

SF2-A

SERIES

Small • Global Safety Light Curtain



Bringing world-class safety standards even closer to you



GLOBAL SAFETY

Application of IEC 61496 (Type 2) International Standard

The SF2-A series conforms European and North American safety standards. So, they can be used in workplaces throughout the world.



Europe

CE marking based on Machine Directive and EMC Directive has been obtained, so that the sensors can be used in Safety Category 2 equipment.

[Type 2 based on IEC 61496-1/2, EN 61496-1 and Category 2 based on EN 954-1]

North America

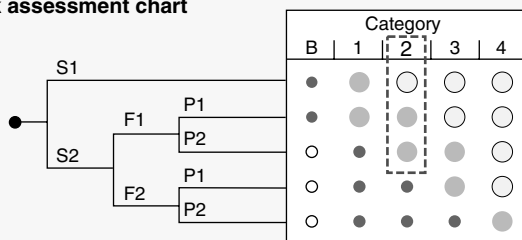
c-UL-us listings (UL 61496-1/2) which are required for use in the United States and Canada have been obtained.

Risk assessment based on ISO 13849-1 / JIS B 9705

Due to control component requirements specified by risk assessment, all possible risk parameters must be selected based on ISO 13849-1: [severity of injury (S), frequency and/or exposure time to the hazard (F), possibility of avoiding the hazard (P)].

When understanding these parameters 'S', 'F' and 'P', or when evaluating risk using these parameters, it is necessary to know that the parameters can be combined with each other, thus causing the risk to be assigned to the control (safety) category. The higher the level of risk, the higher will be the risk for the components comprising the selected safety measure.

Risk assessment chart



- : Preferred categories for references points
- : Possible categories which can require additional measures
- : Measures which can be over dimensioned for the relevant risk

S: Severity of injury

- S1: Slight injury [normally reversible (e.g. bruising and/or lacerations without complications)]
- S2: Serious injury including death

[normally irreversible (e.g. amputation or death)]
In estimating the risk arising from a fault(s) in the safety-related parts of a control system, the severity of the injury must first be evaluated. If the injury is slight injuries, select S1. If the damage is serious injuries including death, then select S2.

F: Frequency and/or exposure time to the hazard

- F1: Seldom to quite often and/or the exposure time is short
 - F2: Frequent to continuous and/or the exposure time is long
- The period of exposure to the hazard should be evaluated on the basis of an average value which can be seen in relation to the total period of time in which the equipment is used. For example, if it is necessary to reach regularly between the tools of the machine during cyclic operation in order to feed and move workpieces, then F2 should be selected. If access is only required from time to time, then F1 can be selected.

P: Possibility of avoiding the hazard

- P1: Possible under specific conditions
 - P2: Scarcely possible
- When a hazard arises it is important to know if it can be recognized and whether it can be avoided before it leads to an accident. For example, an important consideration is whether the hazard can be directly identified by its physical characteristics, or whether it can only be recognized by technical means, e.g. indicators.
- Other important aspects which influence the selection of parameter P are as follows:
- operation with or without supervision
 - operation by experts or non-professionals
 - speed with which the hazard arises, e.g. quickly or slowly
 - possibilities for hazard avoidance, e.g. by taking flight or by intervention of a third party
 - practical safety experiences relating to the process

When a hazardous situation occurs P1 should only be selected if there is a realistic chance of avoiding an accident or of significantly reducing its effect P2 should be selected if there is almost no chance of avoiding the hazard.

Industry's Smallest!!

