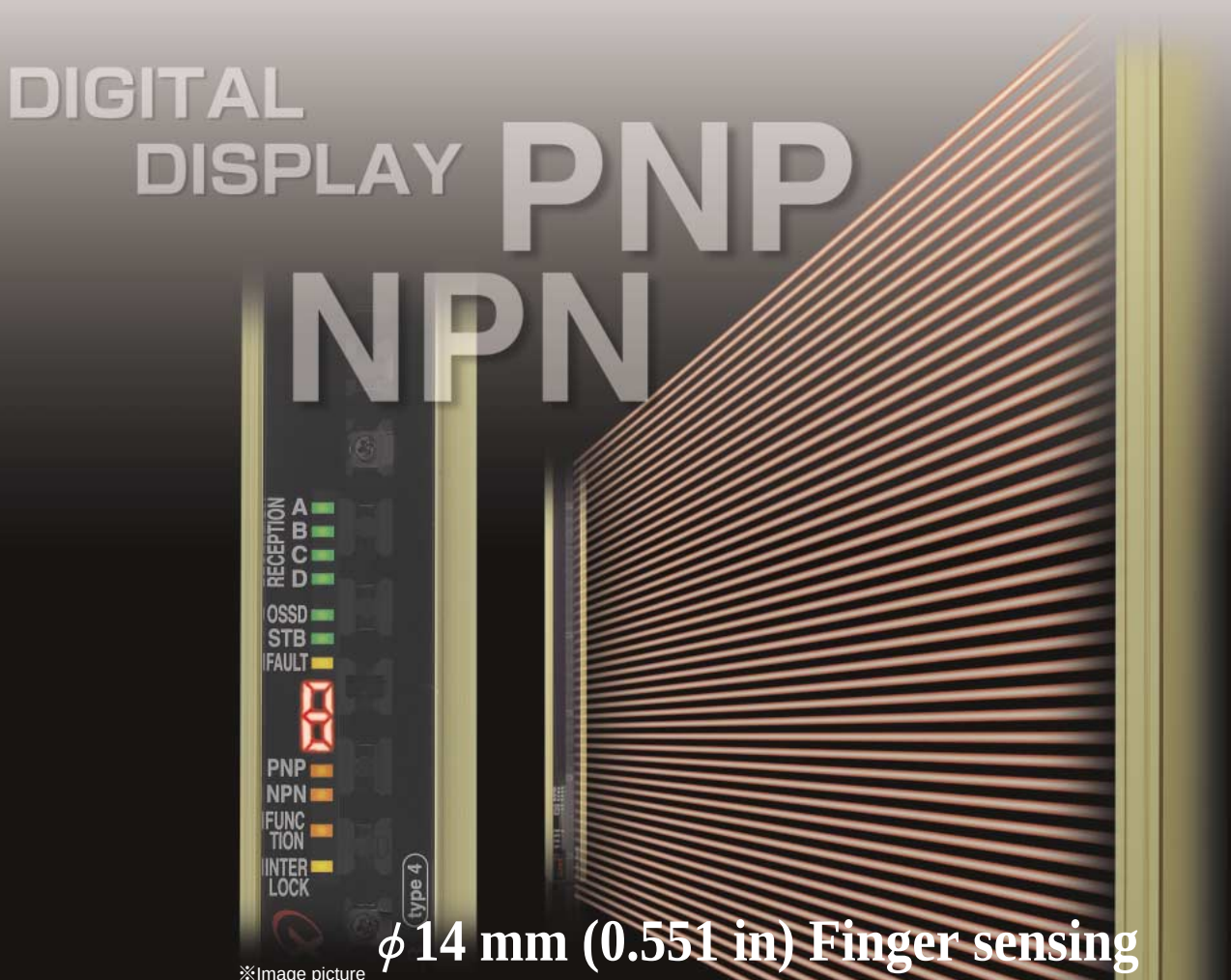
LIGHT CURTAIN **Type4**

New

SF4B SERIES

Conforming to Machine Directive & EMC Directive | Approved Listing | Conforming to OSHA / ANSI | JIS

The SUNX' light curtain uses new concepts and combines even greater safety with higher productivity



※Image picture

ϕ14 mm (0.551 in) Finger sensing

ϕ25 mm (0.984 in) Hand sensing

ϕ45 mm (1.772 in) Arm / Foot sensing

New concepts in design driving toward greater safety and higher productivity

The high level of resistance to disturbance from extraneous light that was a basic feature of the SF4-A series has been maintained in this new series, but a variety of new concepts have been incorporated into the new series, including more compact machine tool size due to a reduction in the safety distance, muting control circuits which have been built into the light curtain, and an override function that allows the manufacturing line to restart operation after the line has stopped even while muting control was active. These functions all contribute to a light curtain that provides greatly improved safety with no losses in productivity.

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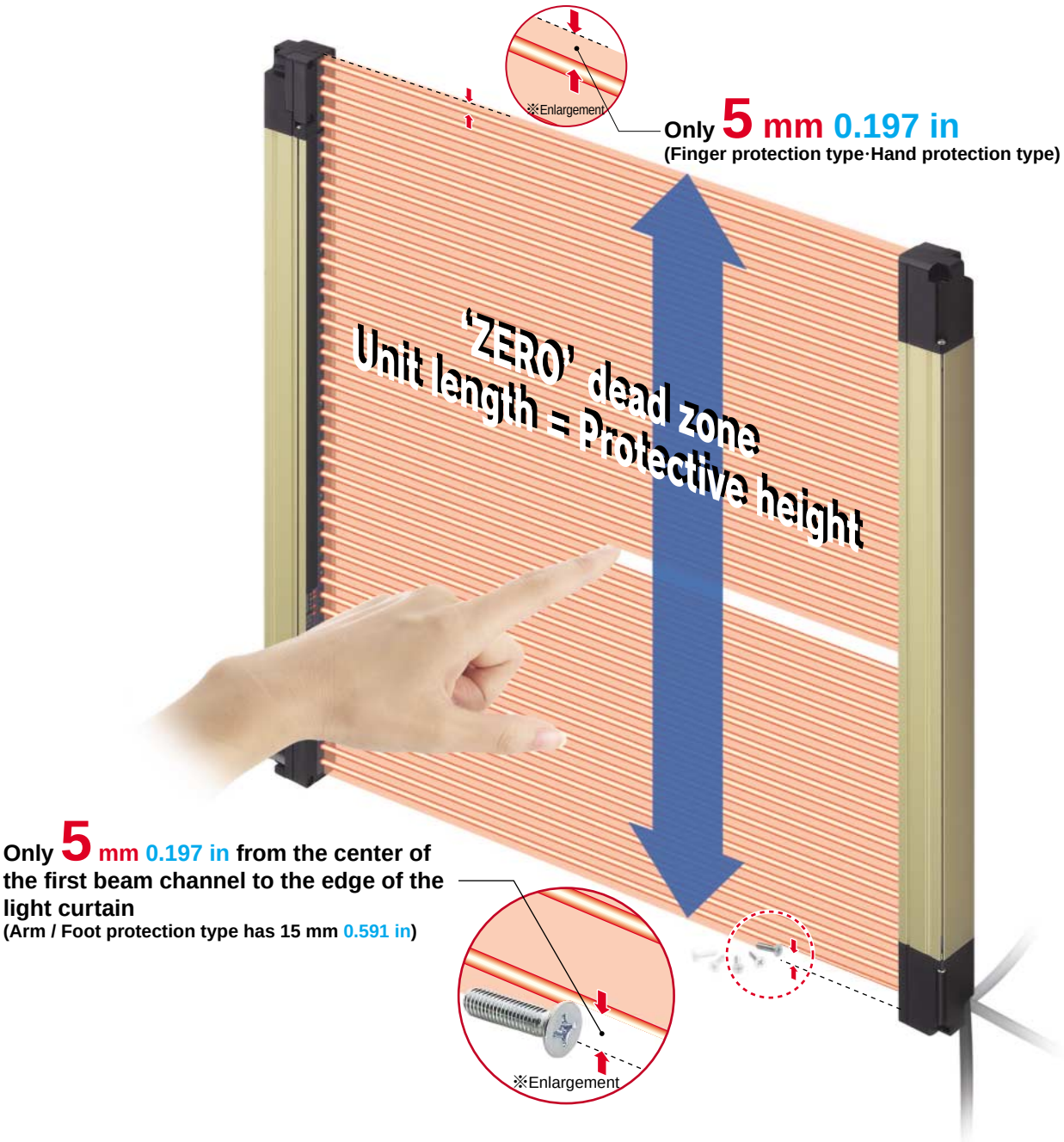


Finger protection type

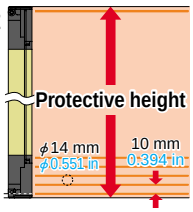
Minimum sensing object

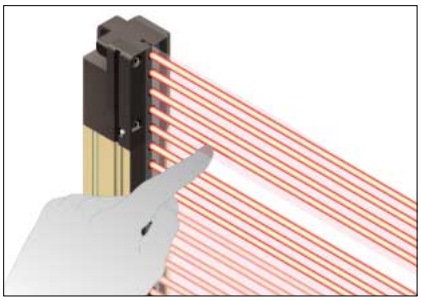
ϕ14 mm

ϕ0.551 in

(10 mm 0.394 in beam pitch)

5 mm 0.197 in





Hand protection type

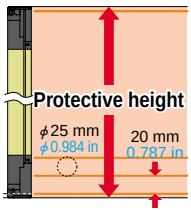
Minimum sensing object

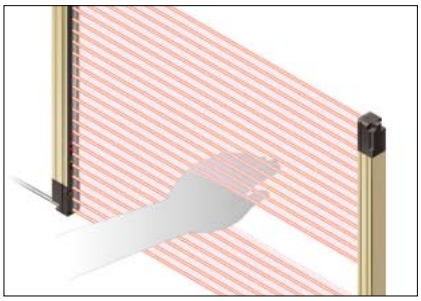
ϕ25 mm

ϕ0.984 in

(20 mm 0.787 in beam pitch)

5 mm 0.197 in





Arm / Foot protection type

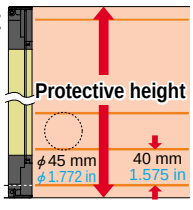
Minimum sensing object

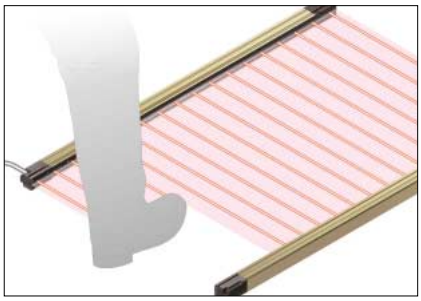
ϕ45 mm

ϕ1.772 in

(40 mm 1.575 in beam pitch)

15 mm 0.591 in



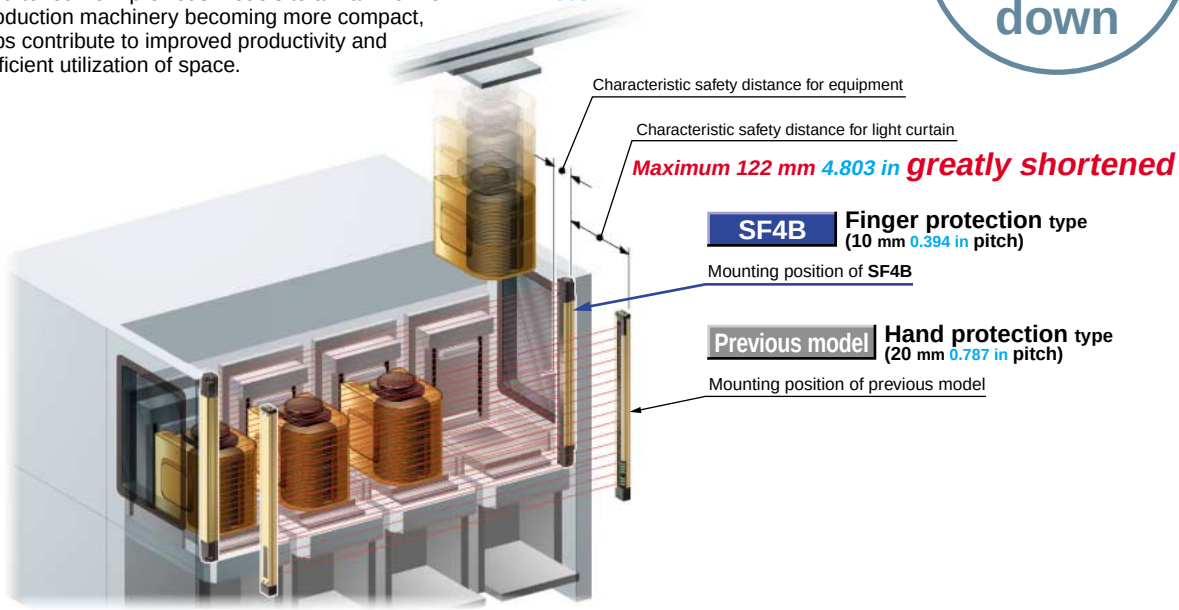


Safety distance greatly shortened to improve productivity!

Safety distance
Maximum 81%※ down

A finger protection type model improves productivity and reduced on-floor costs in line with more compact machinery.

The finger protection type can detect very small objects with diameters of as small as 14 mm 0.551 in, so that the safety distance based on the ISO 13855 international standard has been shortened from previous models to a maximum of 122 mm 4.803 in.
With production machinery becoming more compact, this helps contribute to improved productivity and more efficient utilization of space.



Same response time of 14 ms and constant safety distance!

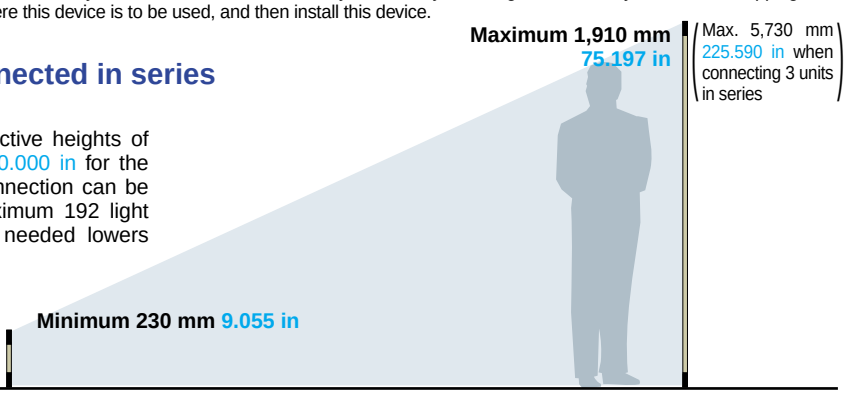
A fast response time of 14 ms has been achieved regardless of the number of beam channels, the beam axis pitches and the number of units connected in series. This reduces calculation work required for the safety distances.

Safety distance = (● Finger protection type: 28 mm※ 1.102 in ● Hand protection type: 116 mm※ 4.567 in) + **Characteristic distance for the machinery's maximum stopping time**

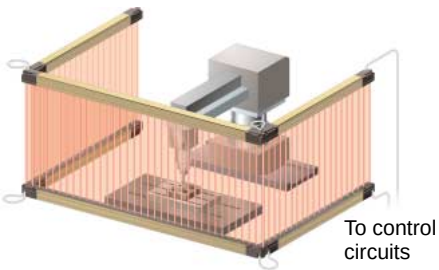
※This is the characteristic safety distance for the light curtain as defined by ISO 13855. Calculate the safety distance by including the machinery's maximum stopping time. Furthermore refer to the relevant standards of the region where this device is to be used, and then install this device.

Up to a maximum 3 sets can be connected in series with same 14 ms response time

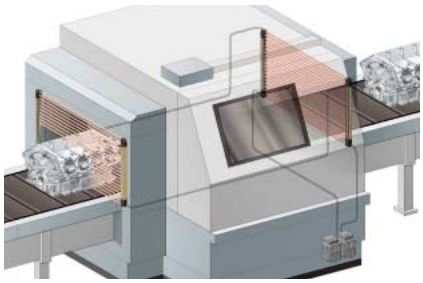
A wide range of variations are available with protective heights of 230 to 1,910 mm 9.055 to 75.197 in (1,270 mm 50.000 in for the finger protection type). Optional cable for series connection can be used to connect up to a maximum of 3 sets (maximum 192 light beams) in series. The reduced amount of wiring needed lowers costs and also helps to prevent interference.



● **Up to 3 sets can be connected in series!**

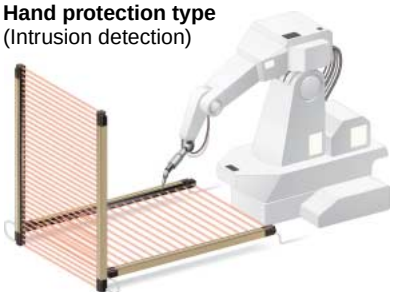


● **Cables for series connection are available in lengths of up to 5 m 16.404 ft!**



● **Series connection of different types is possible.**

Hand protection type
(Intrusion detection)



Arm / Foot protection type
(Presence sensing)

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

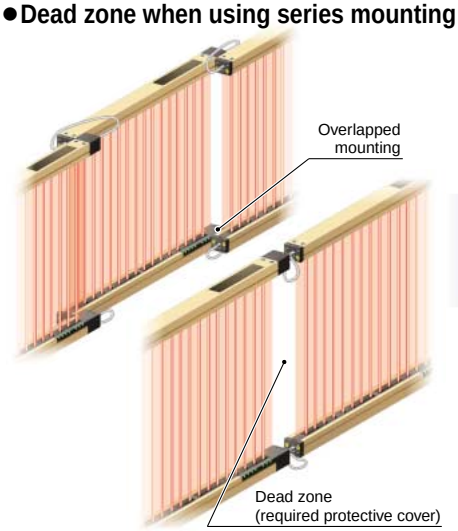
‘ZERO’ dead zone New concept

Unit length = protective height, so that no dead zone can occur in the interfaces between light curtains when units are connected in series.
The equipment can be used with confidence because there are no dangerous openings resulting from dead zone.

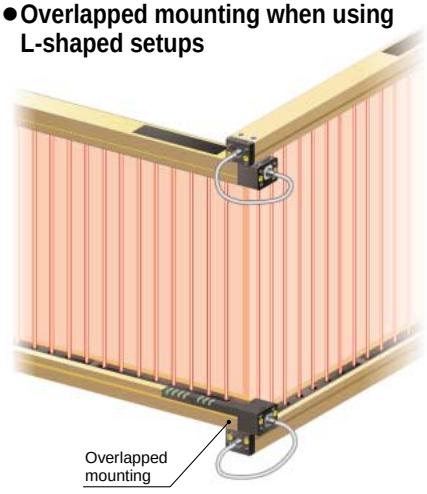
Previous model

Gaps occurred at connecting point
This required mounting of protection covers or overlapped mounting of light curtains.

● **Dead zone when using series mounting**

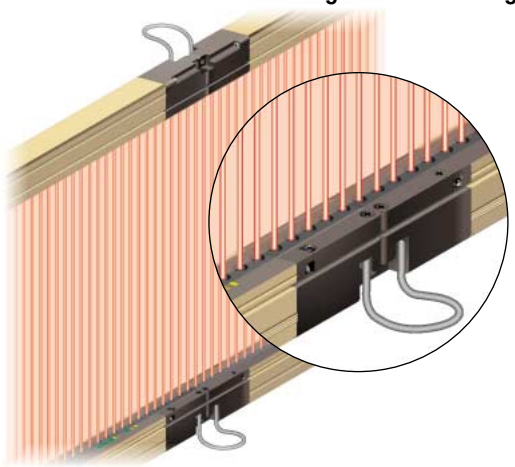


● **Overlapped mounting when using L-shaped setups**

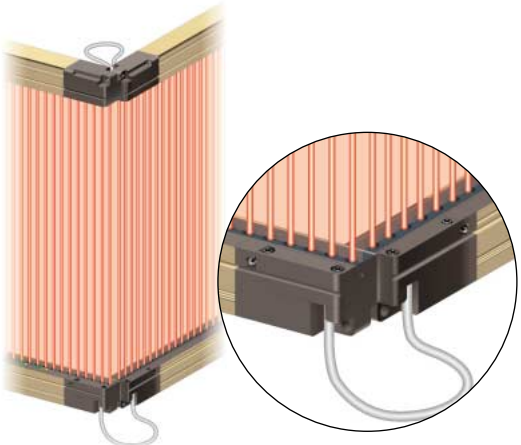


SF4B

● **‘ZERO’ dead zone when using series mounting**

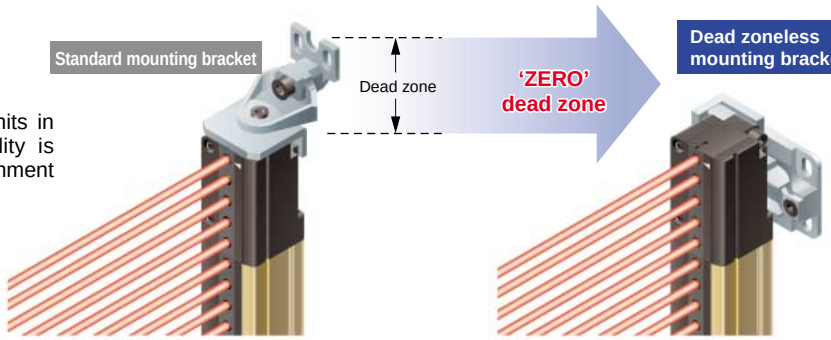


● **‘ZERO’ dead zone when using L-shaped setups**
(Except for finger protection type)



Mounting brackets that support ‘ZERO’ dead zone

Special brackets are available to mount the units in order to create ‘ZERO’ dead zone. Workability is excellent because mounting and beam axis alignment are possible from the front of the light curtain.



