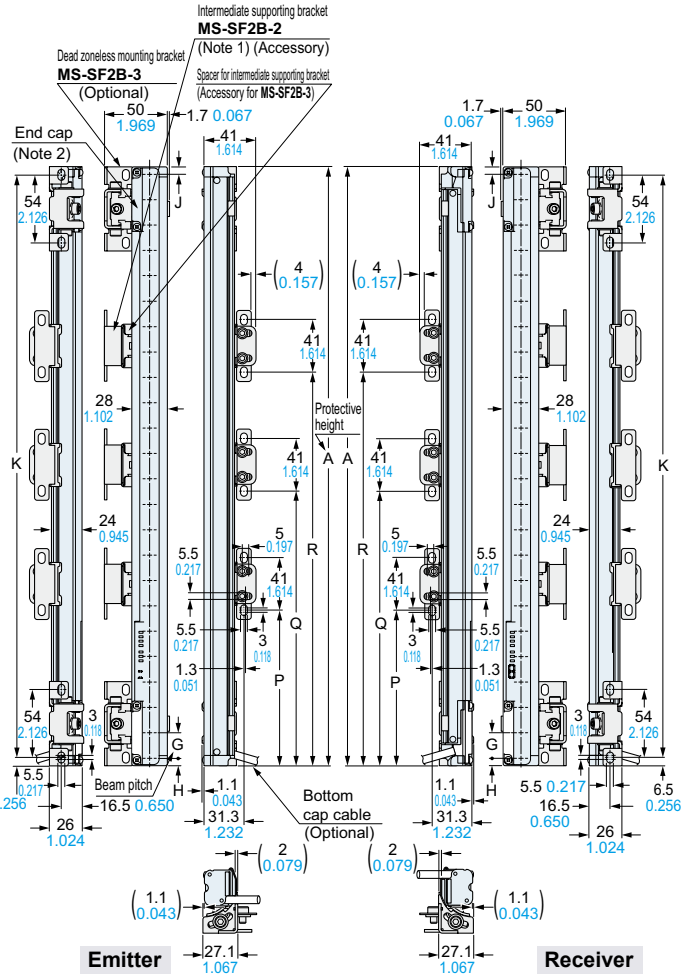
Assembly dimensions

Mounting drawing for the safety light curtains using the dead zoneless mounting brackets **MS-SF2B-3** (optional) and the intermediate supporting brackets **MS-SF2B-2** (accessory for safety light curtain).

<Rear 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 (connector for series connection) is not provided for the **SF2B-H8(SL)(-□)** and **SF2B-A4(SL)(-□)**.

Model No.		A	K	L	M	N	P	Q	R
SF2B-H8(SL)(-□)	**SF2B-A4(SL)(-□)**	168 6.614	155 6.102	—	—	—	—	—	—
SF2B-H12(SL)(-□)	**SF2B-A6(SL)(-□)**	232 9.134	219 8.622	—	—	—	—	—	—
SF2B-H16(SL)(-□)	**SF2B-A8(SL)(-□)**	312 12.283	299 11.772	—	—	—	—	—	—
SF2B-H20(SL)(-□)	**SF2B-A10(SL)(-□)**	392 15.433	379 14.921	—	—	—	—	—	—
SF2B-H24(SL)(-□)	**SF2B-A12(SL)(-□)**	472 18.583	459 18.071	—	—	—	—	—	—
SF2B-H28(SL)(-□)	**SF2B-A14(SL)(-□)**	552 21.732	539 21.221	—	—	—	—	—	—
SF2B-H32(SL)(-□)	**SF2B-A16(SL)(-□)**	632 24.882	619 24.370	—	—	—	—	—	—
SF2B-H36(SL)(-□)	**SF2B-A18(SL)(-□)**	712 28.031	699 27.520	—	—	—	—	—	—
SF2B-H40(SL)(-□)	**SF2B-A20(SL)(-□)**	792 31.181	779 30.669	390 15.354	—	—	379.5 14.941	—	—
SF2B-H48(SL)(-□)	**SF2B-A24(SL)(-□)**	952 37.480	939 36.969	470 18.504	—	—	459.5 18.091	—	—
SF2B-H56(SL)(-□)	**SF2B-A28(SL)(-□)**	1,112 43.779	1,099 43.268	550 21.654	—	—	539.5 21.240	—	—
SF2B-H64(SL)(-□)	**SF2B-A32(SL)(-□)**	1,272 50.079	1,259 49.567	418 16.457	842 33.150	—	407.5 16.043	831.5 32.736	—
SF2B-H72(SL)(-□)	**SF2B-A36(SL)(-□)**	1,432 56.378	1,419 55.866	472 18.583	948 37.323	—	461.5 18.169	937.5 36.909	—
SF2B-H80(SL)(-□)	**SF2B-A40(SL)(-□)**	1,592 62.677	1,579 62.165	525 20.669	1,055 41.535	—	514.5 20.256	1,044.5 41.122	—
SF2B-H88(SL)(-□)	**SF2B-A44(SL)(-□)**	1,752 68.976	1,739 68.465	433 17.047	870 34.252	1,308 51.496	422.5 16.634	859.5 33.839	1,297.5 51.083
SF2B-H96(SL)(-□)	**SF2B-A48(SL)(-□)**	1,912 75.275	1,899 74.764	473 18.622	950 37.402	1,428 56.220	462.5 18.209	939.5 33.839	1,417.5 55.807