Space-saving design only 28 mm 1.102 in wide and 19 mm 0.748 in thick



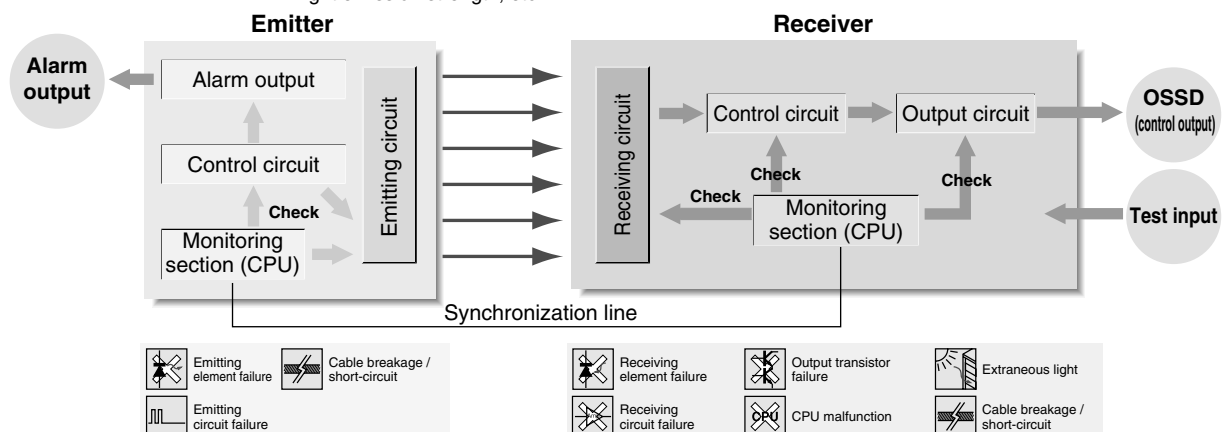
High Level of Safety Achieved

The sensor carries out self-diagnosis when it is turned ON.

The monitoring section (CPU) which is inside the emitter constantly checks the emitting circuit and the control circuit. Furthermore, the receiver also has a monitoring section (CPU) which constantly checks the receiving circuit, control circuit and output circuit, so that a high level of safety is maintained at all times.

Safety design of the SF2-A series

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



SF2-A

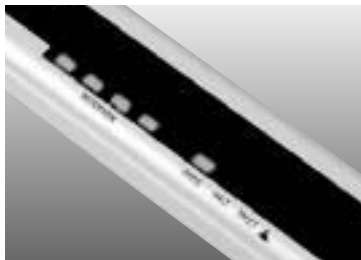
High-performance sensors meeting the needs of workplaces around the world

The SF2-A series of sensors utilize the latest advances in SUNX sensor technology to provide a variety of useful functions while meeting international standards. They combine the level of safety required by such standards with a truly remarkable ease of use. Our newly-developed light curtain, with radically new features, contributes greatly to improved safety at the workplace.

Convenient tool facilitates easy beam axis alignment Reduces installation time significantly

Unaligned beam axes can be seen at a glance

The beam-axis alignment indicators are distributed on the sensors in four sections. As the indicators of the sections whose beams are aligned light up in red, allowing the user to easily verify which beam axes have become aligned. Once all beams have become aligned, the indicators light up in green. Upon the beginning of alignment, as soon as the bottommost or the topmost beam axis (the standard beam axis) becomes aligned, then the corresponding bottommost or topmost alignment indicator light will begin blinking red. Therefore, beam axes can be easily aligned by performing the initial beam axis alignment on either the bottommost or the topmost beam axis, then rotating the light curtain around the axis of this beam. The beam-axis alignment indicators are provided on both the emitter and the receiver, so that you can see at a glance which beams are not aligned.