Contributes to miniaturization of machinery *
Avoids line stoppages when a workpiece passes through P.5
Reduces losses in line utilization rate P.7
Greater maintenance efficiency! P.9
Less setup time for safety circuits P.12

Avoids line stoppages when a workpiece passes through

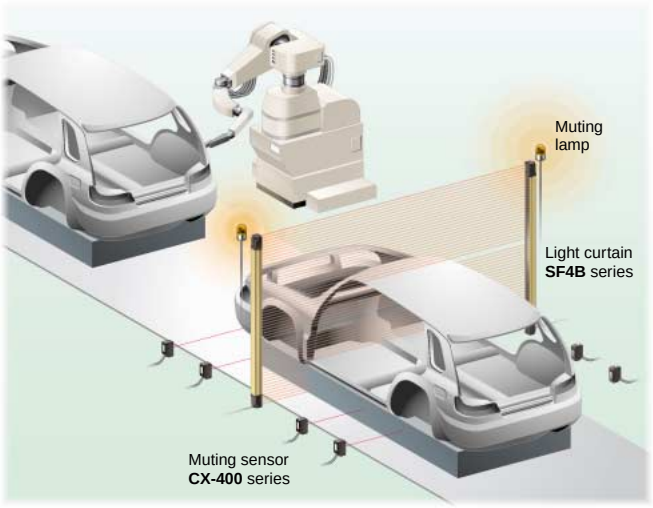
Muting unit function is built into light curtain

Productivity maintained by muting control function

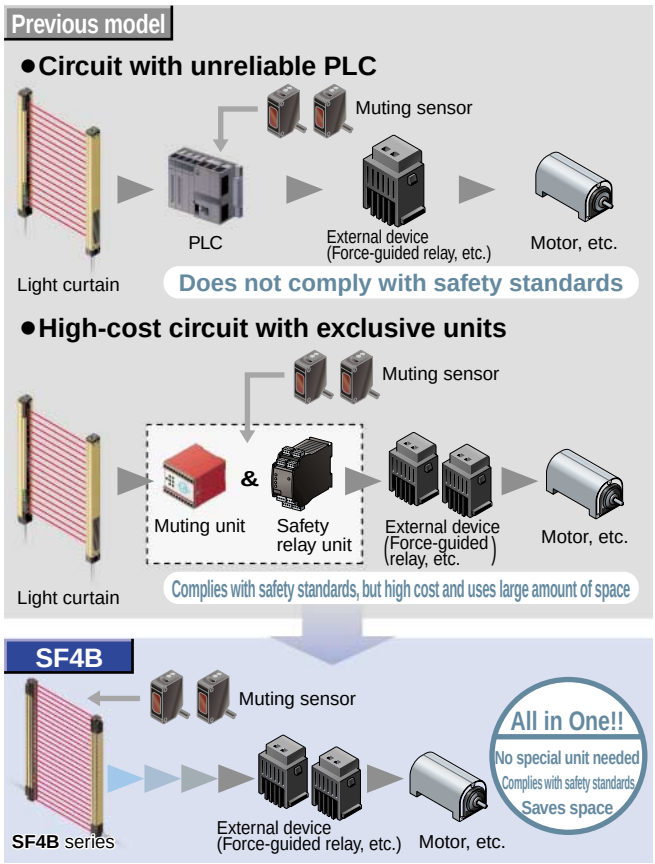
Is the circuit designed to suspend the light curtain from responding when a workpiece passes through it?

A muting control function is provided to increase both safety and productivity.

The light curtain is equipped with a muting control function that causes the line to stop only when a human body passes through the light curtain, and does not stop the line when a workpiece passes through. The muting sensors and muting indicators can be connected directly to the light curtain, so that a special controller is not required for muting. This both reduces costs and increases safety and productivity.



- **Avoiding line stoppages when a workpiece passes through**
  The light curtain has a built-in muting function that causes the light curtain to ignore workpiece when two or more of the four muting sensors are interrupted simultaneously as a result of a workpiece passing by. This prevents the line from stopping when a workpiece passes through the light curtain, thereby maintaining productivity. When a person passes through the light curtain, two or more of the muting sensors are not interrupted, and so the muting function is not activated.

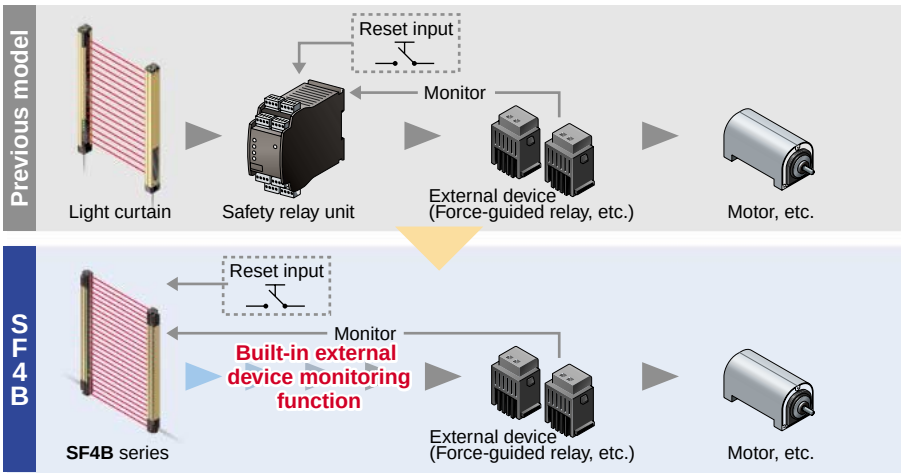


Equipped with a safety circuit that does not require a exclusive safety relay unit

New concept

The safety relay unit capability is built into the light curtain, so component costs can be reduced.

The light curtain has a built-in external device monitoring function (such as for fused relay monitoring) and an interlock function. The safety circuit is constructed so that a separate safety relay unit is not needed, and the control board is also more compact, which both help contribute to lower costs.



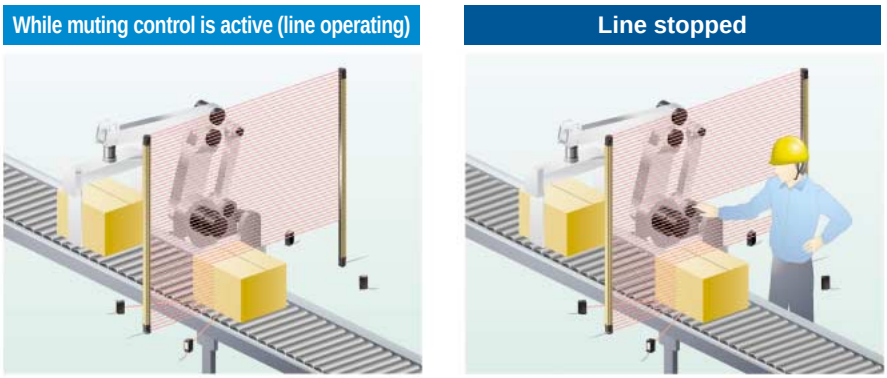
No safety relay unit needed

Smaller control board

Separate muting control function for each beam channel improves safety

The **SFB-HC*** Handy-Controller (optional, refer to p. 11) can be used to carry out muting control for specified beam channels only. Because individual beam channels can be specified to suit the workpiece, separate guards to prevent entry do not need to be set up.

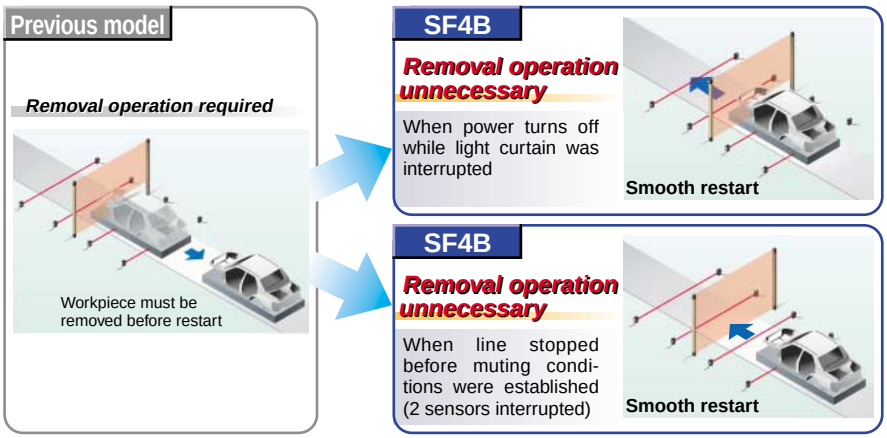
* A Handy-controller cannot be used with the **SF4B-□-01**.



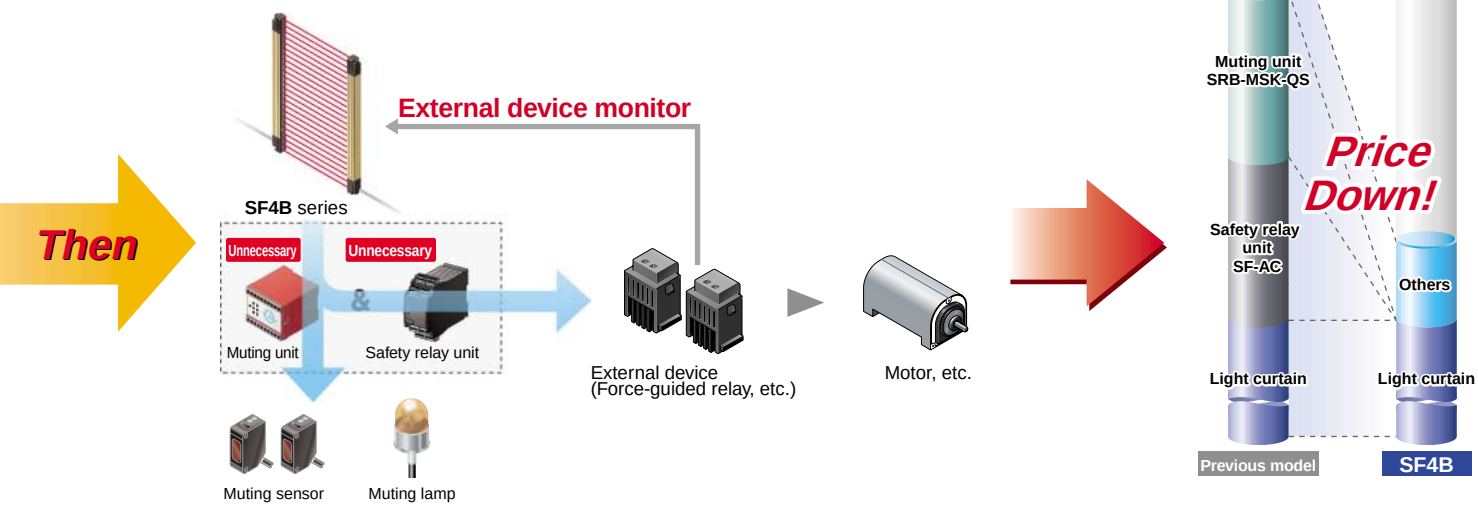
For example, depending on the height of the workpiece, the muting function can be activated for 10 beam channels starting from the bottom, so that if the 11th or subsequent beam channels are interrupted, it is judged that a person has entered the area and the line stops.

Override function allows the line to be restarted smoothly after it has stopped while muting control was active

In case the power turns off while the light curtain has been interrupted by a workpiece or in case the line stops before the muting conditions have been established (if only one muting sensor has been interrupted), the machinery can be restarted. With the special units used previously, muting control was not allowed after a workpiece had interrupted the light curtain. So, the workpiece needed to be removed before the line could be restarted. However, the override function allows the line to be restarted smoothly without having to remove the workpiece that is interrupting the light curtain.



In case of using muting control function…



Incorporates advanced ELCA function

Reduces malfunction due to mutual interference and extraneous light

The advanced ELCA function used in the SF4A that has been widely acclaimed by the marketplace has also been adopted into the SF4B in order to suppress mutual interference and the effects of extraneous light.

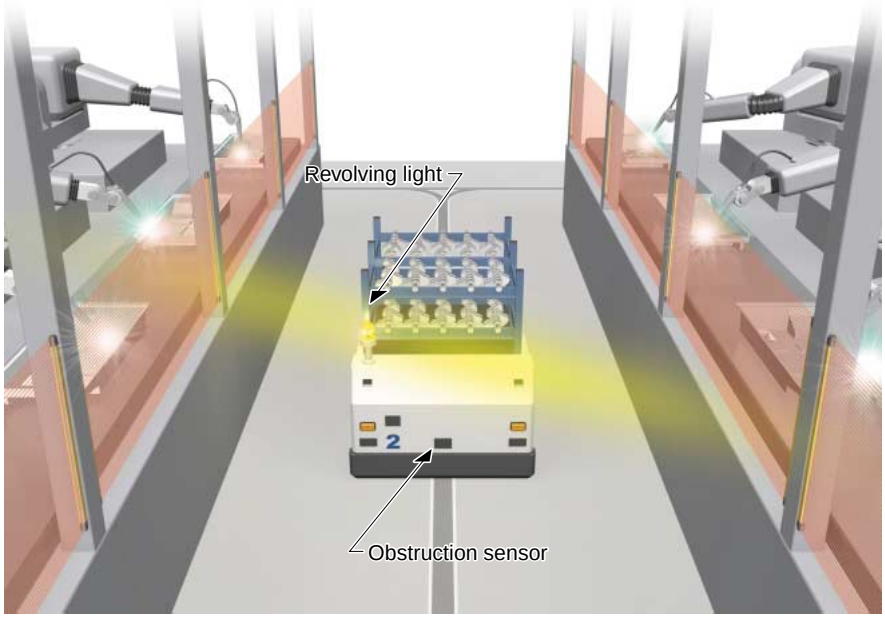
Stops line operating losses before they happen

● Mutual interference is reduced without need for interference prevention lines

The light curtain is equipped with the ELCA (Extraneous Light Check & Avoid) function which has already gained strong approval in the marketplace for its powerful suppression of mutual interference between sensors. Because it automatically shifts the scan timing of the light curtain in order to avoid interference, it is not necessary to wire interference prevention lines between machineries, so that the sensors can be positioned with much greater flexibility.

● Reducing the number of malfunctions caused by extraneous light

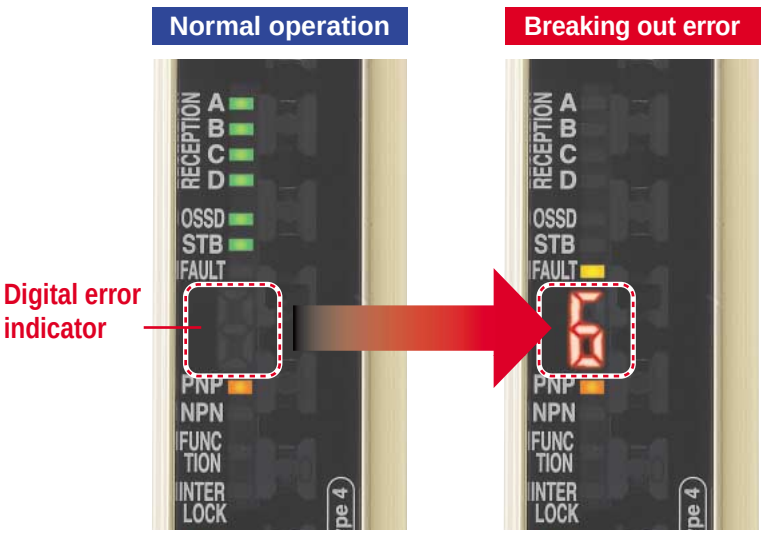
A double scanning method and retry processing are two new functions exclusive to SUNX that have been established in the workplace as being effective in eliminating the effects of momentary extraneous light from peripheral equipment. The reduction in operating errors caused by extraneous light reduces frequent stopping of machinery and helps to prevent losses in line operating efficiency.

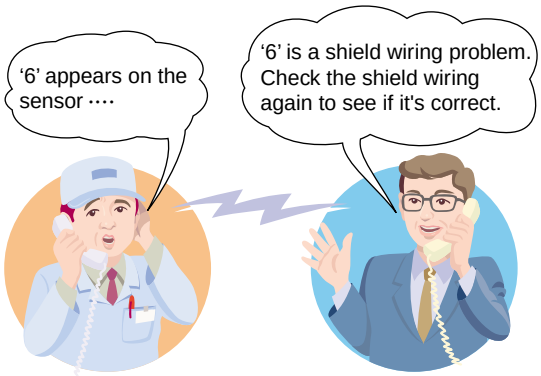


Supports resolution of electrical problems when starting up lines

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

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

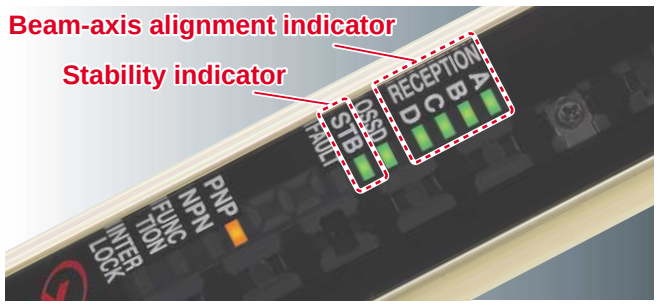


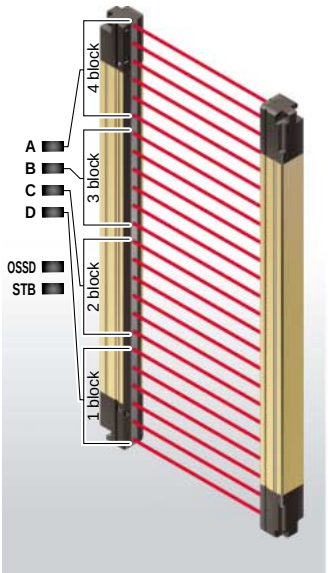
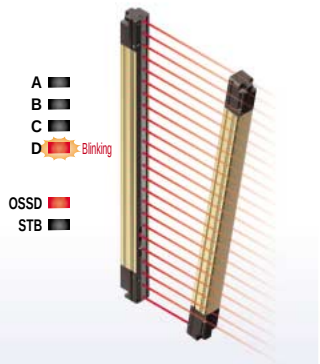
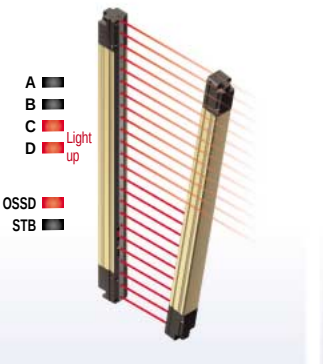
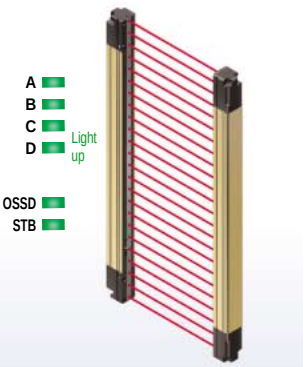


Convenient tool facilitates easy beam alignment
Reduces installation time significantly

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

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



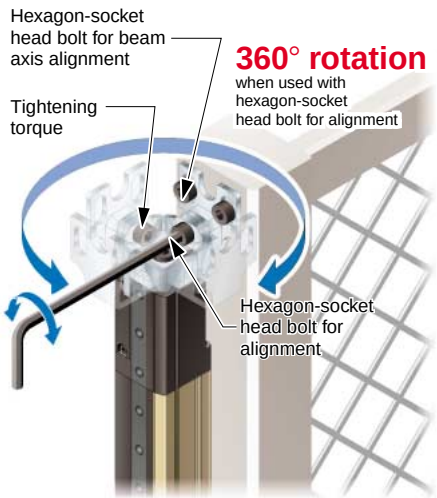
Beam channels are displayed in 4 blocks	The bottommost channel beam axis is aligned	Only the beam axes of the two lower blocks are aligned	All beam axes are aligned
			
	The bottommost LED 'D' is blinking red	The bottom two LEDs 'C, D' light up in red	All LED 'A to D' light up in green

Furthermore, STB display allows the most stable incident light status※ to be confirmed.

※140 % or more incident light intensity of control output operation level

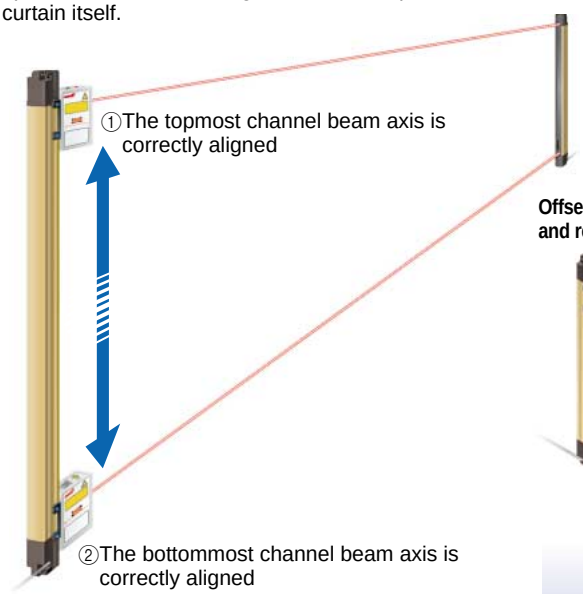
Greatly improving ease of installation working

The hexagon-socket head bolts on the mounting brackets for aligning the beam axis can be tightened from in front of the light curtain, so that work can be carried out easily while checking the hexagon-socket head bolt positions. This makes it much easier to adjust the sensor angles when carrying out beam-axis alignment and greatly improves ease of installation work.