Model No.	G	H	J (Note)
SF2B-H□	20 0.787	6 0.236	6 0.236
SF2B-A□	40 1.575	26 1.024	6 0.236

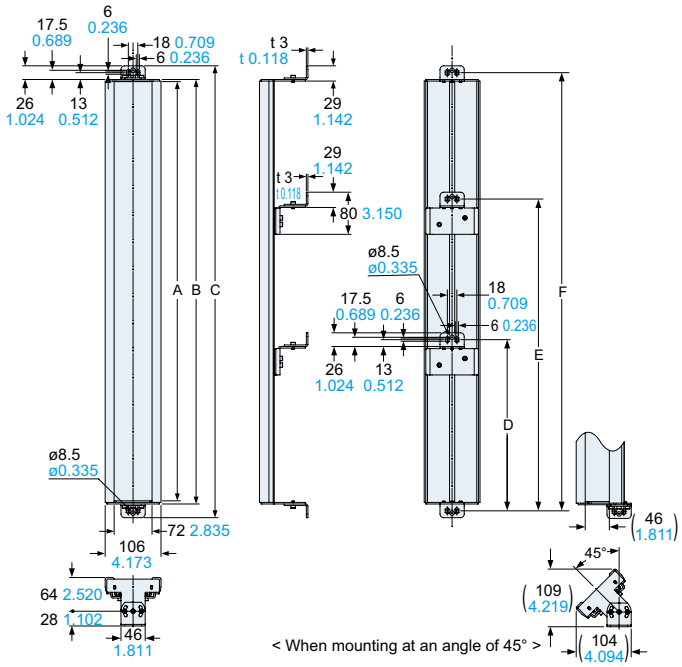
Note: The distance between the tip of the safety light curtain and the last beam axis of the **SF2B-H8(SL)(-□)** and **SF2B-A4(SL)(-□)** is 22 mm 0.866 in.

DIMENSIONS (Unit: mm in)

The CAD data can be downloaded from our website.

RF-SFBH-□

Corner mirror (Optional)



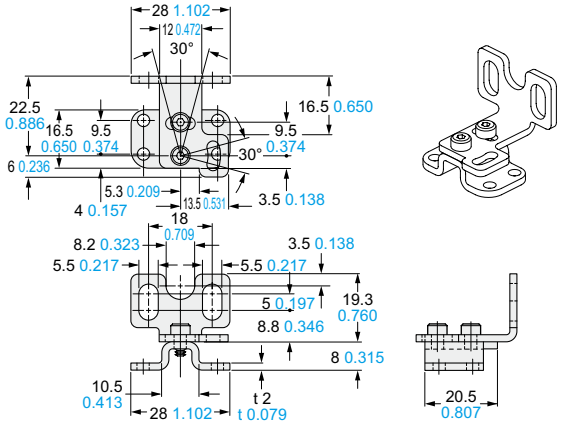
Model No.	A	B	C	D	E	F	Net weight
RF-SFBH-8	173 6.811	183 7.205	235 9.252	——	——	209 8.228	810 g approx.
RF-SFBH-12	236 9.291	246 9.685	298 11.732	——	——	272 10.709	970 g approx.
RF-SFBH-16	316 12.441	326 12.835	378 14.882	——	——	352 13.858	1,170 g approx.
RF-SFBH-20	396 15.591	406 15.984	458 18.031	——	——	432 17.008	1,370 g approx.
RF-SFBH-24	476 18.740	486 19.134	538 21.181	——	——	512 20.157	1,570 g approx.
RF-SFBH-28	556 21.890	566 22.283	618 24.331	——	——	592 23.307	1,770 g approx.
RF-SFBH-32	636 25.039	646 25.433	698 27.480	——	——	672 26.457	1,970 g approx.
RF-SFBH-36	716 28.189	726 28.583	778 30.630	——	——	752 29.606	2,170 g approx.
RF-SFBH-40	796 31.339	806 31.732	858 33.779	458 ± 50 18.031 ± 1.969	——	832 32.756	2,660 g approx.
RF-SFBH-48	956 37.638	966 38.031	1,018 40.079	538 ± 50 21.181 ± 1.969	——	992 39.055	3,060 g approx.
RF-SFBH-56	1,116 43.937	1,126 44.331	1,178 46.378	618 ± 50 24.331 ± 1.969	——	1,152 45.354	3,460 g approx.
RF-SFBH-64	1,276 50.236	1,286 50.630	1,338 52.677	698 ± 50 27.480 ± 1.969	——	1,312 51.653	3,890 g approx.
RF-SFBH-72	1,436 56.353	1,446 56.929	1,498 58.976	538 ± 50 21.181 ± 1.969	1,018 ± 50 40.079 ± 1.969	1,472 57.953	4,550 g approx.
RF-SFBH-80	1,596 62.835	1,606 63.228	1,658 65.275	591 ± 50 23.268 ± 1.969	1,125 ± 50 44.291 ± 1.969	1,632 64.252	4,950 g approx.
RF-SFBH-88	1,756 69.134	1,766 69.527	1,818 71.575	645 ± 50 25.394 ± 1.969	1,231 ± 50 48.464 ± 1.969	1,792 70.551	5,350 g approx.
RF-SFBH-96	1,916 75.433	1,926 75.827	1,978 77.874	698 ± 50 27.480 ± 1.969	1,338 ± 50 52.677 ± 1.969	1,952 76.850	5,750 g approx.