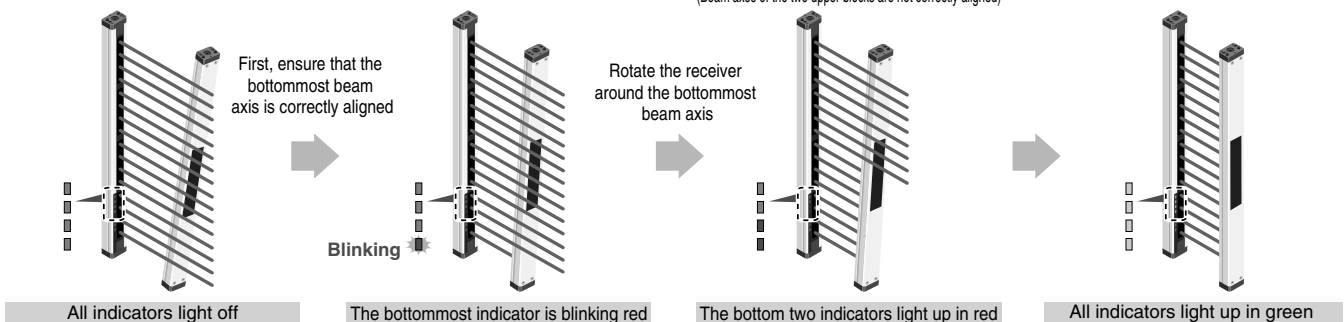
	Conventional unit	SF2-A
When the upper half of all beam axes are aligned	<p>After all beam channels received light, the number of indicators that light up will increase in accordance with the incident light level</p> <p>Even though some beam channels are aligned, the user cannot determine which beam channels are aligned (Cannot determine which beam axes are not aligned)</p>	<p>Upper two indicators light up Lower two indicators light off</p> <p>Even though beam channels are only partially aligned, the user can determine which beam channels are aligned (Beam axes of two upper blocks are aligned / beam axes of two lower blocks are not aligned)</p>

Beam axes are not correctly aligned

Only the bottommost beam axis is correctly aligned

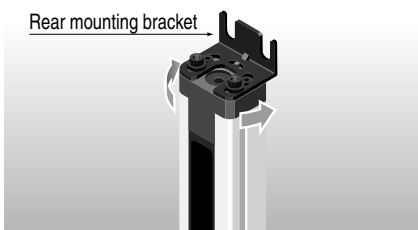
Only the beam axes of the two lower blocks are correctly aligned
(Beam axes of the two upper blocks are not correctly aligned)

All beam channels are correctly aligned



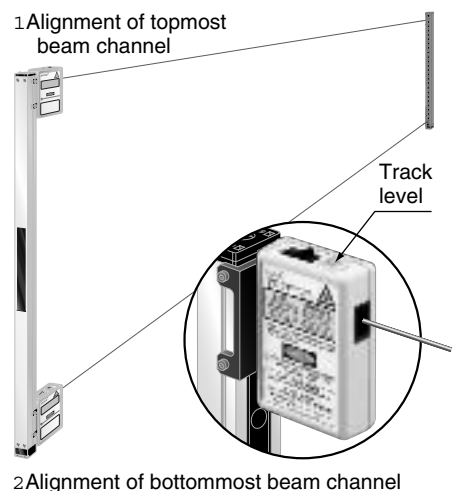
Mounting bracket enables easy beam-axis alignment

The beam-axis alignment is easy since angle adjustment is possible with the enclosed rear mounting bracket (MS-SF2N-1). Furthermore, the optional side mounting bracket (MS-SF2N-3) can also be used for side mounting.



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

If the SF-LAT-2N Laser alignment tool is utilized, then 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 power-up of the light curtain itself.



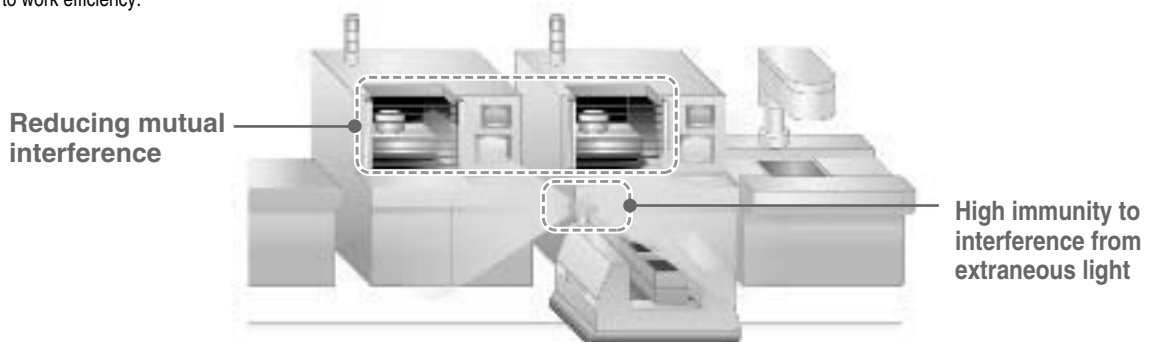
Incorporates advanced ELCA function that prevents mutual interference and reduces interference from extraneous light