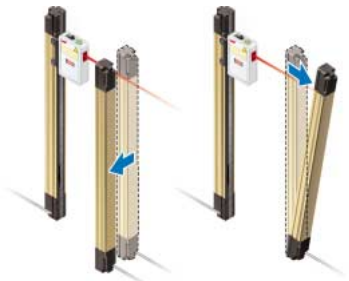


Alignment of beam axes can be accurately performed prior to power-up SF-LAT-2N

With **SF-LAT-2N** Laser Alignment Tool, the beam axes alignment can be quickly and easily performed using the easy-to-see laser beam spot, even when light curtain units are installed long distances apart. In addition, as the **SF-LAT-2N** Laser Alignment Tool is battery-operated; beam axes alignment can be performed before actual powering on of the light curtain itself.



Offset and swing of light curtain emitters and receivers can be seen easily.



Offset | Swing

Contributes to miniaturization of machinery P.3
Avoids line stoppages when a workpiece passes through P.5
Reduces losses in line utilization rate ※
Greater maintenance efficiency! P.9
Less setup time for safety circuits P.12

Greater maintenance efficiency!

Supports both PNP and NPN polarities

The single model is universally compatible to improve maintenance efficiency.

CE Conforming to Machine Directive & EMC Directive

c UL us Approved Listing

Conforming to OSHA / ANSI

JIS

Universal design that can be used anywhere in the world

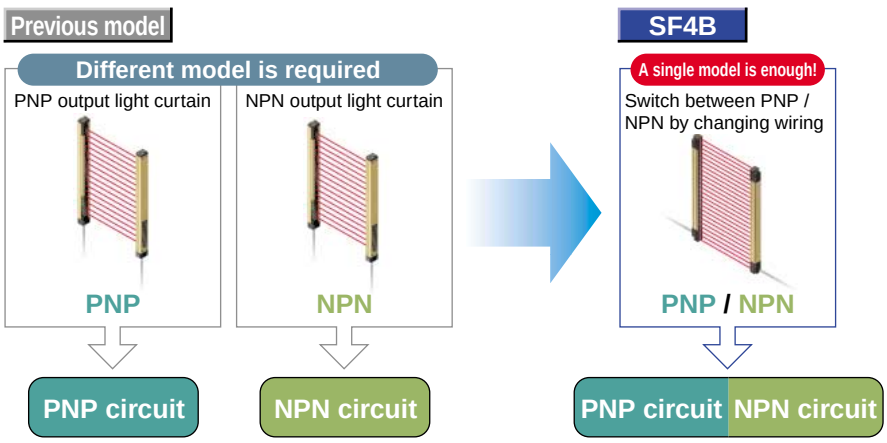
Supports both PNP and NPN polarities in a single model

Industry first※

※ As of October 2004 and based on research conducted by SUNX.

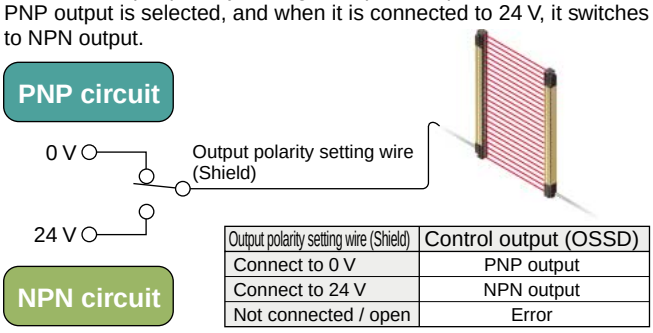
● A single model has universal applicability

The **SF4B** series combines PNP transistor output and NPN transistor output in a single model. Overseas equipment that uses PNP, replacement with NPN sensors, factories that are positively grounded, and transfer of equipment overseas are all situations where the control circuits for a single model are suitable for use worldwide.

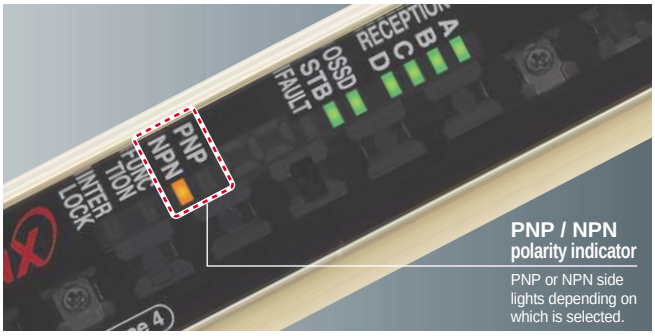


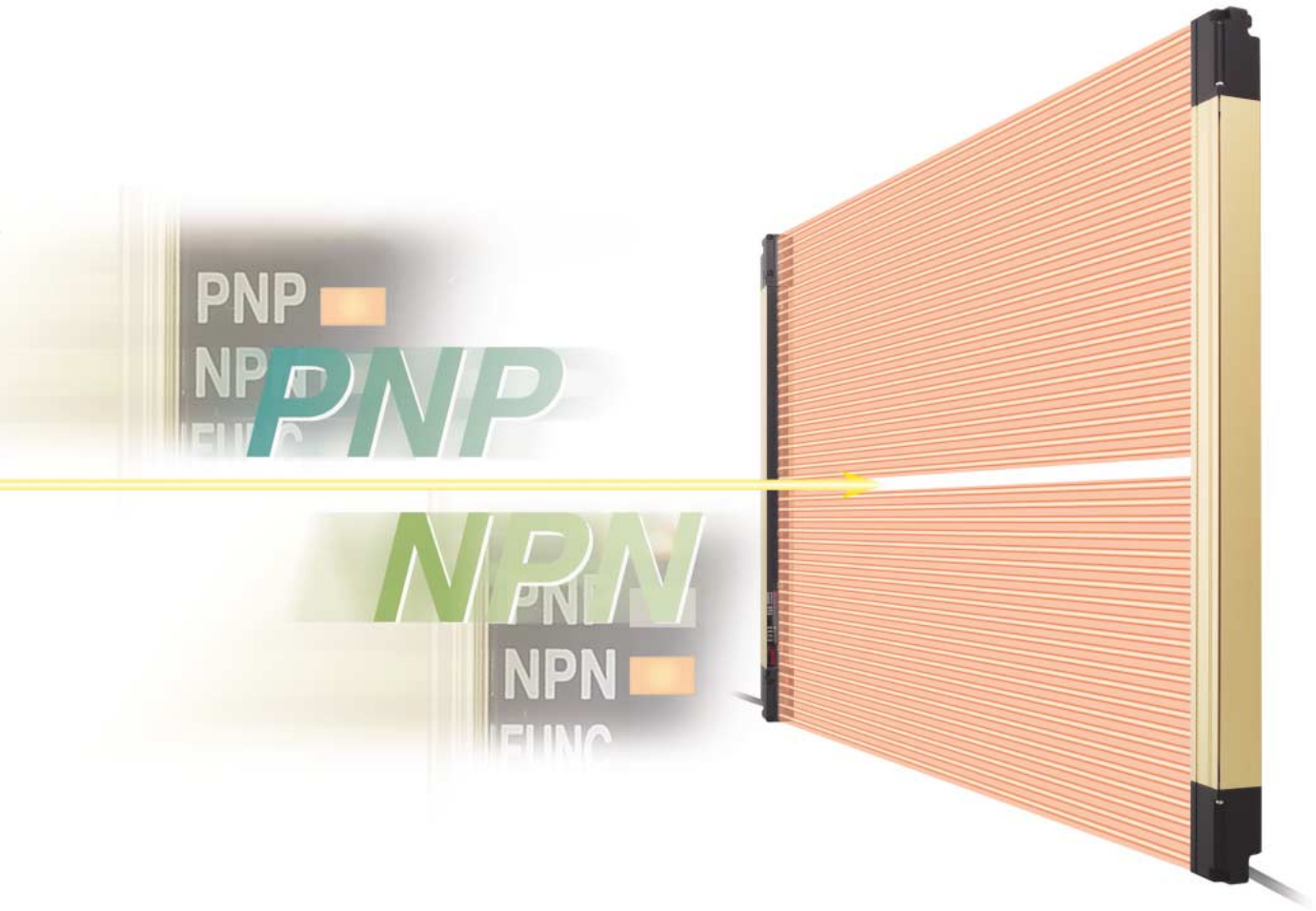
● Polarity can be changed easily by changing wiring

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



Output polarity setting wire (Shield)	Control output (OSSD)
Connect to 0 V	PNP output
Connect to 24 V	NPN output
Not connected / open	Error



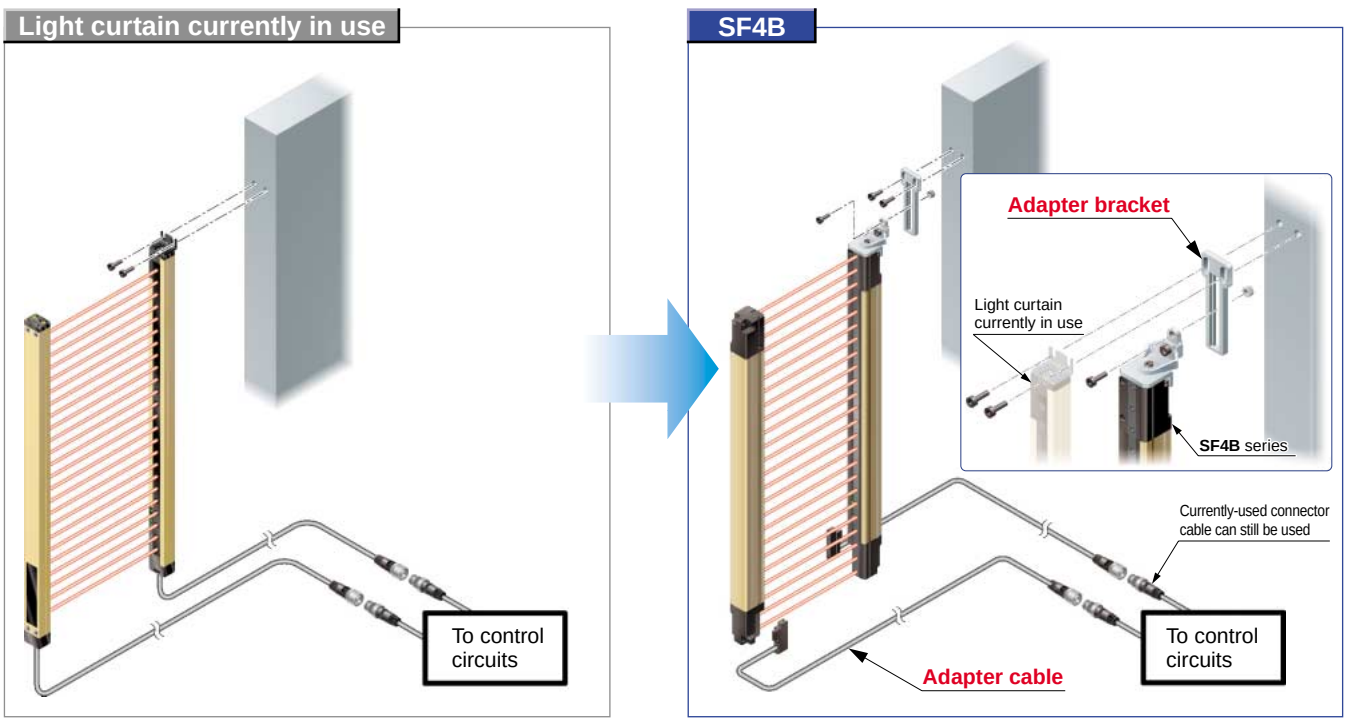


Supply of replacement parts, regardless of whether line is old or new

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

New concept

Adapter cables and adapter brackets are available to make it much easier to replace the wiring when changing over from **SF4-A** series and **SF2-EH** series to a new series. Mounting holes and control circuit connector cables do not need to be changed, and replacement with **SF4B** series components can be carried out smoothly and there is no need to use replacement parts for previous models, so registration can be only **SF4B** series (components).



* For details, please contact our office.

Contributes to miniaturization of machinery P.3
Avoids line stoppages when a workpiece passes through P.5
Reduces losses in line utilization rate P.7
Greater maintenance efficiency! *
Less setup time for safety circuits P.12

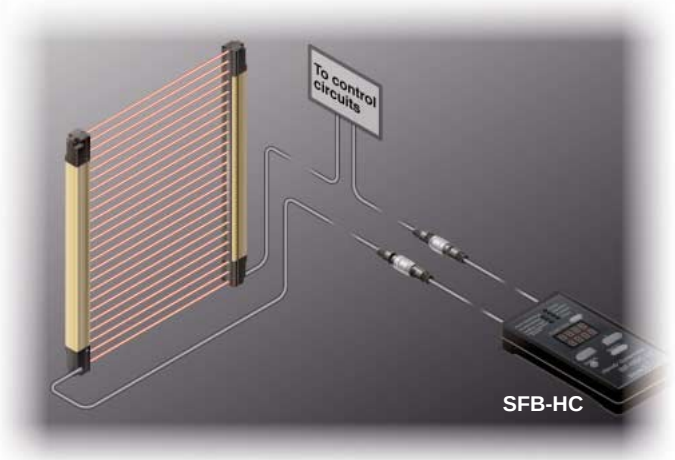
A variety of settings can be made to suit different applications

Safety circuits can be installed and configured easily

Handy-controller SFB-HC* that enables the user to select a variety of settings

Separate muting control function for each beam channel

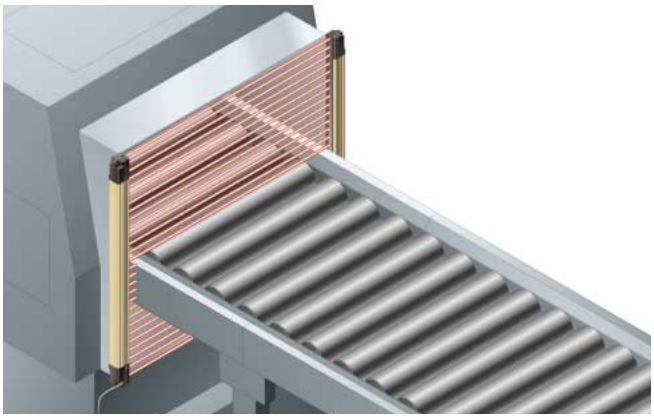
The **SFB-HC*** Handy-Controller can be used to carry out muting control for specified beam channels only. Because individual beam channels can be specified, additional guards to prevent entry do not need to be set up. (refer to p. 6.)



* A Handy-controller cannot be used with the **SF4B-□-01**.

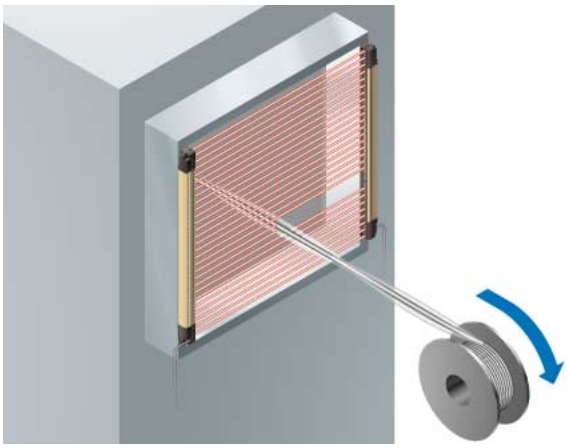
Any valid beam channels can be selected! The SF4B series incorporates a fixed blanking function.

The **SF4B** series is equipped with a fixed blanking function that allows specific beam channels to be selectively blocked, without causing the control output (OSSD) to output the OFF signal. This function is convenient for use with applications in which certain fixed obstacles always block specific beam channels.
Furthermore, this function provides greater safety, as the control output (OSSD) will automatically output the OFF signal if the fixed obstacles are subsequently removed from the sensing area.



Non-specified beam channels can be deactivated ! The SF4B series incorporates a floating blanking function.

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



Note: When the floating blanking function is used, the size of the min. sensing object is changed.
Refer to '**PRECAUTIONS FOR PROPER USE**' (P.23) for details.

Auxiliary output has selectable output configuration

The output configuration of the auxiliary output can be changed.

Mode No.	Description
0	Negative logic of the control output (OSSD 1, OSSD 2) (factory setting)
1	Positive logic of the control output (OSSD 1, OSSD 2)
2	For emission: output ON, For non-emission: output OFF
3	For emission: output OFF, For non-emission: output ON
4	For unstable incident beam: OFF (Note 1)
5	For unstable incident beam: ON (Note 1)
6	For muting: ON
7	For muting: OFF
8	For beam received: ON, For beam interrupted: OFF (Note 2)
9	For beam received: OFF, For beam interrupted: ON (Note 2)

Notes: 1) The output cannot be used while the fix blanking function, floating blanking function or the muting function is activated.
2) This device outputs the beam received / interrupted state under activating the auxiliary output switching function using the handy controller irrespective of activating other functions, fixed blanking function, floating blanking function, and muting function.

A variety of other functions can be selected

- **Emission intensity control function** — This function reduces the amount of emitting light. The two modes, normal mode and short mode, can be selected. The factory setting is set to the normal mode for the emission intensity control function.
- **Setting monitoring function** — This function allows the user to confirm the details of each sensor setting.
- **Protection function** — Unless the password is not input, any setting change of the sensor cannot be allowed. The factory setting is set to invalid for the protect function.
- **Copy function** — Allows settings details to be copied into other light curtains. In the event that the same setting must be input into several different light curtains, this function will reduce the time required for the input of settings.

Adoption of a special control unit

Safety circuits can be installed and configured easily.

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

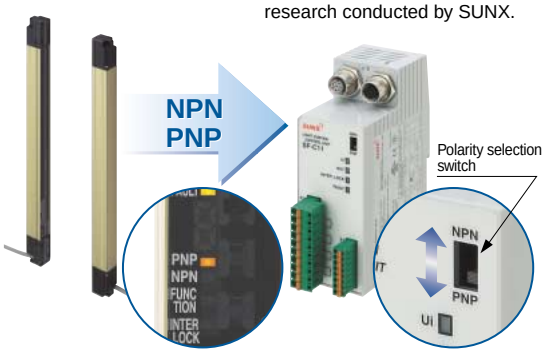
All models

Supports both PNP and NPN polarities

Industry first ※

A single unit can be used for PNP / NPN input switching, reducing the number of parts that need to be registered.

※ As of October 2004 and based on research conducted by SUNX.



SF-C10 SERIES

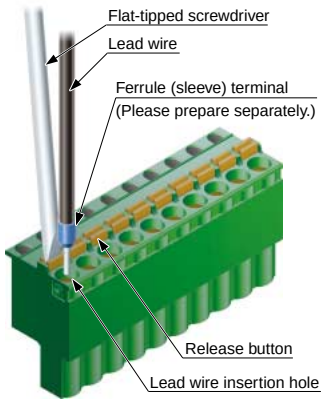
Plug-in type control unit SF-C11

Quick-connection

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

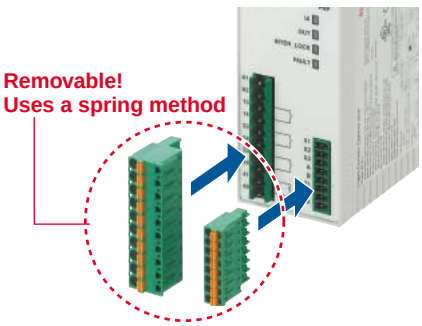
Easy setup requiring no torque control

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



Removable terminal blocks reduce maintenance time

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

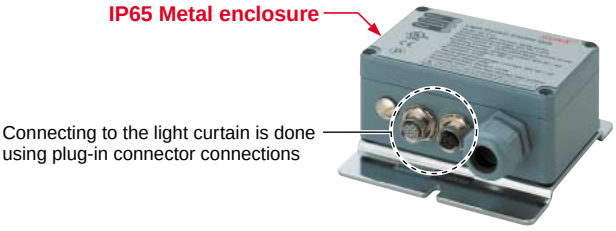


Robust type control unit SF-C12

Metal enclosure with a IP65 protective structure

Robust

The strong metal enclosure has a built-in safety relay. It has an IP65 protective structure, so that it can be set up individually without needing to be inserted into a control panel.

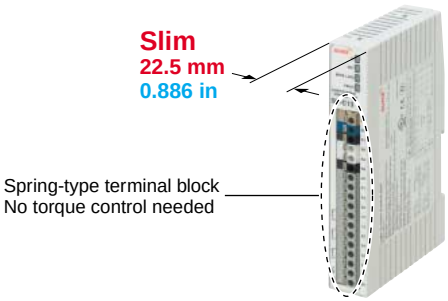


Slim type control unit SF-C13

Slim design

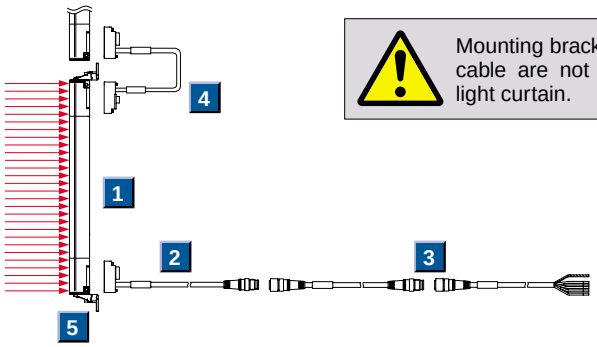
Slim

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



Contributes to miniaturization of machinery P.3
Avoids line stoppages when a workpiece passes through P.5
Reduces losses in line utilization rate P.7
Greater maintenance efficiency! P.9
Less setup time for safety circuits *

PRODUCT LINEUP



Mounting bracket and connecting cable are not supplied with the light curtain.