MS-SF2B-1

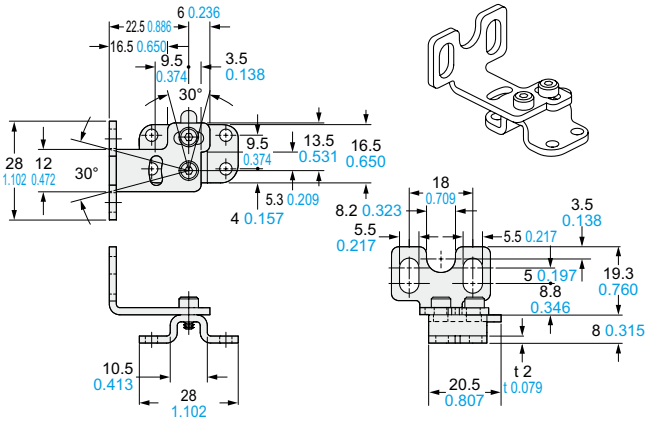
Standard mounting bracket (Optional)

<MS-SF2B-1(R)>

Rear mounting

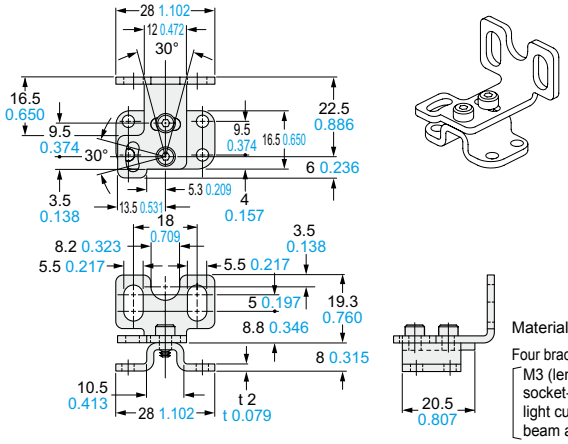


Side mounting

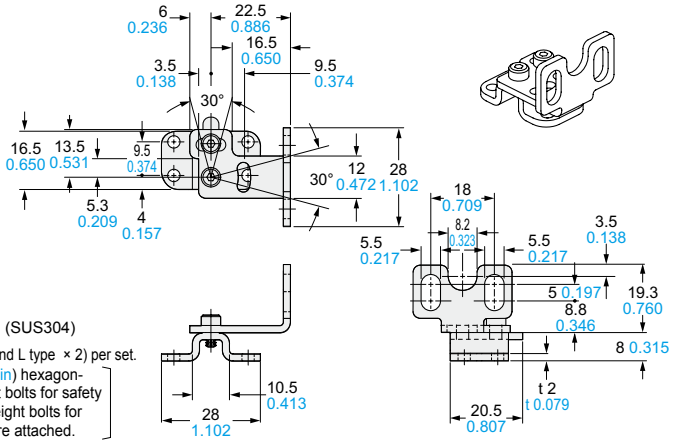


<MS-SF2B-1(L)>

Rear mounting



Side mounting



Material: Stainless steel (SUS304)

Four brackets (R type × 2 and L type × 2) per set.

[M3 (length 5 mm 0.197 in) hexagon-socket-head bolts (eight bolts for safety light curtain mounting, eight bolts for beam axis alignment) are attached.