Recognizes extraneous light and prevents malfunctions

This function allows the sensor to recognize and reject instantaneous interferences of extraneous light emitted from peripheral equipment, thus preventing malfunctions caused by a variety of sources, including: other sensor beams in the vicinity of the operating sensor, beam spatter, AGV and rotating light sources. By reducing the number of malfunctions caused by extraneous light, detection operations will be interrupted less frequently, resulting in tremendous improvements to work efficiency.

Mutual interference is reduced without the need for interference prevention lines

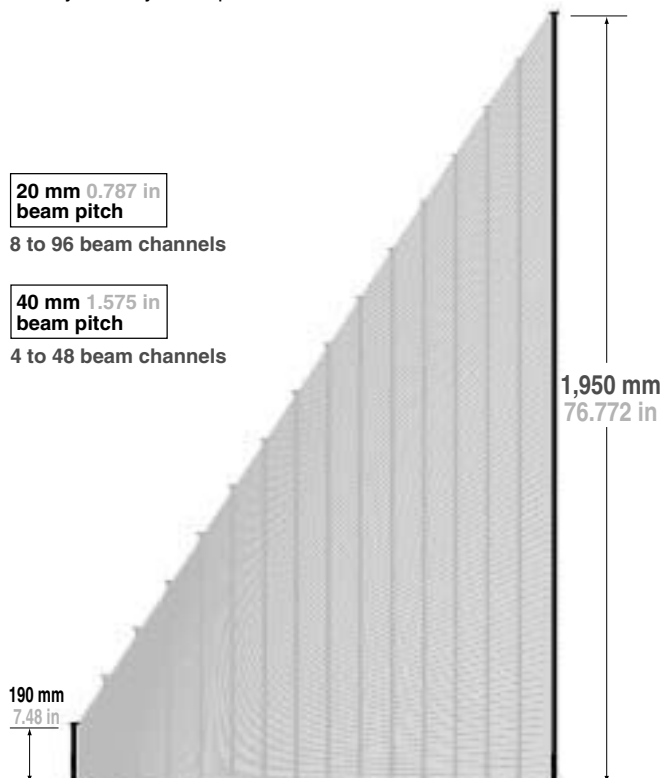
The ELCA (Extraneous Light Check & Avoid) function enhances the functioning of the mutual interference prevention function. ELCA decreases interference from extraneous light having a similar frequency as the light used by the **SF2-A** series, thereby also minimizing mutual interference among nearby **SF2-A** series sensors.



Wide Variety

Different types for different needs

Sensors are available with beam pitches of 20 mm 0.787 in and 40 mm 1.575 in. The protective height for sensors ranges from 190 mm 7.48 in to 1,950 mm 76.772 in, for both 20 mm 0.787 in and 40 mm 1.575 in beam pitch sensors. NPN-PNP output types are also available for all models. The sensors can be selected from this wide variety to suit your requirement.



Thorough sensor protection measures have also been implemented

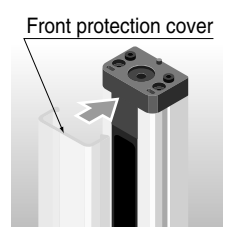
Spatter protection for the sensing surface

The spatter protection hood type, now available, protects the sensing surface from welding machine spatter. Moreover, a front protection cover that can be installed within the sensor casing is also available, completely preventing spatter from adhering to the sensing surface. In addition, even though sensed objects may contact the sensor, the sensing surface will be protected. As well, the ELCA function implements all possible measures to prevent malfunctions caused by spatter.