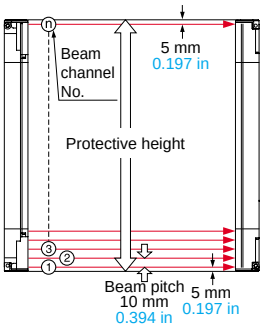
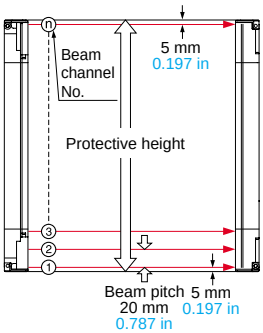
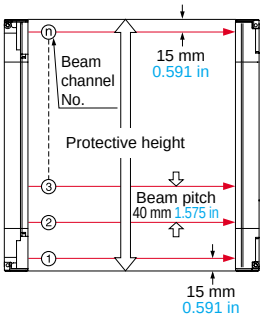
Component parts

1. Light curtain
2. Bottom cap cable (Optional)
3. Extension cable (Optional, use for cable extension)
4. Cable for series connection (Optional, use for connect in series)
5. Mounting bracket (Optional)

ORDER GUIDE

1 Light curtains

Mounting bracket and connecting cable are not supplied with the light curtain. Please order them separately.

Type	Appearance	Operating range (Note 1)	Model No. (Note 2)	Number of beam channels	Protective height (mm in)
Finger protection type Min. sensing object ϕ14 mm 0.551 in (10 mm 0.394 in pitch)		0.3 to 7 m 0.984 to 22.966 ft	**SF4B-F23**	23	230 9.055
			SF4B-F31	31	310 12.205
			SF4B-F39	39	390 15.354
			SF4B-F47	47	470 18.504
			SF4B-F55	55	550 21.654
			SF4B-F63	63	630 24.803
			SF4B-F71	71	710 27.953
			SF4B-F79	79	790 31.102
			SF4B-F95	95	950 37.402
			SF4B-F111	111	1,110 43.701
			SF4B-F127	127	1,270 50.000
Hand protection type Min. sensing object ϕ25 mm 0.984 in (20 mm 0.787 in pitch)		0.3 to 9 m 0.984 to 29.528 ft	**SF4B-H12**	12	230 9.055
			SF4B-H16	16	310 12.205
			SF4B-H20	20	390 15.354
			SF4B-H24	24	470 18.504
			SF4B-H28	28	550 21.654
			SF4B-H32	32	630 24.803
			SF4B-H36	36	710 27.953
			SF4B-H40	40	790 31.102
			SF4B-H48	48	950 37.402
			SF4B-H56	56	1,110 43.701
			SF4B-H64	64	1,270 50.000
		0.3 to 7 m 0.984 to 22.966 ft	**SF4B-H72**	72	1,430 56.299
			SF4B-H80	80	1,590 62.598
			SF4B-H88	88	1,750 68.898
			SF4B-H96	96	1,910 75.197
Arm / Foot protection type Min. sensing object ϕ45 mm 1.772 in (40 mm 1.575 in pitch)		0.3 to 9 m 0.984 to 29.528 ft	**SF4B-A6**	6	230 9.055
			SF4B-A8	8	310 12.205
			SF4B-A10	10	390 15.354
			SF4B-A12	12	470 18.504
			SF4B-A14	14	550 21.654
			SF4B-A16	16	630 24.803
			SF4B-A18	18	710 27.953
			SF4B-A20	20	790 31.102
			SF4B-A24	24	950 37.402
			SF4B-A28	28	1,110 43.701
			SF4B-A32	32	1,270 50.000
		0.3 to 7 m 0.984 to 22.966 ft	**SF4B-A36**	36	1,430 56.299
			SF4B-A40	40	1,590 62.598
			SF4B-A44	44	1,750 68.898
			SF4B-A48	48	1,910 75.197

Note: The 'operating range' is the possible setting distance between the emitter and the receiver. The sensor can detect less than 0.3 m 0.984 ft away.

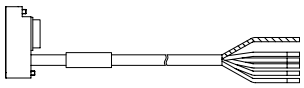
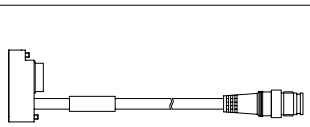
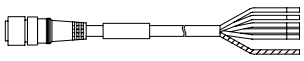
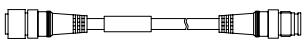
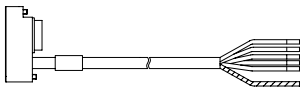
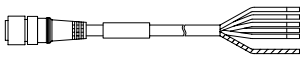
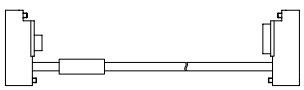
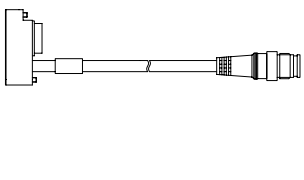
Handy-controller non-compatible types

Some models that cannot use the **SFB-HC** Handy-controller (optional) are also available. Order models with '**-01**' at the end of the model No.
(Ex.) **SF4B-F23** handy-controller non-compatible type: **SF4B-F23-01**

ORDER GUIDE

2 **3** **4** Connecting cable / Extension cable / Cables for series connection

Connecting cable is not supplied with the light curtain. Please order it separately.

Type			Appearance	Model No.	Description	
8-core (Standard)	Bottom cap cable	Discrete wire		**SFB-CCB3**	Length: 3 m 9.843 ft Net weight 370 g approx. (2 cables)	Used for connecting to the light curtain and to other cables or the **SF-C13** control unit. Two cables per set for emitter and receiver, Cable outer diameter: ϕ6 mm ϕ0.236 in Cable color: Gray (for emitter), Gray with black line (for receiver) The min. bending radius: R6 mm R0.236 in
				SFB-CCB7	Length: 7 m 22.966 ft Net weight 820 g approx. (2 cables)	
		Connector		**SFB-CB05**	Length: 0.5 m 1.640 ft Net weight 95 g approx. (2 cables)	Used for connecting to the light curtain and to an extension cable or the **SF-C11** control unit. Two cables per set for emitter and receiver, Cable outer diameter: ϕ6 mm ϕ0.236 in Connector outer diameter: ϕ14 mm ϕ0.551 in max. Cable color: Gray (for emitter), Gray with black line (for receiver) The min. bending radius: R6 mm R0.236 in
				SFB-CB5	Length: 5 m 16.404 ft Net weight 620 g approx. (2 cables)	
				SFB-CB10	Length: 10 m 32.808 ft Net weight 1,200 g approx. (2 cables)	
	Extension cable with connector on one end			**SFB-CC3**	Length: 3 m 9.843 ft Net weight 380 g approx. (2 cables)	Used for connecting to an extension cable or the **SF-C13** control unit. Two cables per set for emitter and receiver, Cable outer diameter: ϕ6 mm ϕ0.236 in Connector outer diameter: ϕ14 mm ϕ0.551 in max. Cable color: Gray (for emitter), Gray with black line (for receiver) The min. bending radius: R6 mm R0.236 in
				SFB-CC10	Length: 10 m 32.808 ft Net weight 1,200 g approx. (2 cables)	
	Extension cable with connectors on both ends	For emitter		**SFB-CCJ10E**	Length: 10 m 32.808 ft Net weight 580 g approx. (1 cable)	Used for connecting to an extension cable or the **SF-C11** control unit. One each for emitter and receiver, Cable outer diameter: ϕ6 mm ϕ0.236 in Connector outer diameter: ϕ14 mm ϕ0.551 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
		For receiver		**SFB-CCJ10D**	Length: 10 m 32.808 ft Net weight 600 g approx. (1 cable)	
12-core (In case of using the muting control or interference prevention wire)	Bottom cap cable	Discrete wire		**SFB-CCB3-MU**	Length: 3 m 9.843 ft Net weight 420 g approx. (2 cables)	Used for connecting to the light curtain and to other cables or the **SF-C13** control unit. Two cables per set for emitter and receiver, Cable outer diameter: ϕ6 mm ϕ0.236 in Cable color: Gray (for emitter), Gray with black line (for receiver) The min. bending radius: R6 mm R0.236 in
				SFB-CCB7-MU	Length: 7 m 22.966 ft Net weight 930 g approx. (2 cables)	
		Connector		**SFB-CB05-MU**	Length: 0.5 m 1.640 ft Net weight 110 g approx. (2 cables)	Used for connecting to the light curtain and to an extension cable or the **SF-C12** control unit. Two cables per set for emitter and receiver, Cable outer diameter: ϕ6 mm ϕ0.236 in Connector outer diameter: ϕ16 mm ϕ0.630 in max. Cable color: Gray (for emitter), Gray with black line (for receiver) The min. bending radius: R6 mm R0.236 in
	Extension cable with connector on one end			**SFB-CC3-MU**	Length: 3 m 9.843 ft Net weight 430 g approx. (2 cables)	Used for connecting to an extension cable or the **SF-C13** control unit. Two cables per set for emitter and receiver, Cable outer diameter: ϕ6 mm ϕ0.236 in Connector outer diameter: ϕ16 mm ϕ0.630 in max. Cable color: Gray (for emitter), Gray with black line (for receiver) The min. bending radius: R6 mm R0.236 in
				SFB-CC10-MU	Length: 10 m 32.808 ft Net weight 1,300 g approx. (2 cables)	
	Extension cable with connectors on both ends	For emitter		**SFB-CCJ10E-MU**	Length: 10 m 32.808 ft Net weight 660 g approx. (1 cable)	Used for connecting to an extension cable or the **SF-C12** control unit. One each for emitter and receiver, Cable outer diameter: ϕ6 mm ϕ0.236 in Connector outer diameter: ϕ16 mm ϕ0.630 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
		For receiver		**SFB-CCJ10D-MU**	Length: 10 m 32.808 ft Net weight 680 g approx. (1 cable)	
Cable for series connection				**SFB-CSL01**	Length: 0.1 m 0.328 ft Net weight 45 g approx. (2 cables)	Used to connect light curtains in series Two cables per set for emitter and receiver (common for emitter and receiver) Cable outer diameter: ϕ6 mm ϕ0.236 in Cable color: Gray (common for emitter and receiver) The min. bending radius: R6 mm R0.236 in
				SFB-CSL05	Length: 0.5 m 1.640 ft Net weight 95 g approx. (2 cables)	
				SFB-CSL1	Length: 1 m 3.281 ft Net weight 150 g approx. (2 cables)	
				SFB-CSL5	Length: 5 m 16.404 ft Net weight 630 g approx. (2 cables)	
Adapter cable	For **SF4A-AH□** (PNP type)			**SFB-CB05-A-P**	Length: 0.5 m 1.640 ft Net weight 110 g approx. (2 cables)	12-core bottom cap cable specifications. Used to allow connector cables connected to previous light curtains (at the control circuit side) to be smoothly adapted to the **SF4B** series. Two cables per set for emitter and receiver, Cable outer diameter: ϕ6 mm ϕ0.236 in Connector outer diameter: ϕ16 mm ϕ0.630 in max. Cable color: Gray (for emitter), Gray with black line (for receiver) The min. bending radius: R6 mm R0.236 in
	For **SF4A-AH□-N** (NPN type)			**SFB-CB05-A-N**		
	For **SF2-EH□** (PNP type)			**SFB-CB05-B-P**		
	For **SF2-EH□-N** (NPN type)			**SFB-CB05-B-N**		

ORDER GUIDE

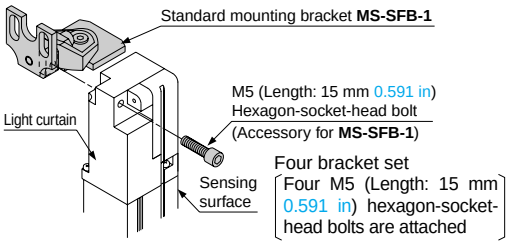
5 Mounting brackets

Mounting bracket is not supplied with the light curtain. Please order it separately.

Designation	Model No.	Description
Standard mounting bracket	**MS-SFB-1**	Used to mount the light curtain on the rear surface and side surface (4 pcs. per set for emitter and receiver)
Pitch adapter bracket	**MS-SFB-4**	Used as the mounting bracket when changing over a previous light curtain with a protective height of 200 to 750 mm 7.874 to 29.528 in to the **SF4B** series. It is installed using two M5 hexagon-socket-head bolts. (4 pcs. per set for emitter and receiver)
M8 mounting bracket	**MS-SFB-1-T**	Allows the light curtain to be mounted at the rear and side with one M8 hexagon-socket-head bolt. (4 pcs. per set for emitter and receiver)
M8 pitch adapter bracket	**MS-SFB-4-T**	Used as the mounting bracket when changing over a previous light curtain with a protective height of 200 to 750 mm 7.874 to 29.528 in to the **SF4B** series. It is installed using two M8 hexagon-socket-head bolts. (4 pcs. per set for emitter and receiver)
Dead zoneless mounting bracket	**MS-SFB-3**	Mounting with no dead zone is possible so that the mounting bracket does not project past the sensing height. (4 pcs. per set for emitter and receiver)

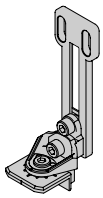
Standard mounting brackets

• **MS-SFB-1**



Pitch adapter bracket

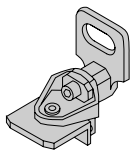
• **MS-SFB-4**



Four bracket set

M8 mounting bracket

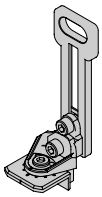
• **MS-SFB-1-T**



Four bracket set

M8 pitch adapter bracket

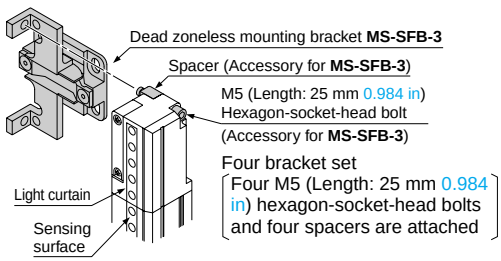
• **MS-SFB-4-T**



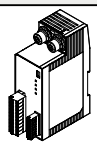
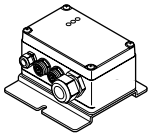
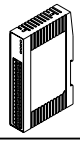
Four bracket set

Dead zoneless mounting bracket

• **MS-SFB-3**



Exclusive control units

Designation	Appearance	Model No.	Description
Connector connection type control unit		**SF-C11**	Applicable to 8-core cable with connector. Up to control category 4
Solid type control unit		**SF-C12**	Applicable to 12-core cable with connector. Up to control category 4
Thin type control unit		**SF-C13**	Applicable to discrete wire connector. Up to control category 4

SF-C12 spare relay set

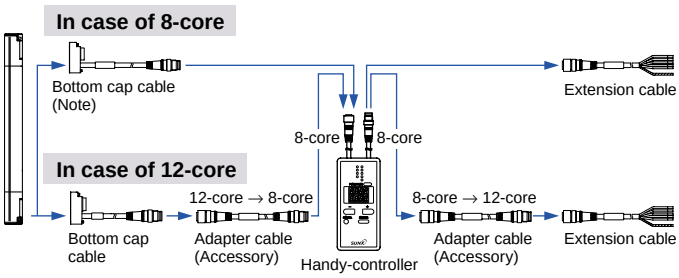
A set of spare relays (2 safety relays and 1 removal tool) is available for the safety relay that is built into the **SF-C12**. Model No.: **SF-C12-RY**

ORDER GUIDE

Handy-controller

Designation	Appearance	Model No.
Handy-controller	* Includes 2 adapter cables	**SFB-HC**

Note: A handy-controller cannot be used with the **SF4B-□-01**.



Note: If using a bottom cap cable with discrete wire, please order the **SFB-CC3/CC10** separately. Refer to the instruction manual for the light curtain for details on the wiring.

Spare parts (Accessories for light curtain)

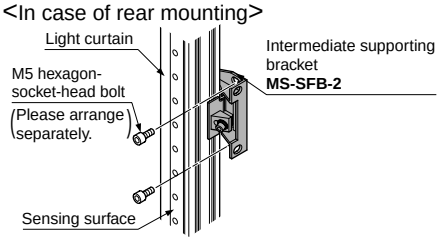
Designation	Model No.	Description
Intermediate supporting bracket (Note)	**MS-SFB-2**	Used to mount the light curtain on the intermediate position. Mounting is possible behind or at the side of the light curtain.
Test rod ϕ14	**SF4B-TR14**	Min. sensing object for regular checking (ϕ14 mm ϕ0.551 in), with finger protection type (min. sensing object ϕ14 mm ϕ0.551 in)
Test rod ϕ25	**SF4B-TR25**	Min. sensing object for regular checking (ϕ25 mm ϕ0.984 in), with hand protection type (min. sensing object ϕ25 mm ϕ0.984 in)

Note: The number of sets required varies depending on the product. Refer to '**DIMENSIONS**' on p. 30 for further details.

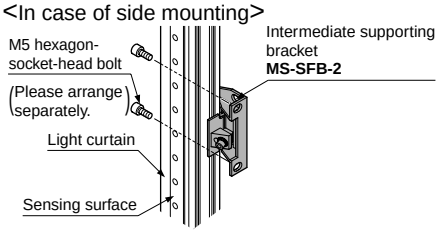
Intermediate supporting bracket

• **MS-SFB-2**

<In case of rear mounting>



<In case of side mounting>



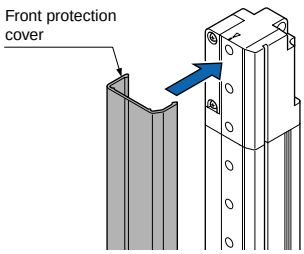
OPTIONS

Applicable beam channels: Finger	Hand	Arm / Foot	Front protection cover: Model No.
23	12	6	**FC-SFBH-12**
31	16	8	**FC-SFBH-16**
39	20	10	**FC-SFBH-20**
47	24	12	**FC-SFBH-24**
55	28	14	**FC-SFBH-28**
63	32	16	**FC-SFBH-32**
71	36	18	**FC-SFBH-36**
79	40	20	**FC-SFBH-40**
95	48	24	**FC-SFBH-48**
111	56	28	**FC-SFBH-56**
127	64	32	**FC-SFBH-64**
—	72	36	**FC-SFBH-72**
—	80	40	**FC-SFBH-80**
—	88	44	**FC-SFBH-88**
—	96	48	**FC-SFBH-96**

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

Front protection cover

• **FC-SFBH-□**
It protects sensing surface.
The operating range reduces when the front protection cover is used.



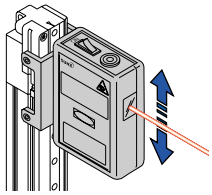
Sensing range

	SF4B-F□	SF4B-H□ 12 to 64 beam channels type	SF4B-H□ 72 to 96 beam channels type	SF4B-A□ 6 to 32 beam channels type	SF4B-A□ 36 to 48 beam channels type
Only emitter installed	0.3 to 6 m 0.984 to 19.685 ft	0.3 to 7.5 m 0.984 to 24.606 ft	0.3 to 6 m 0.984 to 19.685 ft	0.3 to 7.5 m 0.984 to 24.606 ft	0.3 to 6 m 0.984 to 19.685 ft
Only receiver installed	0.3 to 6 m 0.984 to 19.685 ft	0.3 to 7.5 m 0.984 to 24.606 ft	0.3 to 6 m 0.984 to 19.685 ft	0.3 to 7.5 m 0.984 to 24.606 ft	0.3 to 6 m 0.984 to 19.685 ft
Both emitter and receiver installed	0.3 to 5.5 m 0.984 to 18.045 ft	0.3 to 7 m 0.984 to 22.966 ft	0.3 to 5.5 m 0.984 to 18.045 ft	0.3 to 7 m 0.984 to 22.966 ft	0.3 to 5.5 m 0.984 to 18.045 ft

Designation	Model No.	Description
Test rod ϕ45	**SF4B-TR45**	Min. sensing object for regular checking (ϕ45 mm ϕ1.772 in), with arm / foot protection type (min. sensing object ϕ45 mm ϕ1.772 in)
Laser alignment tool	**SF-LAT-2N**	Allows easy beam axis alignment using easy-to-see laser beam

Laser alignment tool

• **SF-LAT-2N**



SPECIFICATIONS

Individual specifications

SF4B-F□

Item \ Type / Model No.	Min. sensing object ϕ14 mm ϕ0.551 in type					
	SF4B-F23	**SF4B-F31**	**SF4B-F39**	**SF4B-F47**	**SF4B-F55**	**SF4B-F63**
No. of beam channels	23	31	39	47	55	63
Beam pitch	10 mm 0.394 in					
Protective height	230 mm 9.055 in	310 mm 12.205 in	390 mm 15.354 in	470 mm 18.504 in	550 mm 21.654 in	630 mm 24.803 in
Current consumption	Emitter: 80 mA or less, Receiver: 120 mA or less			Emitter: 100 mA or less, Receiver: 160 mA or less		
Net weight (total of emitter and receiver)	570 g approx.	680 g approx.	800 g approx.	920 g approx.	1,030 g approx.	1,150 g approx.