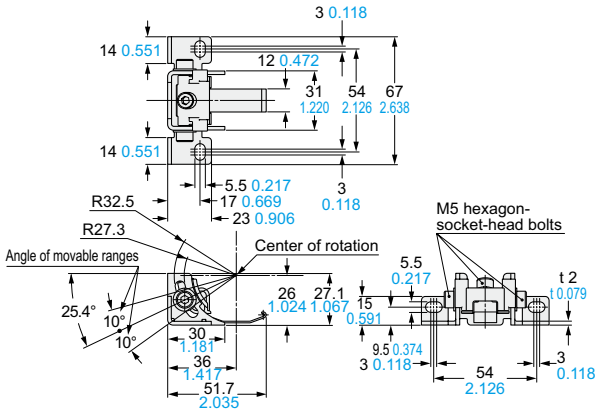
DIMENSIONS (Unit: mm in)

The CAD data can be downloaded from our website.

MS-SF2B-3

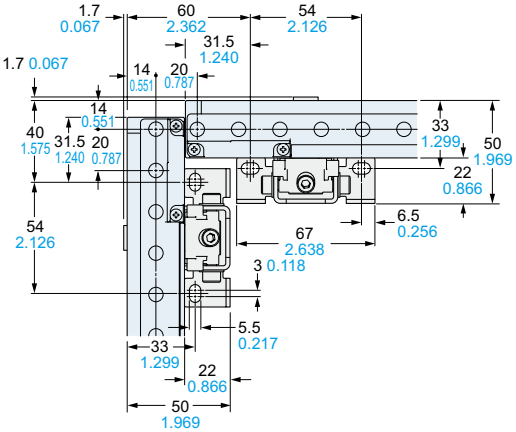
Dead zoneless mounting bracket (optional)

Main body



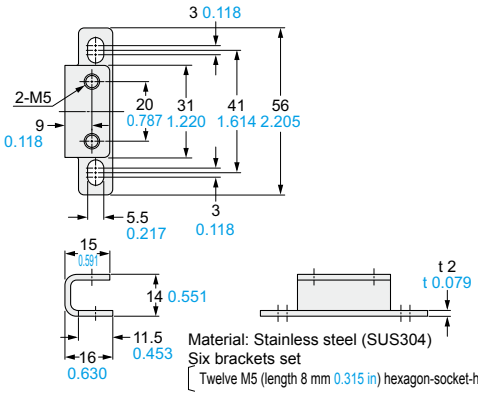
Material: Stainless steel (SUS304) • Die-cast zinc alloy
Four bracket set

L-shaped mounting



Spacer for intermediate supporting bracket (Accessory)

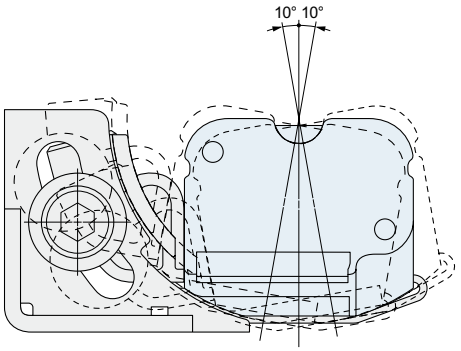
The spacer for intermediate supporting bracket **MS-SF2B-2** can be used as a spacer for eliminating the dead zone when mounting the safety light curtain laterally.



Material: Stainless steel (SUS304)
Six brackets set
[Twelve M5 (length 8 mm 0.315 in) hexagon-socket-head bolts are attached.]

Mounting adjustment range

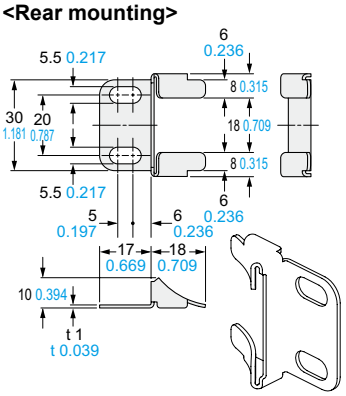
The adjustment range of the safety light curtain angle is up to ±10 degrees.



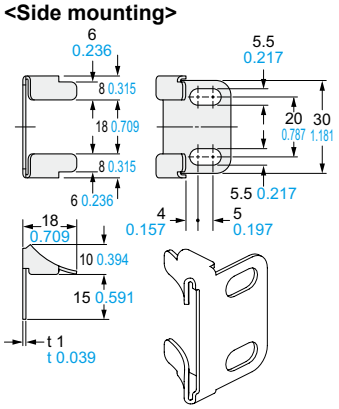
MS-SF2B-2

Intermediate supporting bracket (Accessory for safety light curtain)

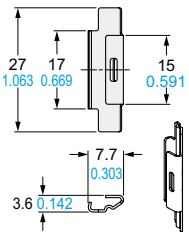
<Rear mounting>



<Side mounting>



<For main unit mounting>

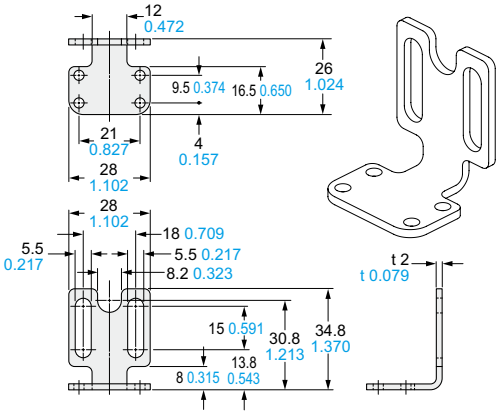


Material: Stainless steel (SUS304)
Two main unit mounting brackets per set (for rear mounting and side mounting) (Note)

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-H**□ ··· 40 to 56 beam channels
SF2B-A□ ··· 20 to 28 beam channels
2 sets: **SF2B-H**□ ··· 64 to 80 beam channels
SF2B-A□ ··· 32 to 40 beam channels
3 sets: **SF2B-H**□ ··· 88 to 96 beam channels
SF2B-A□ ··· 44 to 48 beam channels

MS-SF2B-4

Adapter mounting bracket for **SF1-N / NA40** (Optional)



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

DIMENSIONS (Unit: mm in)

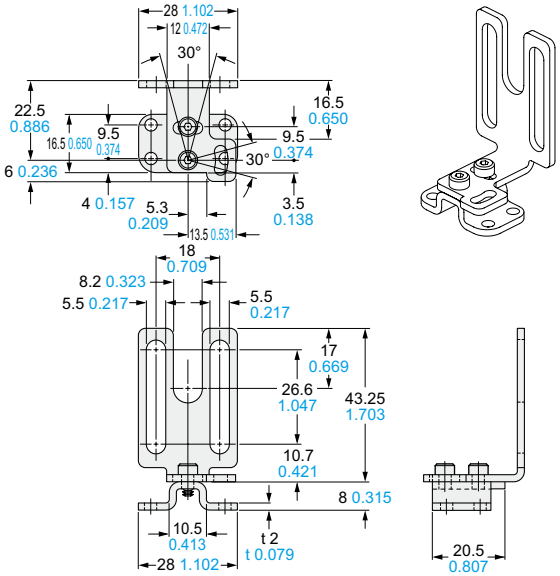
The CAD data can be downloaded from our website.

MS-SF2B-5

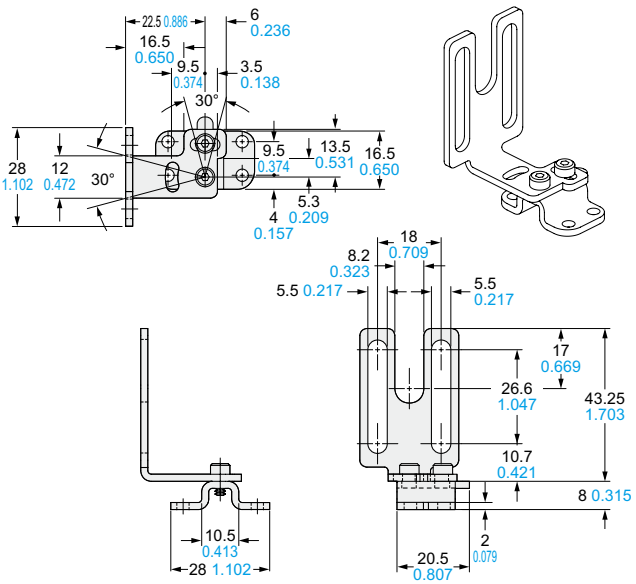
Adapter mounting bracket for **SF2-A / SF2-N** (Optional)