Item \ Type / Model No.	Min. sensing object ϕ14 mm ϕ0.551 in type				
	SF4B-F71	**SF4B-F79**	**SF4B-F95**	**SF4B-F111**	**SF4B-F127**
No. of beam channels	71	79	95	111	127
Beam pitch	10 mm 0.394 in				
Protective height	710 mm 27.953 in	790 mm 31.102 in	950 mm 37.402 in	1,110 mm 43.701 in	1,270 mm 50.000 in
Current consumption	Emitter: 100 mA or less, Receiver: 160 mA or less	Emitter: 115 mA or less, Receiver: 190 mA or less		Emitter: 135 mA or less, Receiver: 230 mA or less	
Net weight (total of emitter and receiver)	1,260 g approx.	1,380 g approx.	1,620 g approx.	1,850 g approx.	2,090 g approx.

SF4B-H□

Item \ Type / Model No.	Min. sensing object ϕ25 mm ϕ0.984 in type					
	SF4B-H12	**SF4B-H16**	**SF4B-H20**	**SF4B-H24**	**SF4B-H28**	**SF4B-H32**
No. of beam channels	12	16	20	24	28	32
Beam pitch	20 mm 0.787 in					
Protective height	230 mm 9.055 in	310 mm 12.205 in	390 mm 15.354 in	470 mm 18.504 in	550 mm 21.654 in	630 mm 24.803 in
Current consumption	Emitter: 70 mA or less, Receiver: 95 mA or less			Emitter: 80 mA or less, Receiver: 115 mA or less		
Net weight (total of emitter and receiver)	570 g approx.	680 g approx.	800 g approx.	920 g approx.	1,030 g approx.	1,150 g approx.

Item \ Type / Model No.	Min. sensing object ϕ25 mm ϕ0.984 in type					
	SF4B-H36	**SF4B-H40**	**SF4B-H48**	**SF4B-H56**	**SF4B-H64**	**SF4B-H72**
No. of beam channels	36	40	48	56	64	72
Beam pitch	20 mm 0.787 in					
Protective height	710 mm 27.953 in	790 mm 31.102 in	950 mm 37.402 in	1,110 mm 43.701 in	1,270 mm 50.000 in	1,430 mm 56.299 in
Current consumption	Emitter: 80 mA or less, Receiver: 115 mA or less	Emitter: 90 mA or less, Receiver: 140 mA or less		Emitter: 100 mA or less, Receiver: 160 mA or less		Emitter: 110 mA or less, Receiver: 180 mA or less
Net weight (total of emitter and receiver)	1,260 g approx.	1,380 g approx.	1,620 g approx.	1,850 g approx.	2,090 g approx.	2,320 g approx.

Item \ Type / Model No.	Min. sensing object ϕ25 mm ϕ0.984 in type		
	SF4B-H80	**SF4B-H88**	**SF4B-H96**
No. of beam channels	80	88	96
Beam pitch	20 mm 0.787 in		
Protective height	1,590 mm 62.598 in	1,750 mm 68.898 in	1,910 mm 75.197 in
Current consumption	Emitter: 110 mA or less, Receiver: 180 mA or less	Emitter: 120 mA or less, Receiver: 200 mA or less	
Net weight (total of emitter and receiver)	2,540 g approx.	2,780 g approx.	3,010 g approx.

SF4B-A□

Item \ Type / Model No.	Min. sensing object ϕ45 mm ϕ1.772 in type					
	SF4B-A6	**SF4B-A8**	**SF4B-A10**	**SF4B-A12**	**SF4B-A14**	**SF4B-A16**
No. of beam channels	6	8	10	12	14	16
Beam pitch	40 mm 1.575 in					
Protective height	230 mm 9.055 in	310 mm 12.205 in	390 mm 15.354 in	470 mm 18.504 in	550 mm 21.654 in	630 mm 24.803 in
Current consumption	Emitter: 65 mA or less, Receiver: 85 mA or less			Emitter: 70 mA or less, Receiver: 95 mA or less		
Net weight (total of emitter and receiver)	570 g approx.	680 g approx.	800 g approx.	920 g approx.	1,030 g approx.	1,150 g approx.

Item \ Type / Model No.	Min. sensing object ϕ45 mm ϕ1.772 in type					
	SF4B-A18	**SF4B-A20**	**SF4B-A24**	**SF4B-A28**	**SF4B-A32**	**SF4B-A36**
No. of beam channels	18	20	24	28	32	36
Beam pitch	40 mm 1.575 in					
Protective height	710 mm 27.953 in	790 mm 31.102 in	950 mm 37.402 in	1,110 mm 43.701 in	1,270 mm 50.000 in	1,430 mm 56.299 in
Current consumption	Emitter: 70 mA or less, Receiver: 95 mA or less	Emitter: 75 mA or less, Receiver: 105 mA or less		Emitter: 80 mA or less, Receiver: 120 mA or less		Emitter: 85 mA or less, Receiver: 130 mA or less
Net weight (total of emitter and receiver)	1,260 g approx.	1,380 g approx.	1,620 g approx.	1,850 g approx.	2,090 g approx.	2,320 g approx.

Item \ Type / Model No.	Min. sensing object ϕ45 mm ϕ1.772 in type		
	SF4B-A40	**SF4B-A44**	**SF4B-A48**
No. of beam channels	40	44	48
Beam pitch	40 mm 1.575 in		
Protective height	1,590 mm 62.598 in	1,750 mm 68.898 in	1,910 mm 75.197 in
Current consumption	Emitter: 85 mA or less, Receiver: 130 mA or less	Emitter: 95 mA or less, Receiver: 140 mA or less	
Net weight (total of emitter and receiver)	2,540 g approx.	2,780 g approx.	3,010 g approx.

SPECIFICATIONS

Common specifications

Item \ Type	Min. sensing object ϕ14 mm ϕ0.551 in type	Min. sensing object ϕ25 mm ϕ0.984 in type	Min. sensing object ϕ45 mm ϕ1.772 in type
Model No.	**SF4B-F□**	**SF4B-H□**	**SF4B-A□**
Applicable standards	JIS B 9704-1/2 (Type 4), JIS B 9705-1 / ISO 13849-1 (Category 4), EN 954-1 (Category 4) EN 61496-1 (Type 4), IEC 61496-1/2 (Type 4), UL 61496-1/2 (Type 4), UL 1998		
Operating range (Note 1)	0.3 to 7 m 0.984 to 22.966 ft	12 to 64 beam channels type: 0.3 to 9 m 0.984 to 29.528 ft 72 to 96 beam channels type: 0.3 to 7 m 0.984 to 22.966 ft	6 to 32 beam channels type: 0.3 to 9 m 0.984 to 29.528 ft 36 to 48 beam channels type: 0.3 to 7 m 0.984 to 22.966 ft
Min. sensing object (Note 2)	ϕ14 mm ϕ0.551 in in opaque object	ϕ25 mm ϕ0.984 in in opaque object	ϕ45 mm ϕ1.772 in in opaque object
Effective aperture angle	±2.5 ° or less [for an operating range exceeding 3 m 9.843 ft (conforming to IEC 61496-2 / UL 61496-2)]		
Supply voltage	24 V DC ±10 % Ripple P-P 10 % or less		
Control output (OSSD1, OSSD2)	PNP open collector transistor / NPN open collector transistor (switching method) • When selecting PNP output: Max. source current 200 mA, When selecting NPN output: Max. sink current 200 mA • Applied voltage: same as supply voltage (When selecting PNP output: between the control output and +V, When selecting NPN output: between the control output and 0 V) • Residual voltage: 2.5V or less (When selecting PNP output: source current 200 mA, when selecting NPN output: sink current 200 mA) (when using 20 m 65.617 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 sensor or the synchronization signal)(Note 3, 4)		
Protection circuit	Incorporated		
Response time	OFF response: 14 ms or less, ON response: 80 to 90 ms		
Auxiliary output (Non-safety output)	PNP open collector transistor / NPN open collector transistor (switching method) • When selecting PNP output: Max. source current 60 mA, When selecting NPN output: Max. sink current 60 mA • Applied voltage: same as supply voltage (When selecting PNP output: between the auxiliary output and +V, When selecting NPN output: between the auxiliary output and 0 V) • Residual voltage: 2.5V or less (When selecting PNP output: source current 60 mA, when selecting NPN output: sink current 60 mA) (when using 20 m 65.617 ft length cable)		
Operation mode	OFF when control outputs are ON, ON when control outputs are OFF (Default setting; operating mode can be changed using the **SFB-HC** handy controller). Refer to p.11 for details.		
Protection circuit	Incorporated		
Interference prevention function	Incorporated (Note 5)		
Emission halt function	Incorporated		
Interlock function	Incorporated [Manual reset / Auto reset (Note 6)]		
External device monitor function	Incorporated		
Override function	Incorporated (Note 5)		
Muting function	Incorporated (Note 5)		
Optional function (Note 7)	Fixed blanking function, floating blanking function, auxiliary output switching function, interlock setting changing function, external relay monitor setting changing function, muting setting changing function, protect function, emission intensity control function		
Environmental resistance: Degree of protection	IP65 (IEC)		
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		
Environmental resistance: Ambient humidity	30 to 85 % RH, Storage: 30 to 95 % RH		
Environmental resistance: Ambient illuminance	Incandescent light: 3,500 ℓx or less at the light-receiving face		
Environmental resistance: Dielectric strength voltage	1,000 V AC for one min. between all supply terminals connected together and enclosure		
Environmental resistance: Insulation resistance	20 MΩ, or more, with 500 V DC megger between all supply terminals connected together and enclosure		
Environmental resistance: Vibration resistance	10 to 55 Hz frequency, 0.75 mm 0.030 in amplitude in X, Y and Z directions for two hours each		
Environmental resistance: Shock resistance	300 m/s² acceleration (30 G approx.) in X, Y and Z directions for three times each		
Emitting element	Infrared LED (Peak emission wavelength: 870 nm 0.034 mil)		
Material	Enclosure: Aluminium, Lens cover: Acrylic, Cap: Polycarbonate • ABS		
Connecting method	Connector		
Cable length	Extension up to total 50 m 164.042 ft is possible for both emitter and receiver, with optional mating cables (Note 8)		
Accessories	**MS-SFB-2** (Intermediate supporting bracket): (Note 8) **SF4B-TR14** (Test rod): 1 No.	**MS-SFB-2** (Intermediate supporting bracket): (Note 8) **SF4B-TR25** (Test rod): 1 No.	**MS-SFB-2** (Intermediate supporting bracket): (Note 8)

Notes: 1) The operating range is the possible setting distance between the emitter and the receiver. The sensor can detect sensing object if less than 0.3 m 0.984 ft away.
2) When the floating blanking function is used, the size of the min. sensing object is changed. For details of the floating blanking function, refer to p. 11.
3) The outputs are not 'OFF' during muting function is active even if the beam channel is blocked.
4) In case the blanking function is valid, the operation mode is changed. For details of the floating blanking function, refer to p. 11.
5) Please use 12-core cable.
6) The manual reset and auto reset are possible to be switched depending on the wiring status.
7) In case of using optional function, the handy-controller (**SFB-HC**)(optional) is required. However, a handy-controller cannot be used with the **SF4B-□-01**.
8) The cable can be extended within 30 m 98.425 ft (for emitter / receiver) when two light curtains are connected with series connection, within 20 m 65.617 ft when three light curtains are connected with series connection. Furthermore, when the muting lamp is used, the cable can be extended within 40 m 131.234 ft (for emitter / receiver).
9) The intermediate supporting bracket (**MS-SFB-2**) is enclosed with the following models. The quantity of the enclosed bracket differs depending on the model as follows:
1 set: **SF4B-F□**…Light curtain with 79 to 111 beam channels, **SF4B-H□**…Light curtain with 40 to 56 beam channels, **SF4B-A□**…Light curtain with 20 to 28 beam channels
2 sets: **SF4B-F127**, **SF4B-H□**…Light curtain with 64 to 80 beam channels, **SF4B-A□**…Light curtain with 32 to 40 beam channels
3 sets: **SF4B-H□**…Light curtain with 88 to 96 beam channels, **SF4B-F□**…Light curtain with 44 to 48 beam channels

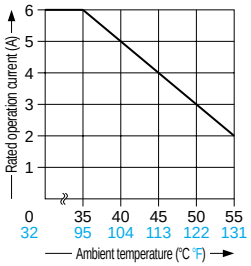
SPECIFICATIONS

Exclusive control unit

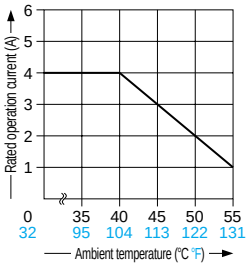
Item \ Model No.	SF-C11	SF-C12	SF-C13
Connectable light curtains	**SF4B** series		Light curtain manufactured by SUNX
Applicable standard	IEC 61496-1, UL 61496-1, JIS B 9704-1		
Control category	ISO 13849-1 (EN 954-1, JIS B 9705-1) compliance up to Category 4 standards		
Supply voltage	24 V DC ±10 % Ripple P-P 10 % or less		
Current consumption	100 mA or less (without light curtain)		
Fuse (power supply)	Built-in electronic fuse, Triggering current: 0.5 A or more, Reset after power down		
Enabling path	NO contact × 3 (13-14, 23-24, 33-34)	NO contact × 2 (13-14, 23-24)	NO contact × 3 (13-14, 23-24, 33-34)
Application category	AC-15, DC-13 (IEC 60947-5-1)		
Rated operation voltage (Ue) / Rated operation current (Ie)	30 V DC / 6 A, 230 V AC / 6 A, resistive load (For induced load, during contact protection) Minute current: 10 mA or more (at 24 V DC)(Note 1)	24 V DC / 1 A, resistive load (For induced load, during contact protection) Minimum applicable load: 15 mA or less (at 24 V DC)	30 V DC / 4 A, 230 V AC / 4 A, resistive load (For induced load, during contact protection) Minute current: 10 mA or more (at 24 V DC)(Note 1)
Contact material / contacts	AgSnO, self cleaning, positively driven	AgNiO + 0.2 μmAu, self cleaning, positively driven	AgSnO, self cleaning, positively driven
Contact resistance	100 mΩ or less (initial value)	50 mΩ or less (initial value)	100 mΩ or less (initial value)
Contact protection fuse rated	6 A (slow blow)	3 A (slow blow)	4 A (slow blow)
Mechanical lifetime	10 million times or more (switching frequency 180 times/min.) (Note 2)		
Electrical lifetime	100,000 times or more (switching frequency 20 times/min, 230 V AC / 3 A resistive load)		
Pick-up delay (Auto reset / Manual reset)	80 ms or less / 90 ms or less	30 ms or less / 30 ms or less	80 ms or less / 90 ms or less
Response time	10 ms or less	14 ms or less	10 ms or less
Auxiliary output	Safety relay contact (NC contact) ×1 (41-42) (Related to enabling path)	Safety relay contact (NC contact) ×1 (31-32) (Related to enabling path)	Safety relay contact (NC contact) ×1 (41-42) (Related to enabling path)
Rated operation voltage / current	24 V DC / 2 A, Minute current: 10 mA or more (at 24 V DC)	30 V DC / 3 A, Minute current: 15 mA or less (at 24 V DC)	24 V DC / 2 A, Minute current: 10 mA or more (at 24 V DC)
Contact protection fuse rated	2 A (slow blow)	3 A (slow blow)	2 A (slow blow)
Semiconductor auxiliary output (AUX)	<Minus ground (Setting for PNP)> • Max. source current: 60 mA • Applied voltage: same as supply voltage (between the semiconductor auxiliary output and + V) • Residual voltage: 2.3 V or less (at source current 60 mA) • Leakage current: 2 mA or less	<Plus ground (Setting for NPN)> • Max. sink current: 60 mA • Applied voltage: same as supply voltage (between the semiconductor auxiliary output and 0 V) • Residual voltage: 1.5 V or less (at sink current 60 mA) • Leakage current: 2 mA or less	———	PNP open collector transistor • Max. source current: 60 mA • Applied voltage: same as supply voltage (between the semiconductor auxiliary output and + V) • Residual voltage: 2.3 V or less (at source current 60 mA) • Leakage current: 2 mA or less
Output operation	Related to auxiliary output of light curtain	———	On when the light curtain is interrupted
Excess voltage category	III		
Indicators: Power supply (Ui)	Green LED (lights up when current flowing)		
Indicators: Enabling path [OUT (Note 3)]	Green LED (lights up when enabling contacts are closed)		
Indicators: Interlock (INTERLOCK)	Yellow LED (lights up when enabling contacts are opened)	———	Yellow LED (lights up when enabling contacts are opened)
Indicators: Fault (FAULT)	Yellow LED (blinks when fault occurs)	Orange LED (lights up when two light curtain input polarity select switch settings are different)	Yellow LED (blinks when fault occurs)
External relay monitor function	Incorporated	Incorporated (Note 4)	Incorporated
Trailing edge function	Incorporated		
Polarity selection function	Incorporated (Sliding switch allows selection of plus / minus ground) Plus ground: Correspond to NPN output light curtain Minus ground: Correspond to PNP output light curtain		Incorporated (Cable connection allows selection of plus / minus ground) Plus ground: Correspond to NPN output light curtain Minus ground: Correspond to PNP output light curtain
Pollution level	2		
Environmental resistance: Protection	Enclosure: IP40, Terminal: IP20	IP65	Enclosure: IP40, Terminal: IP20
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		
Environmental resistance: Ambient humidity	30 to 85 %RH, Storage: 30 to 95 %RH	35 to 85 %RH, Storage: 35 to 85 %RH	30 to 85 %RH, Storage: 30 to 95 %RH
Environmental resistance: Vibration resistance	10 to 55 Hz frequency, 0.35 mm 0.014 in amplitude in X, Y, and Z directions for twenty times each	10 to 55 Hz frequency, 0.75 mm 0.030 in amplitude in X, Y, and Z directions for two hours each	10 to 55 Hz frequency, 0.35 mm 0.014 in amplitude in X, Y, and Z directions for twenty times each
Connection terminal	Detachable-type spring gauge terminal	European terminal	Spring gauge terminal
Enclosure material	ABS	Die-cast aluminium	ABS
Net weight	320 g approx.	1 kg approx.	200 g approx.

Notes: 1) If several **SF-C11** or **SF-C13** units are being used in line together, leave a space of 5 mm 0.197 in or more between each unit. If the units are touching each other, reduce the rated operating current for safety output in accordance with the ambient operating temperature as shown in the graphs at right.
2) Relay switching lifetime will vary depending on factors such as the type of load, the switching frequency, and ambient conditions.
3) The operation indicator is marked as 'Enabling' on the unit for **SF-C12**.
4) Terminals for utilizing the functions of the **SF4B** series are available.

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



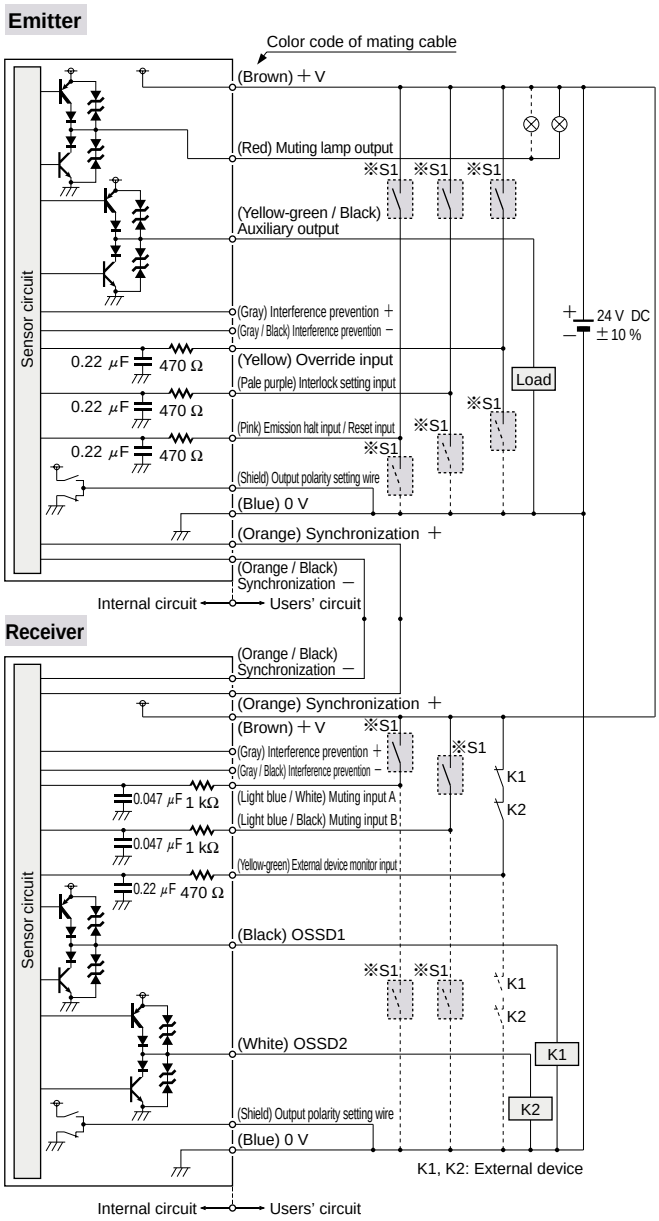
<Dilating when **SF-C13** units are mounted close together>



I/O CIRCUIT AND WIRING DIAGRAMS

I/O circuit diagram

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



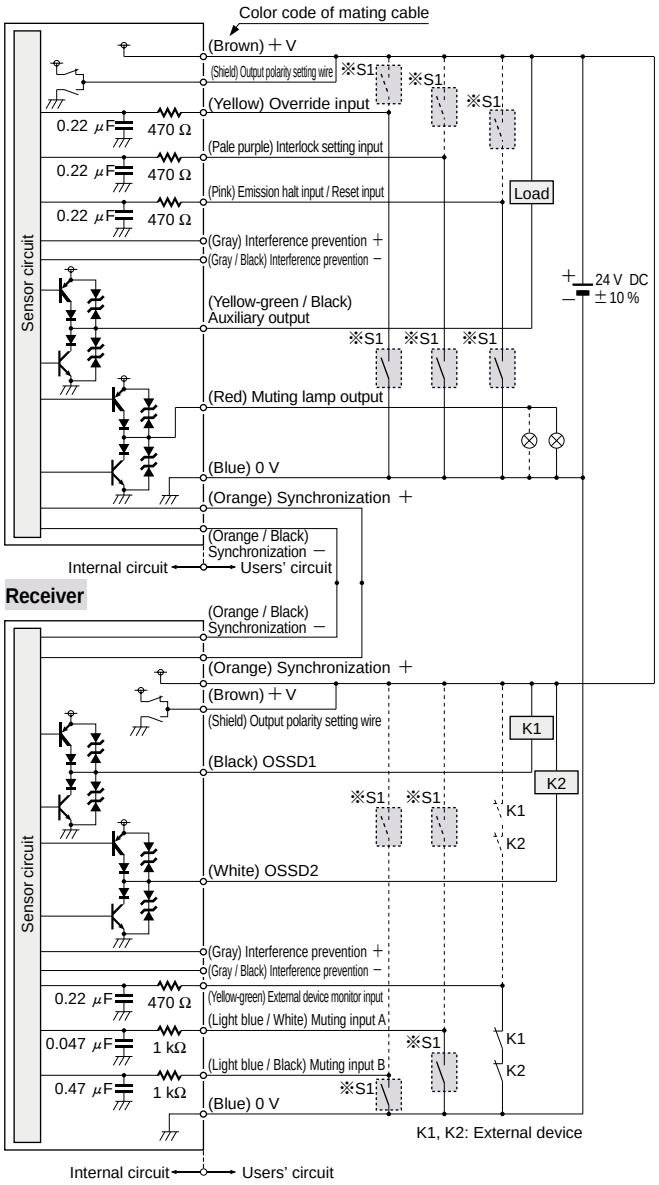
Note: The above diagram is when using a 12-core cable. If an 8-core cable is used, the red, yellow, gray, gray / black, light blue / white and light blue / black lead wires are absent.