<MS-SF2B-5(R)>

Rear mounting

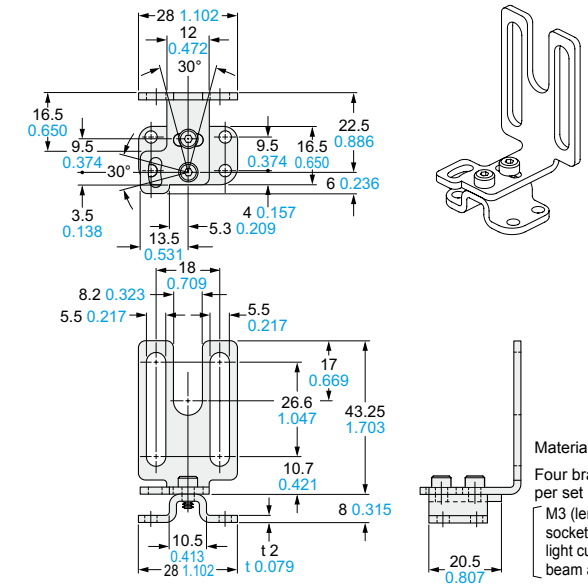


Side mounting

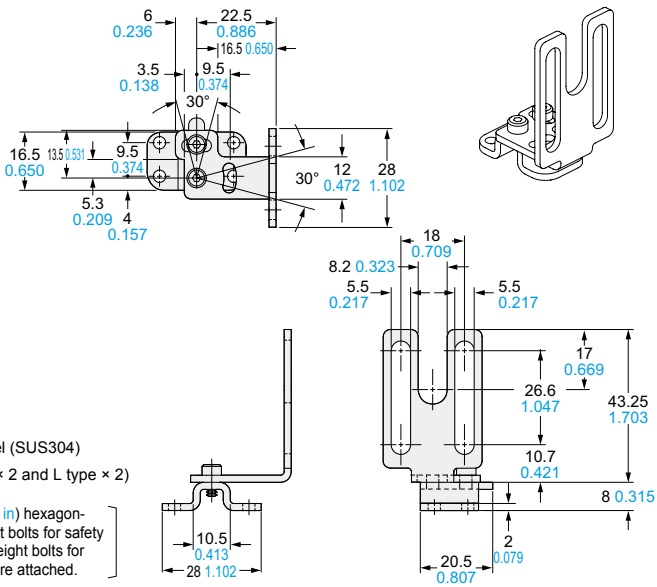


<MS-SF2B-5(L)>

Rear mounting



Side mounting



Material: Stainless steel (SUS304)

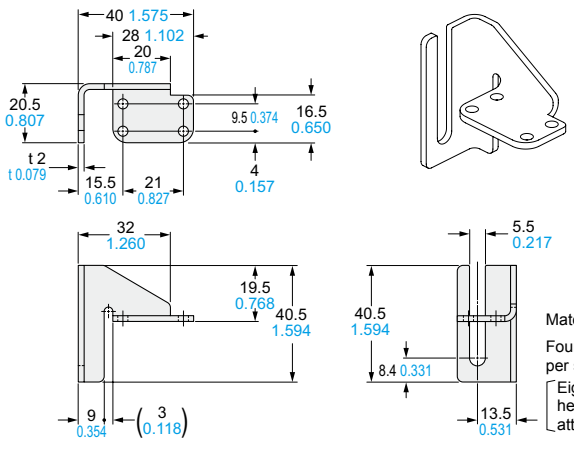
Four brackets (R type × 2 and L type × 2) per set

[M3 (length 5 mm 0.197 in) hexagon-socket-head bolts (eight bolts for safety light curtain mounting, eight bolts for beam axis alignment) are attached.]

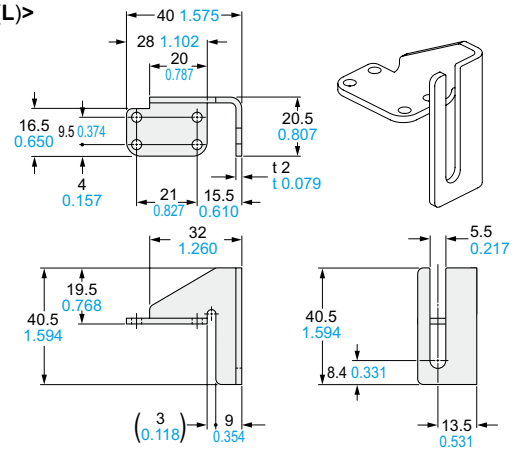
MS-SF2B-6

Adapter mounting bracket for **NA40** (Optional)

<MS-SF2B-6(R)>



<MS-SF2B-6(L)>



Material: Stainless steel (SUS304)

Four brackets (R type × 2 and L type × 2) per set

[Eight M3 (length 5 mm 0.197 in) hexagon-socket-head bolts are attached.]

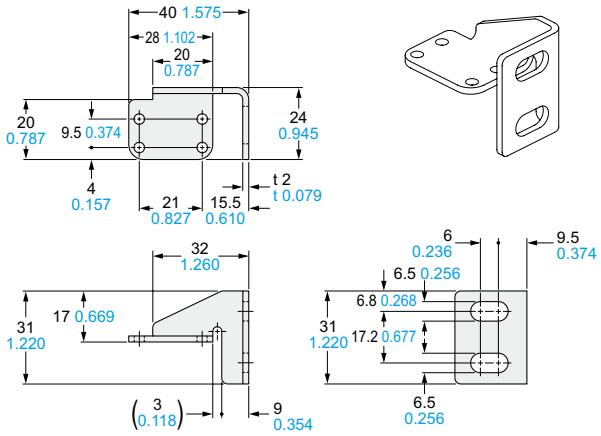
DIMENSIONS (Unit: mm in)

The CAD data can be downloaded from our website.