※S1

Switch S1 (connectable either to + V or 0 V)
- Emission halt input / Reset input
  For manual reset
  0 to + 1.5 V (source current 5 mA or less) or
  Vs to Vs − 2.5 V (sink current 5 mA or less): Emission halt (Note)
  Open: Emission
  For auto-reset:
  0 to + 1.5 V (source current 5 mA or less) or
  Vs to Vs − 2.5 V (sink current 5 mA or less): Emission (Note)
  Open: Emission halt
- Interlock setting input, Override input, Muting input A / B, External device monitor input
  0 to + 1.5 V (source current 5 mA or less) or
  Vs to Vs − 2.5 V (sink current 5 mA or less): Valid (Note)
  Open: Invalid

Note: Vs is the applying supply voltage.

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



Note: The above diagram is when using a 12-core cable. If an 8-core cable is used, the red, yellow, gray, gray / black, light blue / white and light blue / black lead wires are absent.

※S1

Switch S1 (connectable either to + V or 0 V)
- Emission halt input / Reset input
  For manual reset
  0 to + 1.5 V (source current 5 mA or less) or
  Vs to Vs − 2.5 V (sink current 5 mA or less): Emission halt (Note)
  Open: Emission
  For auto-reset:
  0 to + 1.5 V (source current 5 mA or less) or
  Vs to Vs − 2.5 V (sink current 5 mA or less): Emission (Note)
  Open: Emission halt
- Interlock setting input, Override input, Muting input A / B, External device monitor input
  0 to + 1.5 V (source current 5 mA or less) or
  Vs to Vs − 2.5 V (sink current 5 mA or less): Valid (Note)
  Open: Invalid

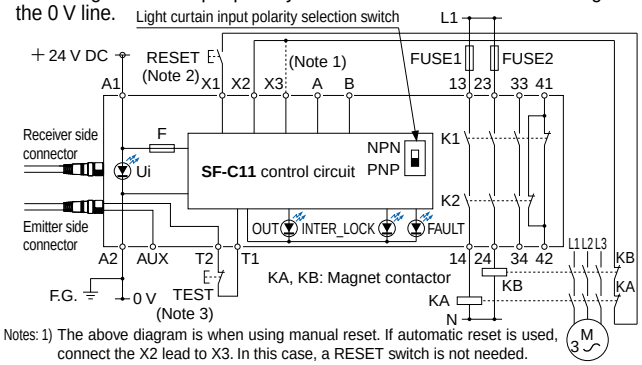
Note: Vs is the applying supply voltage.

I/O CIRCUIT AND WIRING DIAGRAMS

SF-C11 Wiring diagram (Control category 4)

For PNP output (minus ground)

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



Notes: 1) The above diagram is when using manual reset. If automatic reset is used, connect the X2 lead to X3. In this case, a RESET switch is not needed.
2) Use a momentary-type switch as the reset button.
3) Emission halt occurs when the test button is open, and emission occurs when the test button is shorted. If not using the test button, short out T1 and T2.

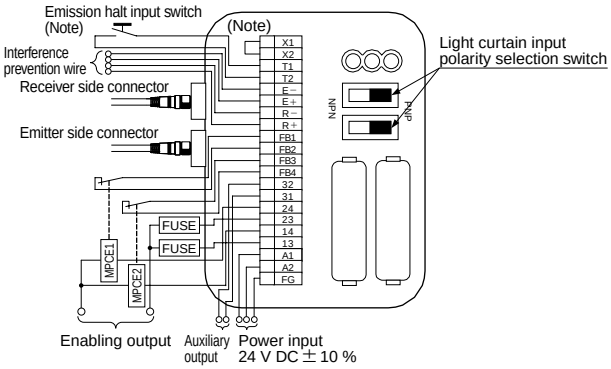
For NPN output (plus ground)

• In the above diagram, set the light curtain input polarity select switch to the NPN side and ground the + side.

SF-C12 Wiring diagram (Control category 4)

For PNP output (minus ground)

• Set the two light curtain input polarity select switches to the PNP side and connect the FG terminal to the 0 V line.



Note: The above diagram is when using manual reset. If automatic reset is used, connect a normal close-type pushbutton switch between T1 and T2 and leave between X1 and X2 open.

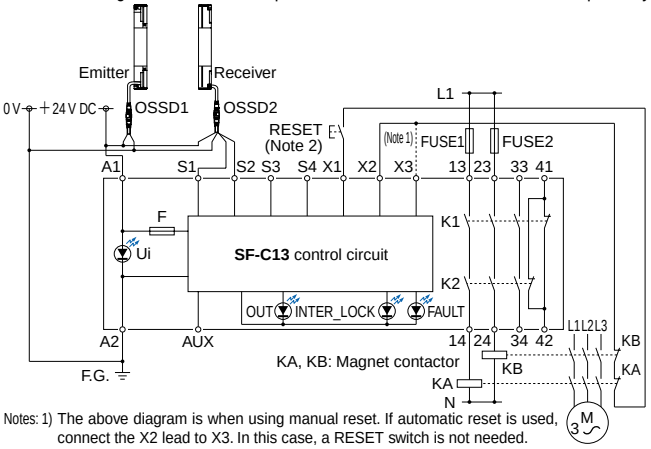
For NPN output (plus ground)

• In the above diagram, set the two light curtain input polarity select switches to the NPN side and connect the FG terminal to the + side.

SF-C13 Wiring diagram (Control category 4)

For PNP output (minus ground)

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



Notes: 1) The above diagram is when using manual reset. If automatic reset is used, connect the X2 lead to X3. In this case, a RESET switch is not needed.
2) Use a momentary-type switch as the reset button.
3) Refer to the light curtain catalog or instruction manual for details on wiring at the light curtain.

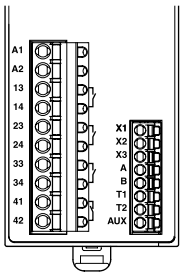
• If connecting a Type 2 light curtain, connect the light curtain control output (OSSD) to S1 and short S2 − S3.

For NPN output (plus ground)

• In the above diagram, connect the light curtain control outputs OSSD1 and OSSD2 to S2 and S4 respectively and ground the + side.

• If connecting a Type 2 light curtain, connect the light curtain control output (OSSD) to S4 and short S2 − S3.

SF-C11 Terminal arrangement diagram



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

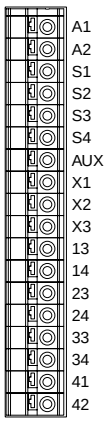
SF-C12 Terminal arrangement diagram

X1	X2	T1	T2	E−	E+	R−	R+	FB1	FB2	FB3	FB4	32	31	24	23	14	13	A1	A2	FG

Terminal	Function
FG	Frame ground (FG) terminal
A2	0 V
A1	+ 24 V DC
13-14, 23-24	Enabling output (NO contact × 2)
31-32	Auxiliary output (NC contact × 1)
FB4	External relay monitor terminal 2
FB3	
FB2	External relay monitor terminal 1
FB1	

Terminal	Function
R +	Interference prevention wire − (Receiver side)
R −	Interference prevention wire + (Receiver side)
E +	Interference prevention wire − (Emitter side)
E −	Interference prevention wire + (Emitter side)
T2	Emission halt input terminal
T1	
X2	Auto reset / manual reset selection terminal Manual reset: X1 − X2 shorted
X1	

SF-C13 Terminal arrangement diagram

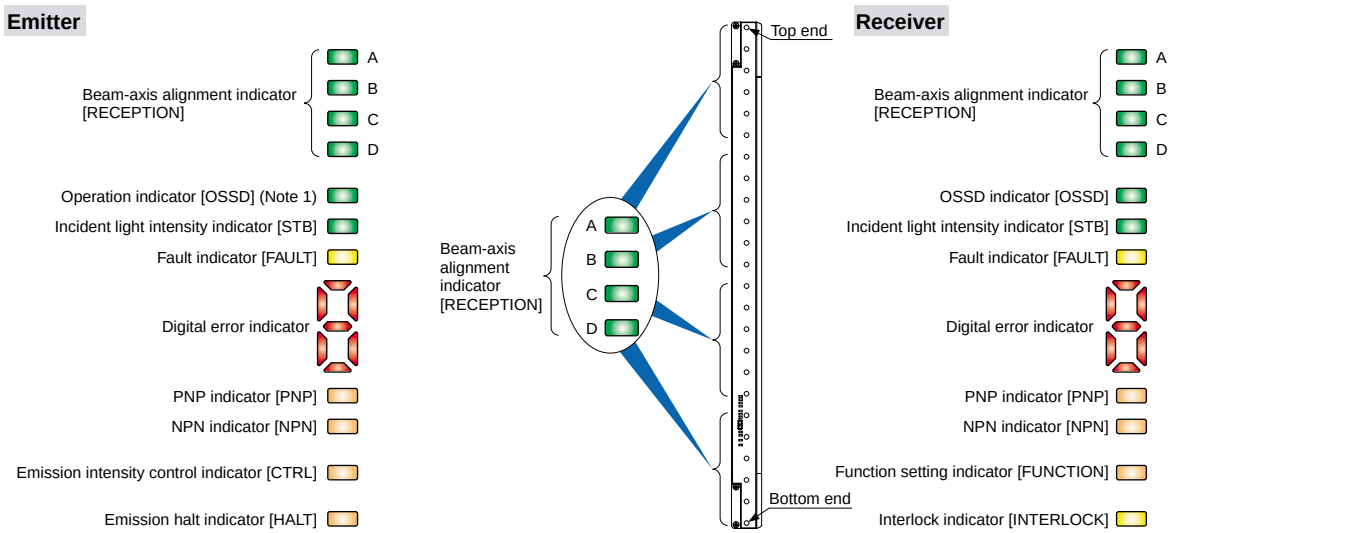


Terminal	Function
A1	+ 24 V DC
A2	0 V
S1 to S4	Light curtain control output (OSSD) input terminal
AUX	Semiconductor auxiliary output
X1	Reset output terminal
X2	Reset input terminal (Manual)
X3	Reset input terminal (Auto)
13-14, 23-24, 33-34	Enabling output (NO contact × 3)
41-42	Auxiliary output (NC contact × 1)

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

PRECAUTIONS FOR PROPER USE

Part description and function



Description		Function
Beam-axis alignment indicator (Red / Green) [RECEPTION]	A	When light curtain top receives light: lights up in red When light curtain top end receives light: blinks in red When control output is ON: lights up in green
	B	When light curtain upper middle receives light: lights up in red When control output is ON: lights up in green
	C	When light curtain lower middle receives light: lights up in red When control output is ON: lights up in green
	D	When light curtain bottom receives light: lights up in red When light curtain bottom end receives light: blinks in red When control output is ON: lights up in green
Operation indicator (Red / Green) [OSSD] (Note 1)		Lights up while light curtain operation is as follows [sequential operation]: When control output is OFF: lights up in red When control output is ON: lights up in green
Incident light intensity indicator (Orange / Green) [STB]		When sufficient light is received (incident light: 130 % or more)(Note 2): lights up in green When stable light is received (incident light: 115 to 130 %)(Note 2): OFF When unstable light is received (incident light: 100 to 115 %)(Note 2): lights up in orange When light is interrupted: OFF (Note 3)
Fault indicator (Yellow) [FAULT] (Note 4)		When fault occurs in the light curtain: lights up or blink
Digital error indicator (Red) (Note 4)		When device is lockout: lights up for incident error content
PNP indicator (Orange) [PNP]		When PNP output is set: lights up
NPN indicator (Orange) [NPN]		When NPN output is set: lights up
Emission intensity control indicator (Orange) [CTRL]		When light is emitted under short mode: lights up When light is emitted under normal mode: lights off
Emission halt indicator (Orange) [HALT]		When light emission is halt: lights up When light is emitted: lights off

Description		Function
Beam-axis alignment indicator (Red / Green) [RECEPTION]	A	When light curtain top receives light: lights up in red When light curtain top end receives light: blinks in red When control output is ON: lights up in green
	B	When light curtain upper middle receives light: lights up in red When control output is ON: lights up in green
	C	When light curtain lower middle receives light: lights up in red When control output is ON: lights up in green
	D	When light curtain bottom receives light: lights up in red When light curtain bottom end receives light: blinks in red When control output is ON: lights up in green
OSSD indicator (Red / Green) [OSSD]		When control output is OFF: lights up in red When control output is ON: lights up in green
Incident light intensity indicator (Orange / Green) [STB]		When sufficient light is received (incident light: 130 % or more)(Note 2): lights up in green When stable light is received (incident light: 115 to 130 %)(Note 2): OFF When unstable light is received (incident light: 100 to 115 %)(Note 2): lights up in orange When light is interrupted: OFF (Note 3)
Fault indicator (Yellow) [FAULT] (Note 4)		When fault occurs in the light curtain: lights up or blink
Digital error indicator (Red) (Note 4)		When device is lockout: lights up for incident error content
PNP indicator (Orange) [PNP]		When PNP output is set: lights up
NPN indicator (Orange) [NPN]		When NPN output is set: lights up
Function setting indicator (Orange) [FUNCTION]		When blanking function is used: lights up (Note 5) When handy-controller is connected: blinks
Interlock indicator (Yellow) [INTERLOCK]		When device is interlocked: lights up Other cases: OFF

Notes: 1) Since the color of the operation indicator changes according to the ON / OFF status of the control output (OSSD1, OSSD2), the operation indicator is marked as 'OSSD' on the light curtain.
2) The threshold value where the control output (OSSD1, OSSD2) changes from OFF to ON is applied as '100% incident light intensity'.
3) The status 'when light is interrupted' refers to the status that the some obstacle is existed in the sensing area.
4) Refer to instruction manual enclosed with this product for details.
5) The blanking function is set by using the handy-controller (**SFB-HC**)(optional). Please order the handy-controller separately. However, a handy-controller cannot be used with the **SF4B-□-01**.
6) The description given in [ ] is marked on the sensor.

Wiring

Refer to the applicable regulations for the region where this device is to be used when setting up the device. 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

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

PRECAUTIONS FOR PROPER USE

- When this device is used in the 'PSDI mode', an appropriate control circuit must be configured between this device and the machinery. For details, be sure to refer to the standards or regulations applicable in each region or country.
- To use this product in the U.S.A., refer to OSHA 1910. 212 and OSHA 1910. 217 for installation, and in Europe, refer to EN 999 as well. Observe your national and local requirements before installing this product.

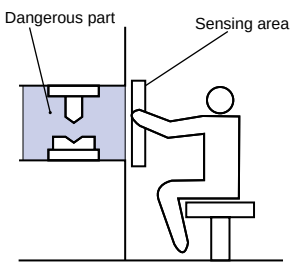
- This catalog is a guide to select a suitable product. Be sure to read instruction manual attached to the product prior to its use.
- Both emitter and receiver are combined adjusted on factory setting, please apply both emitter and receiver with the same serial No. The serial No. is indicated on the plates of both emitter and receiver. (The last 5 digits under the model represents the serial No.)

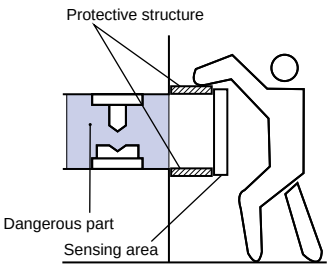
- Make sure to carry out the test run before regular operation.
- This safety system is for use only on machinery in which the dangerous parts can be stopped immediately, either by an emergency stop unit or by disconnecting the power supply. Do not use this system with machinery which cannot be stopped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

Sensing area

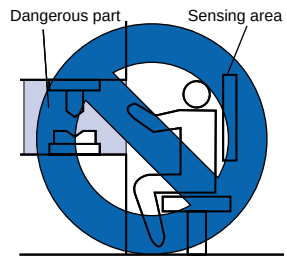
- Make sure to install this product such that any part of the human body must pass through its sensing area in order to reach the dangerous parts of the machinery. If the human body is not detected, there is a danger of serious injury or death.
- Do not use any reflective type or retroreflective type 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.
- Furthermore, facing several receivers towards one emitter, or vice versa, could produce a non-sensing area or cause mutual interference, which may result in serious injury or death.

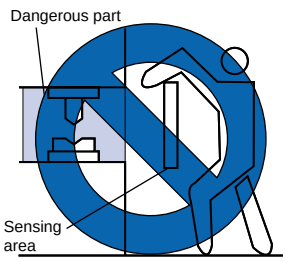
Correct mounting method





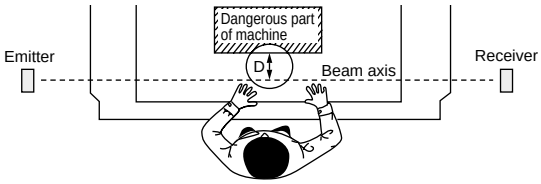
Wrong mounting method





Safety distance

- 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 sensor and the dangerous parts of the machinery. (Please check the latest standards for the equation.) If the safety distance is miscalculated or if sufficient distance is not maintained, there is a danger of serious injury or death.
- Before designing the system, refer to the relevant standards of the region where this device is to be used and then install this device.



The sizes of the minimum sensing objects for this device vary depending on whether or not the floating blanking function is being used. The equation differs depending on the case whether the minimum sensing object is larger than ϕ40 mm ϕ1.575 in or not. Calculate the safety distance with the proper size of the minimum sensing object and appropriate equation.

Size of minimum sensing object when applying floating blanking function

	Min. sensing object when applying floating blanking function			
	Invalid	Setting (Note)		
		1 beam channel	2 beam channels	3 beam channels
SF4B-F□ (Min. sensing object ϕ 14 mm ϕ0.551 in)	ϕ14 mm ϕ0.551 in	ϕ24 mm ϕ0.945 in	ϕ34 mm ϕ1.339 in	ϕ44 mm ϕ1.732 in
SF4B-H□ (Min. sensing object ϕ 25 mm ϕ0.984 in)	ϕ25 mm ϕ0.984 in	ϕ45 mm ϕ1.772 in	ϕ65 mm ϕ2.559 in	ϕ85 mm ϕ3.346 in
SF4B-A□ (Min. sensing object ϕ 45 mm ϕ1.772 in)	ϕ45 mm ϕ1.772 in	ϕ85 mm ϕ3.346 in	ϕ125 mm ϕ4.921 in	ϕ165 mm ϕ6.496 in

Note: Refer to p.11～ for details of the floating blanking function. In case of using optional function. However, a handy-controller cannot be used with the **SF4B-□-01**.

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

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

For intrusion direction perpendicular to the sensing area

<In case that the minimum sensing object is ϕ40 mm ϕ1.575 in or less>

- Equation ① $S = K \times T + C$

S: Safety distance (mm)
Minimum required distance between the sensing area surface and the dangerous parts of the machine
K: Intrusion velocity of operator's body or object (mm/sec.)
Normally taken as 2,000 (mm/sec.) for calculation
T: Response time of total equipment (sec.)
$T = T_m + T_{SF4B}$
T_m: Maximum halting time of machinery (sec.)
T_{SF4B}: Response time of the **SF4B** series 0.014 (sec.)
C: Additional distance calculated from the size of the minimum sensing object of the light curtain (mm)
However, the value of C cannot be 0 or less.
$C = 8 \times (d - 14)$
d: Minimum sensing object diameter (mm)

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 enclosed with this product. For calculating Tm (maximum halt time of the machinery), use a special device called a 'brake monitor'.
When this device is used in the 'PSDI mode', an appropriate safety distance S must be calculated. For details, be sure to refer to the standards or regulations applicable in each region or country.