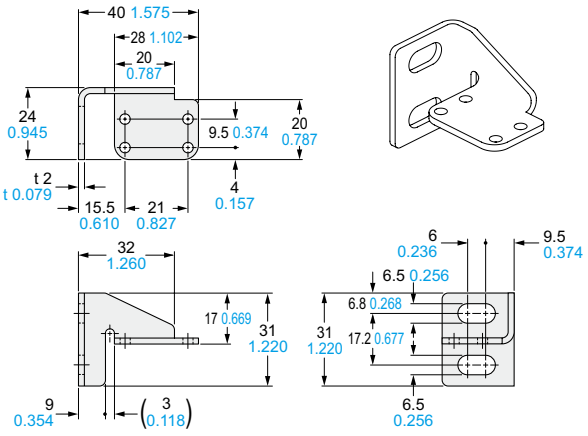
MS-SF2B-7

Adapter bracket for **SF1-N** (Optional)

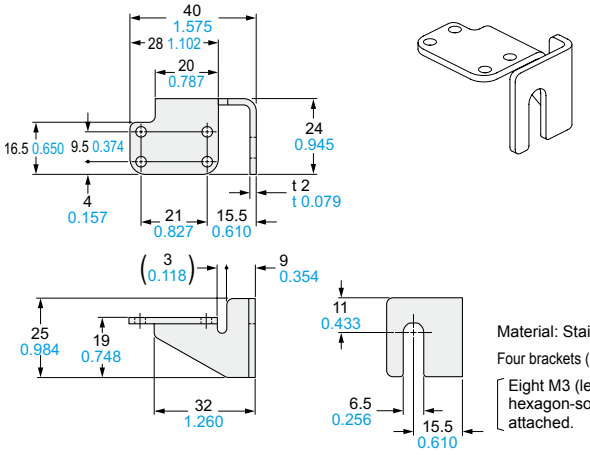
<For upper-right surface mounting>



<For upper-left surface mounting>

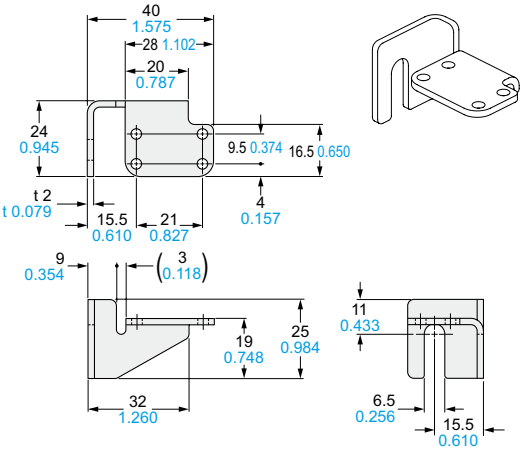


<For lower-right surface mounting>



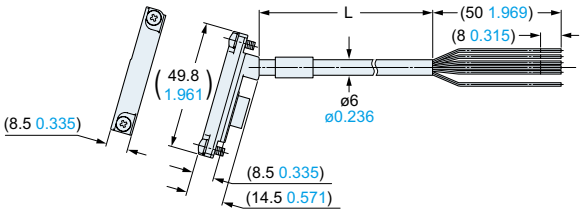
Material: Stainless steel (SUS304)
Four brackets (one of each type) per set
Eight M3 (length 5 mm 0.197 in) hexagon-socket-head bolts are attached.

<For lower-left surface mounting>



SF2B-CCB□

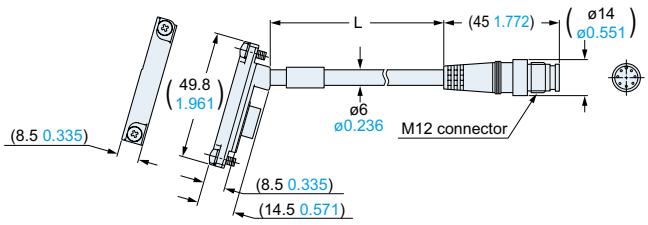
Bottom cap cable (Optional)



Model No.	L
SF2B-CCB3	3,000 118.110
SF2B-CCB7	7,000 275.590
SF2B-CCB10	10,000 393.700
SF2B-CCB15	15,000 590.551

SF2B-CB□

Bottom cap cable (Optional)

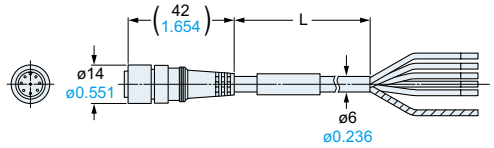


Model No.	L
SF2B-CB05 (-A/B)	500 19.685
SF2B-CB5	5,000 196.850
SF2B-CB10	10,000 393.700

DIMENSIONS (Unit: mm in)

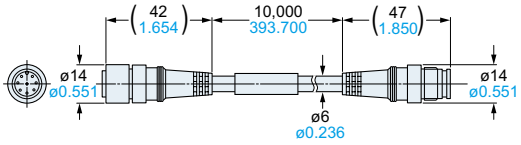
The CAD data can be downloaded from our website.