<In the case that the minimum sensing object is ϕ40 mm ϕ1.575 in or more>

- Equation $S = K \times T + C$

S: Safety distance (mm)
K: Intrusion velocity of operator's body or object (mm/sec.) Taken as 1,600 (mm/sec.) for calculation
T: Response time of total equipment (sec.)
$T = T_m + T_{SF4B}$
T_m: Maximum halting time of machinery (sec.)
T_{SF4B}: Response time of the **SF4B** series 0.014 (sec.)
C: Additional distance calculated from the size of the minimum sensing object of the light curtain (mm)
C = 850 (mm)(Constant)

PRECAUTIONS FOR PROPER USE

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

• Equation ② $S = K \times (T_s + T_c + T_{SF4B} + T_{bm}) + D_{pf}$

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_{SF4B}: Response time of light curtain (sec.)

T_{bm}: Additional halting time tolerance for the brake monitor (sec.)
The following equation holds when the machine is equipped with a brake monitor.
$T_{bm} = T_a - (T_s + T_c)$
T_a: Setting time of brake monitor (sec.)
When the machine is not equipped with a brake monitor, it is recommended that 20 % or more of $(T_s + T_c)$ is taken as additional halting time.

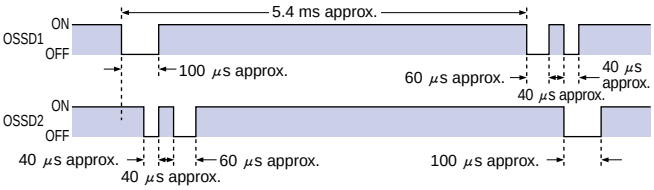
D_{pf}: Additional distance calculated from the size of the minimum sensing of the
SF4B-F□ D_{pf} = 23.8 mm 0.937 in
SF4B-H□ D_{pf} = 61.2 mm 2.409 in
SF4B-A□ D_{pf} = 129.2 mm 5.087 in

$D_{pf} = 3.4 \times (d - 0.276)$(inch)
$\fallingdotseq 3.4 \times (d - 7)$(mm)
d: Minimum sensing object diameter 0.552 (inch)≒14 (mm) **SF4B-F**□
Minimum sensing object diameter 0.985 (inch)≒25 (mm) **SF4B-H**□
Minimum sensing object diameter 1.772 (inch)≒45 (mm) **SF4B-A**□
However, the value of Dpf cannot be 0 or less.

Output waveform [Control output (OSSD1, OSSD2) ON]

• Since the receiver performs the self-diagnosis of the output circuit when the light curtain is in beam receiving status (ON status), the output transistor becomes OFF status periodically. (Refer to the figure below.)
When the OFF signal is fed back, the receiver judges the output circuit as normal. When the OFF signal is not fed back, the receiver judges either the output circuit or wiring as error, and the control output (OSSD1, OSSD2) maintains OFF status.

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

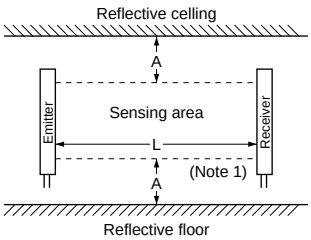


Influence of reflective surfaces

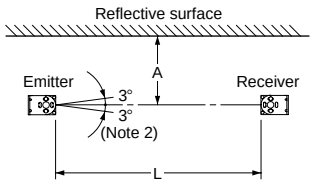
Install the light curtain by considering the effect of nearby reflective surfaces, and take countermeasures such as painting, masking, or changing the material of the reflective surface, etc. Failure to do so may cause the light curtain not to detect, resulting in serious body injury or death.

• Install this device at a distance of at least A (m)(given below) away from reflective surfaces such as metal walls, floors, ceilings, workpiece, covers, panels or glass surfaces.

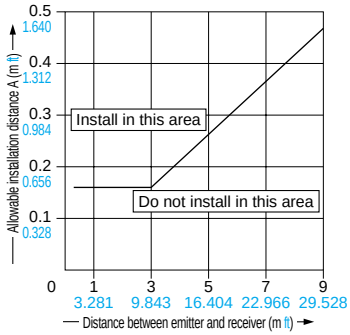
Side view



Top view



Distance between emitter and receiver (Setting distance L)	Allowable installation distance A
0.3 to 3 m 0.984 to 9.843 ft	0.16 m 0.525 ft or more
3 to 9 m 9.843 to 29.528 ft (Note 1)	L × tanθ θ = 3° = L × 0.052 (m) 0.171 (ft) or more



Notes: 1) The setting distance L varies depending on the type of unit. Refer to '**ORDER GUIDE**' on p. 13 for details.
2) The effective aperture angle for this device is ±2.5° 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 ±3° to take care of beam misalignment, etc. during installation.

PRECAUTIONS FOR PROPER USE

Handy-controller

This device enables to set each function using the handy-controller (**SFB-HC**)(optional). However, a handy-controller cannot be used with the **SF4B-□-01**. Among the functions, the contents related to the safety distance such as the size of the minimum sensing object and response time are varied depending on the setting condition. When setting each function, re-calculate the safety distance, and make enough space larger than the calculated safety distance. Failure to do so might cause the accident that the device cannot stop quickly before reaching the dangerous area of the machinery, resulting in the serious injury or death.

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

Interlock function

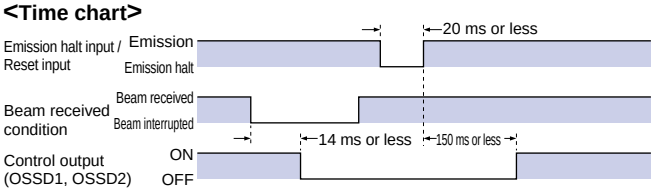
- When the curtain light has been interrupted and control output (OSSD1, OSSD2) is OFF, the interlock function keeps the control output at OFF until a reset signal is input.
- You can select whether interlock is enabled (manual reset) or disabled (automatic reset) by the way in which the interlock setting input line (pale purple) is connected.

Interlock function	Reset operation	Interlock setting input (pale purple)
Enabled	Manual reset	Connected to 0 V or + V
Disabled	Auto reset	Open

Interlock enabled (manual reset)

- When the curtain light has been interrupted and control output (OSSD1, OSSD2) is OFF, the control output (OSSD1, OSSD2) is kept at OFF and does not automatically turn back ON even if the incoming light status is restored.
  If a reset signal is input when incoming light is being received by the light curtain (emission halt input / reset input changes from 'open' to '0 V' or the + V side changes from 'shorted' to 'open'), control output (OSSD1, OSSD2) turns ON.

<Time chart>



Interlock disabled (automatic reset)

- When the curtain light has been interrupted and control output (OSSD1, OSSD2) is OFF, the control output turns ON automatically when the incoming light status is restored.

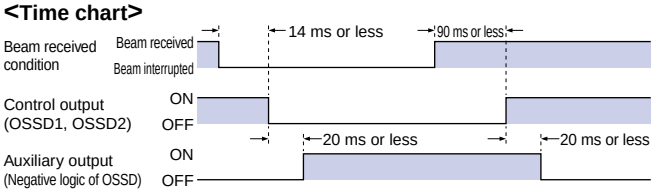
In case that this light curtain is used under auto reset mode, set the system not to be auto reset by the safety relay unit, etc. (conforming to EN 60204-1)

Auxiliary output (Non-safety output)

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

Auxiliary output setting	Normal mode			Lockout
	Emission halt	Control output (OSSD1, OSSD2) status		
		Beam received	Beam interrupted	
Negative logic of OSSD (Factory setting)	ON	OFF	ON	ON

<Time chart>



Do not use the auxiliary output for the purpose of stopping the device. Failure to do so could result in serious injury or death.

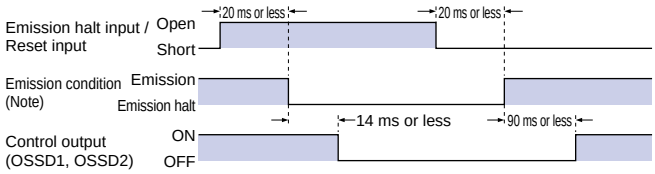
Emission halt function

- 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 emission halt input / reset input line (pink).

Setting status of interlock function	Emission halt input / reset input	Emission status
Enabled (manual reset)	Open	Emission
	Connected to 0 V or + V	Emission halt
Disabled (auto reset)	Open	Emission halt
	Connected to 0 V or + V	Emission

- During emission halt, the control output (OSSD1, OSSD2) becomes OFF status.
- By using this function, malfunction due to extraneous noise or abnormality in the control output (OSSD1, OSSD2) and the auxiliary output can be determined even from the machinery side.
- Normal operation is restored when the emission halt input / reset input line (pink) is connected to 0 V or + V.

<Time chart [when interlock function is enabled (manual reset)]>



Note: This timing chart shows the operation in auto reset. In manual reset, the light curtain performs emission under open status and performs emission halt under short-circuit status.

External device monitor function

- This is the function for checking whether the external safety relay connected to the control output (OSSD1, OSSD2) performs normally in accordance with the control output (OSSD1, OSSD2) or not. Monitor the contacting point 'b' of the external safety relay, and if any abnormality such as deposit of the contacting point, etc. is detected, change the status of the light curtain into lockout one, and turn OFF the control output (OSSD1, OSSD2).

In case of setting the external device monitor function into valid

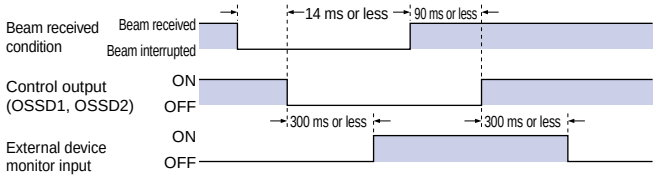
- Connect the external device monitor input (yellow-green) to the external safety relay connected the control output (OSSD1, OSSD2).

In case of not using the external device monitor function

- Connect the external device monitor input (yellow-green) to the auxiliary output (yellow-green / black). At this time, set the auxiliary output as [negative logic of control output (OSSD1, OSSD2)] (factory setting).

- It is also possible to set the external device monitor function into invalid by using the handy-controller **SFB-HC** (optional). However, a handy-controller cannot be used with the **SF4B-□-01**.

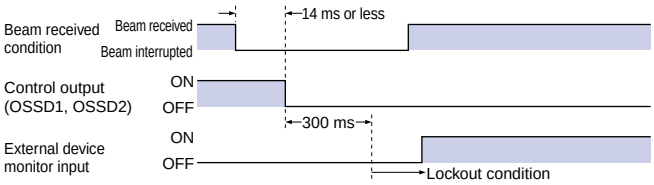
<Time chart (normal)>



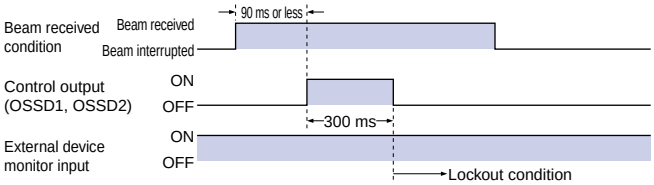
- The setting time of external device monitor is 300 ms or less. Exceeding 300 ms turns the device into lockout status. It can be set within 100 to 600 ms (in units of 10 ms) by using the handy-controller (**SFB-HC**)(optional). However, a handy-controller cannot be used with the **SF4B-□-01**.

PRECAUTIONS FOR PROPER USE

<Time chart (Error ①)>



<Time chart (Error ②)>



Muting function

- Incorrect using of the muting control may cause any accident. Please understand the muting control fully, and use it. As for the muting control, the following international standards define the requirements.
  ISO 13849-1(EN 954-1 / JIS B 9705-1):
  'Safety of machinery－Safety-related parts of control systems －Part 1: General principles for design, Article 5.9 Muting'
  IEC 61496-1 (UL 61496 / JIS B 9704-1):
  'Safety of machinery－Electro sensitive protective equipment －Part 1: General requirements and tests' Annex A, A.7 Muting
  IEC 60204-1 (JIS B 9960-1):
  'Safety of machinery－Electrical equipment of machines－ Part 1: General requirements, 9.2.4 Overriding safeguards'
  EN 415-4:
  'Safety of packaging machines part 4. Palletizers and depalletizers' Annex A, A2.2 Muting'
  ANSI B11.19-1990:
  'for Machine Tools-Safeguarding When Referenced by the Other B11 Machine Tool Safety Standards-Performance Criteria for the Design, Construction, Care, and Operation' 4.2.3 Presence-Sensing Devices: Electro-Optical and Radio Frequency (R.F.)
  ANSI/RIA R15.06-1999:
  'for Industrial Robots and Robot Systems － Safety Requirements, 10.4.5 Muting'
- Use the muting control while the machine cycle is not in danger mode. Maintain safety with the other measure while the muting control is activated.
- For the application that the muting control is activated when a workpiece passes through the sensor, place the muting sensor so that the conditions for the muting control cannot be satisfied by intrusion of personnel when the workpiece is passing through the sensor or the workpiece is not passing through it.
- The muting lamp should be installed in a position where it can always be seen by operators who set or adjust the machine.
- Be sure to check the operation of the muting function before its use. Furthermore, check the state of the muting lamp (cleanliness or brightness etc.)

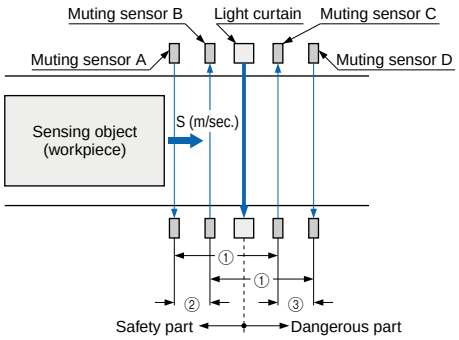
- This function turns the safety function of this light curtain into invalid temporarily. When the control output (OSSD1, OSSD2) is ON, this function is available for passing the workpiece through the sensing area of the light curtain without stopping the machinery.
  The muting function becomes valid when all the conditions listed below are satisfied:
  ①The control output (OSSD1, OSSD2) shall be ON.
  ②The incandescent lamp with 3 to 10 W shall be connected to the muting lamp output (red).
  ③The output of the muting sensors A, B, C, and D shall be changed from OFF (open) to ON. At this time, the time difference occurred by changing the output of the muting sensors A, B, C, and D into ON status shall be within 0.03 to 3 sec.
- The following devices, photoelectric sensor with semiconductor output, proximity sensor, position switch on N.O. (Normal Open) contact, etc. are available for applying to the muting sensor.
- In case of using the muting function, please order 12-core cable.

Specification for muting sensor

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

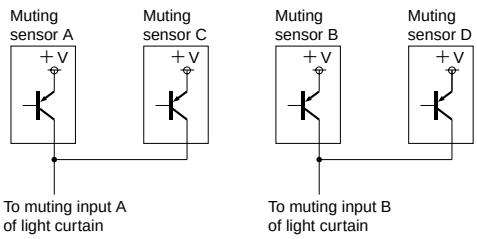
- Be sure to use the muting sensor that satisfies the '**Specification for muting sensor**' above. If the other muting sensor not satisfying the specification above, the muting function might become valid with the timing that the machine designer cannot expect and could result in serious injury or death.
- The muting indicator shall be connected without fail. The muting function is invalid for activating with the muting indicator not connected.

Installation condition of muting sensor

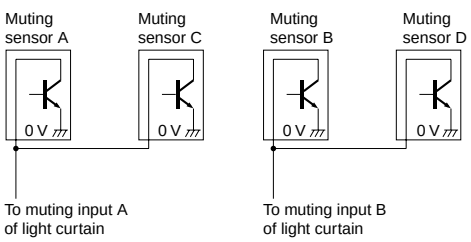


①Shorten the distances between muting sensors A to C and between B to D than the whole length of the sensing object.
②The transit time of the sensing object to be passed through the muting sensors A to B shall be 30 ms to 3 sec.
S is the moving speed of the sensing object, then distance between A and B: S × 3 (s)
③The transit time of the sensing object to be passed through the muting sensors C to D shall be under 3 sec.
S is the moving speed of the sensing object, then distance between C and D: S × 3 (s)

<In case of PNP output>

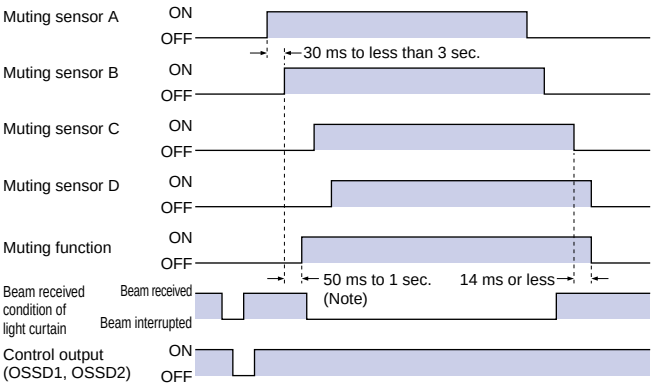


<In case of NPN output>



PRECAUTIONS FOR PROPER USE

<Time chart>



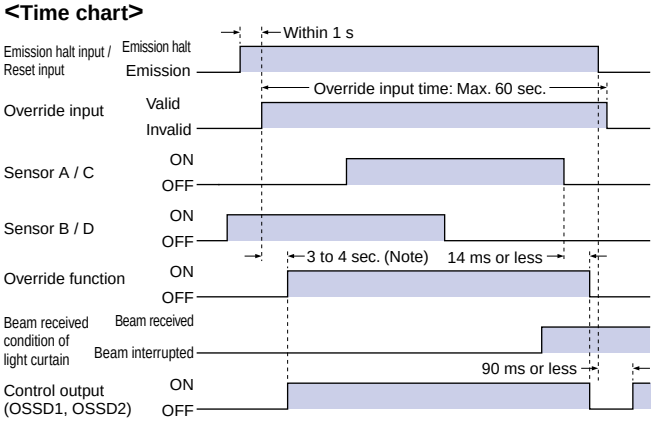
- It is possible to set the muting function into invalid per beam channel respectively and to specify the output order of the muting sensor to be set into valid by using the handy-controller (**SFB-HC**)(optional). However, a handy-controller cannot be used with the **SF4B-□-01**.
- It is recommended that two muting lamp should be connected in parallel. However, take care not to exceed 10 W.

Note: If the muting lamp does not light within 1 sec., the muting function is disabled.

Override function

- This function sets the safety function of this light curtain invalid forcibly. When using the muting function, the override function can be used to start the machinery at times such as when the control outputs (OSSD1 and OSSD2) are OFF or when the muting sensors are ON when the line is to be started.
  The override function becomes valid when all the conditions listed below are satisfied:
  ①The incandescent lamp with 3 to 10 W shall be connected to the muting lamp output (red).
  ②The signal shall be input to either muting sensor A or B.
  ③The override input (yellow) shall be short-circuited to 0 V or ＋V, and the emission halt input / reset input (pink) shall be opened. (3 sec. continuously)
  If one of the three conditions above becomes invalid or timing exceeds 60 sec., the override function becomes invalid.
- The override function only operates when the interlock function is disabled (automatic reset)
- For using the override function, please order 12-core cable.

<Time chart>



Note: If the muting lamp does not light within 4 sec., the override function is disabled.

The emission halt input / reset input button and the override input button should be installed outside the danger area, and in a place where the danger area is clearly visible.

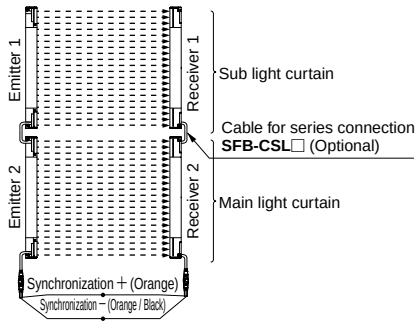
- It is also possible to set the override function into invalid by using the handy-controller **SFB-HC**.

Series connection

Connectable up to 3 sets of light curtains (however, 192 beam channels max.)

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

For series connection, connect the emitter and emitter, receiver and receiver respectively using the exclusive cable (**SFB-CSL□**) for series connection. Wrong connection could generate the non-sensing area, resulting in serious injury or death.

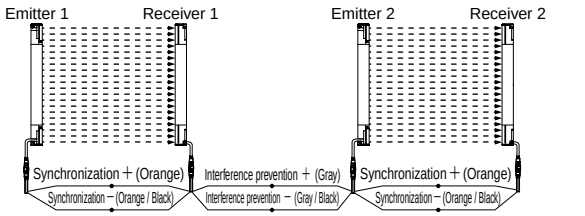


Parallel connection

- This is the configuration for connecting multiple sets of emitter and receiver facing each other in parallel. It is used when there are two or three dangerous parts and each dangerous part can be entered from only one direction. By connecting the interference prevention line, up to three sets of the sensors can be connected. For the control output (OSSD1, OSSD2), only the output of the sensor of which light is blocked turns OFF.

For parallel connection, connect the one receiver to the other connection using the interference prevention wire as shown in the figure below. Wrong connection could generate the non-sensing area, resulting in serious injury or death.

Light curtain A (Master side) **Light curtain B (Slave side)**



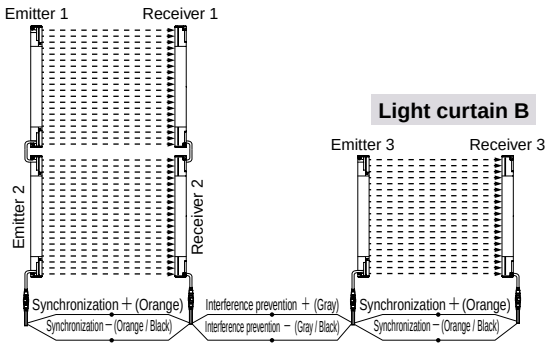
Notes: 1) In case of using the interference prevention wire, please order 12-core cable.
2) If the interference prevention wire is extended, use a ϕ0.2 mm^2, or more, shielded twist pair-cable.

Series and parallel mixed connection

- This is the configuration for connecting multiple sets of emitter and receiver facing each other in mixed series and parallel combination. It is used when there are two or more dangerous parts that can be entered from two or more directions. Up to three sets of sensors in total of the series connection and parallel connection can be connected in combination. However, the total number of beam axes is a maximum of 192. The control output (OSSD1, OSSD2) turns only its output to OFF if the light is blocked.

For parallel connection, connect the one receiver to the other connection using the interference prevention wire as shown in the figure below. Wrong connection could generate the non-sensing area, resulting in serious injury or death.

Light curtain A



Notes: 1) In case of using the interference prevention wire, please order 12-core cable.
2) If the interference prevention wire is extended, use a ϕ0.2 mm^2, or more, shielded twist pair-cable.

DIMENSIONS (Unit: mm in)

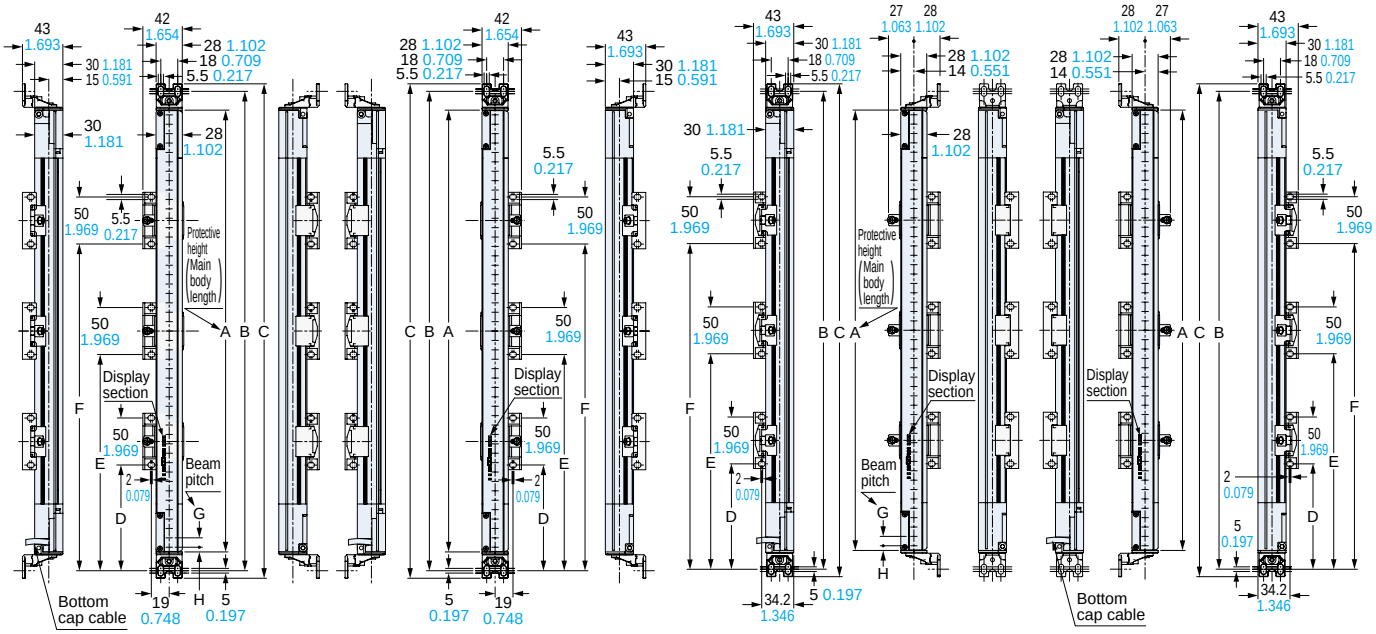
The CAD data in the dimensions can be downloaded from the SUNX website: http://www.sunx.co.jp/

SF4B□ Light curtain

Assembly dimensions

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

<Back mounting> **<Side mounting>**



Model No.			A	B	C	D	E	F
SF4B-F23	SF4B-H12	SF4B-A6	230 9.055	270 10.630	286 11.260	–	–	–
SF4B-F31	SF4B-H16	SF4B-A8	310 12.205	350 13.780	366 14.406	–	–	–
SF4B-F39	SF4B-H20	SF4B-A10	390 15.354	430 16.929	446 17.559	–	–	–
SF4B-F47	SF4B-H24	SF4B-A12	470 18.504	510 20.079	526 20.709	–	–	–
SF4B-F55	SF4B-H28	SF4B-A14	550 21.654	590 23.228	606 23.858	–	–	–
SF4B-F63	SF4B-H32	SF4B-A16	630 24.803	670 26.378	686 27.008	–	–	–
SF4B-F71	SF4B-H36	SF4B-A18	710 27.953	750 29.528	766 30.157	–	–	–
SF4B-F79	SF4B-H40	SF4B-A20	790 31.102	830 32.677	846 33.307	390 15.354	–	–
SF4B-F95	SF4B-H48	SF4B-A24	950 37.402	990 38.976	1,006 39.606	470 18.504	–	–
SF4B-F111	SF4B-H56	SF4B-A28	1,110 43.701	1,150 45.276	1,166 45.905	550 21.654	–	–
SF4B-F127	SF4B-H64	SF4B-A32	1,270 50.000	1,310 51.575	1,326 52.505	418 16.457	842 33.150	–
–	SF4B-H72	SF4B-A36	1,430 56.299	1,470 57.874	1,486 58.504	472 18.583	948 37.323	–
–	SF4B-H80	SF4B-A40	1,590 62.598	1,630 64.173	1,646 64.803	525 20.669	1,055 41.535	–
–	SF4B-H88	SF4B-A44	1,750 68.898	1,790 70.472	1,806 71.102	433 17.047	870 34.252	1,308 51.496
–	SF4B-H96	SF4B-A48	1,910 75.197	1,950 76.772	1,966 77.401	473 18.622	950 37.402	1,428 56.220

Model No.	G	H
SF4B-F□	10 0.394	5 0.197
SF4B-H□	20 0.787	5 0.197
SF4B-A□	40 1.575	15 0.591

Note: The **SF4B-□-01** has the same shape.

DIMENSIONS (Unit: mm in)

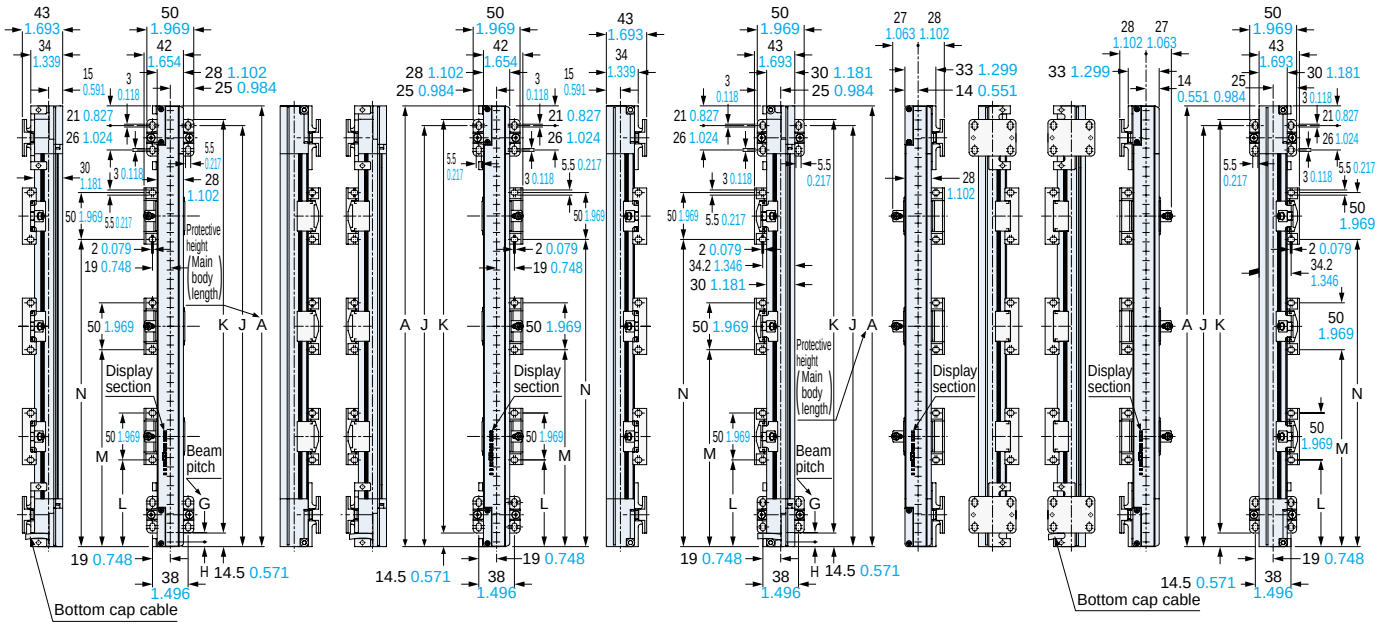
The CAD data in the dimensions can be downloaded from the SUNX website: http://www.sunx.co.jp/

SF4B□ Light curtain

Assembly dimensions

Mounting drawing for the light curtain on which the dead zoneless brackets (**MS-SFB-3**) and the intermediate supporting brackets are mounted.

<Back mounting> **<Side mounting>**



Model No.			A	J	K	L	M	N
SF4B-F23	SF4B-H12	SF4B-A6	230 9.055	209 8.228	201 7.913	—	—	—
SF4B-F31	SF4B-H16	SF4B-A8	310 12.205	289 11.378	281 11.063	—	—	—
SF4B-F39	SF4B-H20	SF4B-A10	390 15.354	369 14.528	361 14.213	—	—	—
SF4B-F47	SF4B-H24	SF4B-A12	470 18.504	449 17.677	441 17.362	—	—	—
SF4B-F55	SF4B-H28	SF4B-A14	550 21.654	529 20.827	521 20.512	—	—	—
SF4B-F63	SF4B-H32	SF4B-A16	630 24.803	609 23.976	601 23.661	—	—	—
SF4B-F71	SF4B-H36	SF4B-A18	710 27.953	689 27.126	681 26.811	—	—	—
SF4B-F79	SF4B-H40	SF4B-A20	790 31.102	769 30.276	761 29.961	370 14.567	—	—
SF4B-F95	SF4B-H48	SF4B-A24	950 37.402	929 36.575	921 36.260	450 17.717	—	—
SF4B-F111	SF4B-H56	SF4B-A28	1,110 43.701	1,089 42.874	1,081 42.559	530 20.866	—	—
SF4B-F127	SF4B-H64	SF4B-A32	1,270 50.000	1,249 49.173	1,241 48.858	398 15.669	822 32.362	—
—	SF4B-H72	SF4B-A36	1,430 56.299	1,409 55.472	1,401 55.157	452 17.795	928 36.535	—
—	SF4B-H80	SF4B-A40	1,590 62.598	1,569 61.772	1,561 61.457	505 19.882	1,035 40.748	—
—	SF4B-H88	SF4B-A44	1,750 68.898	1,729 68.071	1,721 67.756	413 16.260	850 33.465	1,288 50.709
—	SF4B-H96	SF4B-A48	1,910 75.197	1,889 74.370	1,881 74.055	453 17.835	930 36.614	1,408 55.433

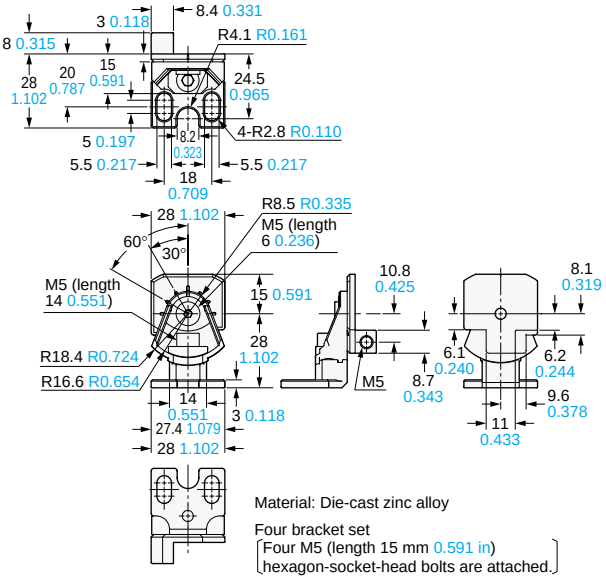
Model No.	G	H
SF4B-F□	10 0.394	5 0.197
SF4B-H□	20 0.787	5 0.197
SF4B-A□	40 1.575	15 0.591

Note: The **SF4B-□-01** has the same shape.

DIMENSIONS (Unit: mm in)

The CAD data in the dimensions can be downloaded from the SUNX website: http://www.sunx.co.jp/

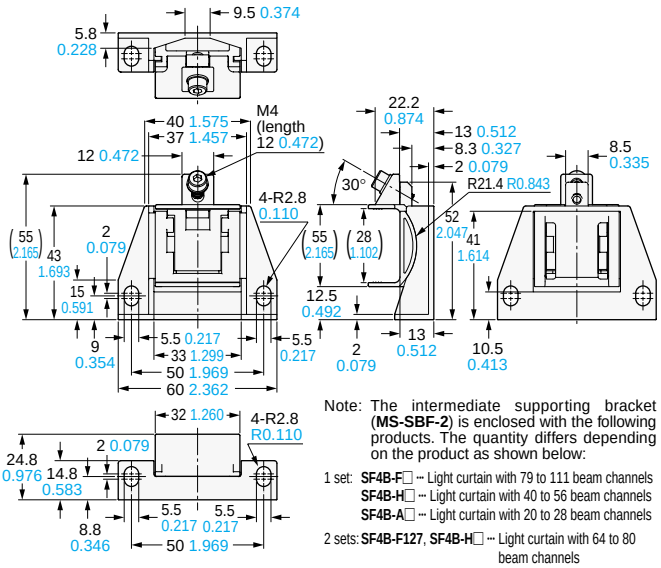
MS-SFB-1 Standard mounting bracket (Optional)



Material: Die-cast zinc alloy

Four bracket set
[Four M5 (length 15 mm 0.591 in) hexagon-socket-head bolts are attached.]

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



Material: Die-cast zinc alloy

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

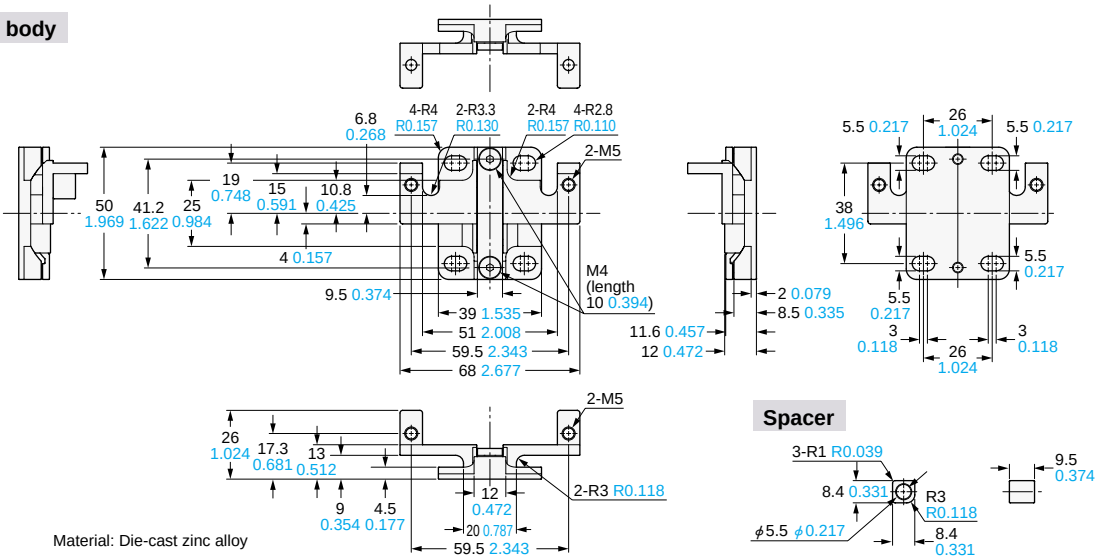
1 set: **SF4B-F**□ ··· Light curtain with 79 to 111 beam channels
SF4B-H□ ··· Light curtain with 40 to 56 beam channels
SF4B-A□ ··· Light curtain with 20 to 28 beam channels

2 sets: **SF4B-F127**, **SF4B-H**□ ··· Light curtain with 64 to 80 beam channels
SF4B-A□ ··· Light curtain with 32 to 40 beam channels

3 sets: **SF4B-H**□ ··· Light curtain with 88 to 96 beam channels
SF4B-F□ ··· Light curtain with 44 to 48 beam channels

MS-SFB-3 Dead spaceless bracket (Optional)

Main body

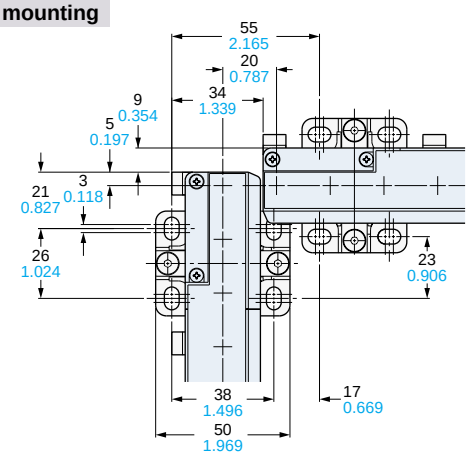


Material: Die-cast zinc alloy

Four bracket set
[Four M5 (length 25 mm 0.984 in) hexagon-socket-head bolts and four spacers are attached.]

Spacer

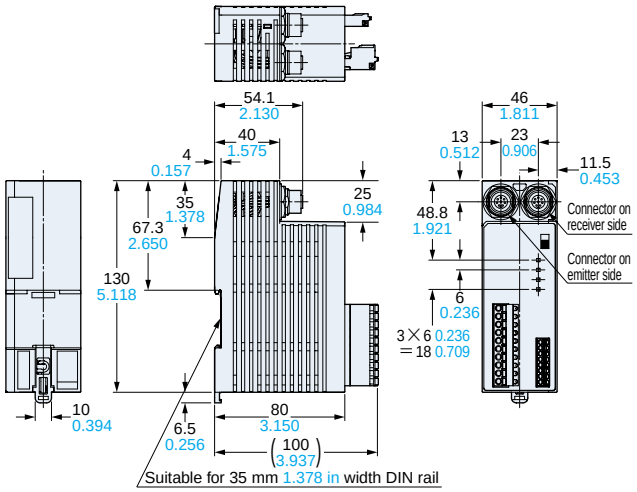
L-shaped mounting



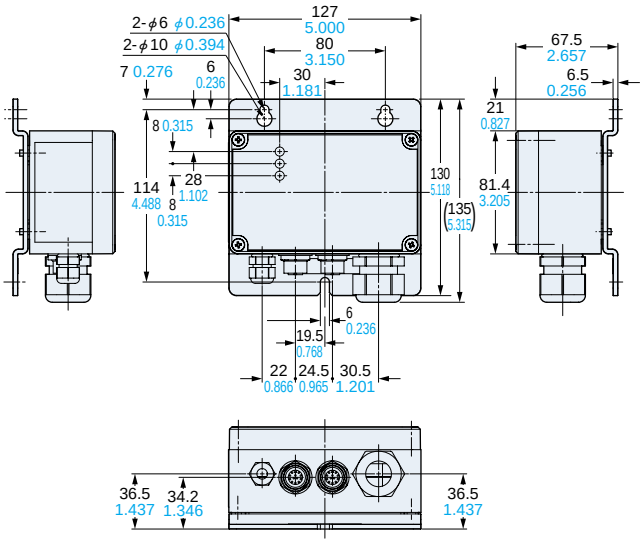
DIMENSIONS (Unit: mm in)

The CAD data in the dimensions can be downloaded from the SUNX website: http://www.sunx.co.jp/

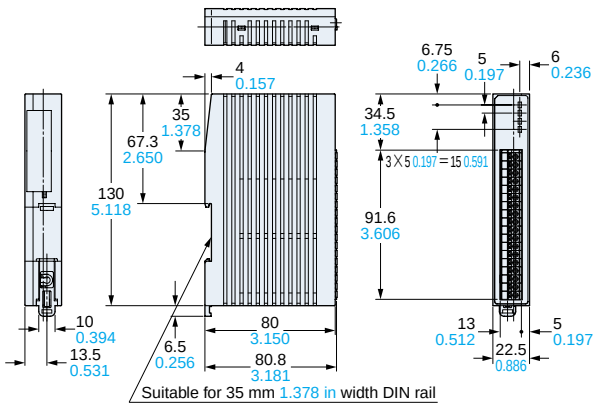
SF-C11 Control unit (Optional)



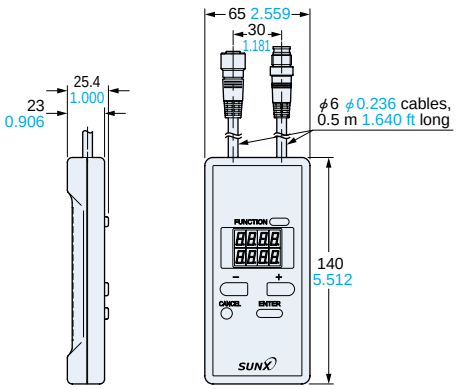
SF-C12 Control unit (Optional)



SF-C13 Control unit (Optional)



SFB-HC Handy-controller (Optional)



All information is subject to change without prior notice.

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