SFB-CC3 SFB-CC10 Extension cable (Optional)

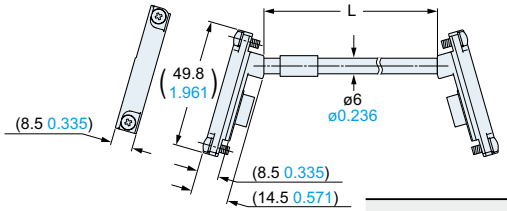


Model No.	L
SFB-CC3	3,000 118.110
SFB-CC10	10,000 393.700

SFB-CCJ10E SFB-CCJ10D Extension cable (Optional)

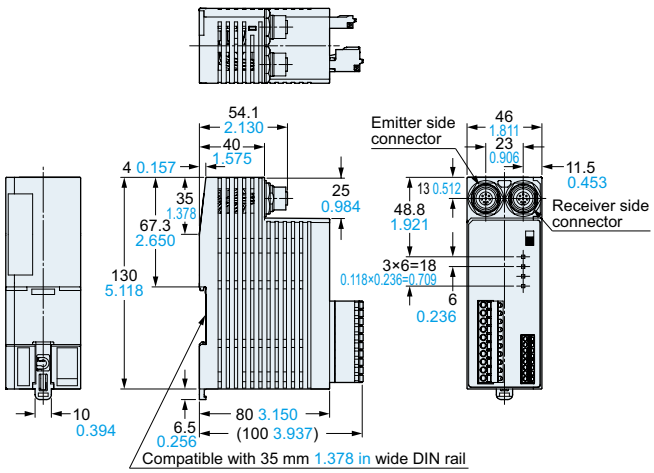


SF2B-CSL01 SF2B-CSL05 Cable for series connection (Optional)

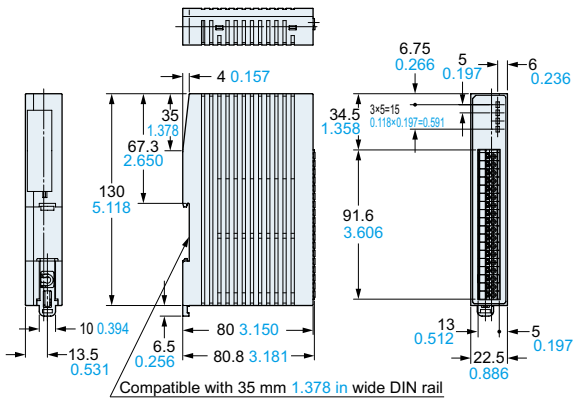


Model No.	L
SF2B-CSL01	100 3.937
SF2B-CSL05	500 19.685

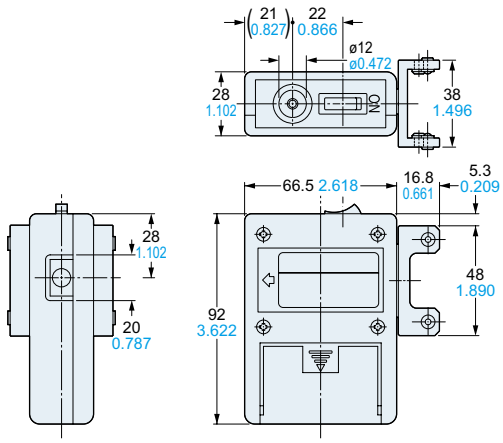
SF-C11 Control unit (Optional)



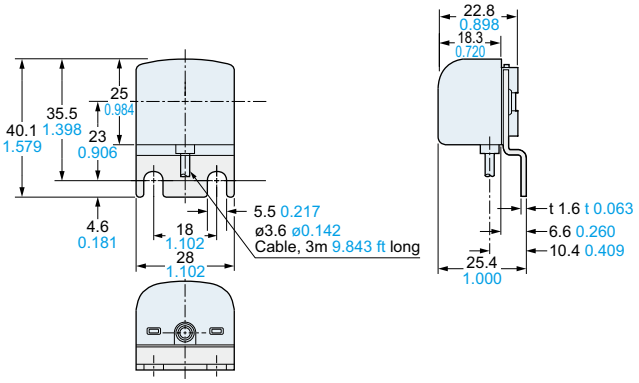
SF-C13 Control unit (Optional)



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



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



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