Front protection cover protects the sensing surface

In the event that the **SF2-A** series is installed in a harsh environment, the use of the front protection cover (**FC-SF4A-H□**, optional) will protect the sensing surface from damage.



SF2-A

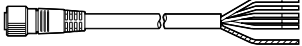
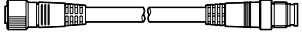
ORDER GUIDE

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

Type	Appearance	Operating range	Model No.		Number of beam channels	Protective height (mm) (in)	
			NPN output type	PNP output type			
Normal case		0.3 to 7 m 0.984 to 22.966 ft	SF2-AH8	SF2-AH8-PN	8	190	7.48
			SF2-AH12	SF2-AH12-PN	12	270	10.63
			SF2-AH16	SF2-AH16-PN	16	350	13.78
			SF2-AH20	SF2-AH20-PN	20	430	16.929
			SF2-AH24	SF2-AH24-PN	24	510	20.079
			SF2-AH28	SF2-AH28-PN	28	590	23.228
			SF2-AH32	SF2-AH32-PN	32	670	26.378
			SF2-AH36	SF2-AH36-PN	36	750	29.528
			SF2-AH40	SF2-AH40-PN	40	830	32.677
			SF2-AH48	SF2-AH48-PN	48	990	38.976
			SF2-AH56	SF2-AH56-PN	56	1,150	45.276
			SF2-AH64	SF2-AH64-PN	64	1,310	51.575
			SF2-AH72	SF2-AH72-PN	72	1,470	57.874
			SF2-AH80	SF2-AH80-PN	80	1,630	64.173
			SF2-AH88	SF2-AH88-PN	88	1,790	70.472
			SF2-AH96	SF2-AH96-PN	96	1,950	76.772
			SF2-AA4	SF2-AA4-PN	4	190	7.48
			SF2-AA6	SF2-AA6-PN	6	270	10.63
			SF2-AA8	SF2-AA8-PN	8	350	13.78
			SF2-AA10	SF2-AA10-PN	10	430	16.929
			SF2-AA12	SF2-AA12-PN	12	510	20.079
			SF2-AA14	SF2-AA14-PN	14	590	23.228
			SF2-AA16	SF2-AA16-PN	16	670	26.378
			SF2-AA18	SF2-AA18-PN	18	750	29.528
SF2-AA20	SF2-AA20-PN	20	830	32.677			
SF2-AA24	SF2-AA24-PN	24	990	38.976			
SF2-AA28	SF2-AA28-PN	28	1,150	45.276			
SF2-AA32	SF2-AA32-PN	32	1,310	51.575			
SF2-AA36	SF2-AA36-PN	36	1,470	57.874			
SF2-AA40	SF2-AA40-PN	40	1,630	64.173			
SF2-AA44	SF2-AA44-PN	44	1,790	70.472			
SF2-AA48	SF2-AA48-PN	48	1,950	76.772			
With spatter protection hood		0.3 to 7 m 0.984 to 22.966 ft	SF2-AH8-H	SF2-AH8-PN-H	8	190	7.48
			SF2-AH12-H	SF2-AH12-PN-H	12	270	10.63
			SF2-AH16-H	SF2-AH16-PN-H	16	350	13.78
			SF2-AH20-H	SF2-AH20-PN-H	20	430	16.929
			SF2-AH24-H	SF2-AH24-PN-H	24	510	20.079
			SF2-AH28-H	SF2-AH28-PN-H	28	590	23.228
			SF2-AH32-H	SF2-AH32-PN-H	32	670	26.378
			SF2-AH36-H	SF2-AH36-PN-H	36	750	29.528
			SF2-AH40-H	SF2-AH40-PN-H	40	830	32.677
			SF2-AH48-H	SF2-AH48-PN-H	48	990	38.976
			SF2-AH56-H	SF2-AH56-PN-H	56	1,150	45.276
			SF2-AH64-H	SF2-AH64-PN-H	64	1,310	51.575
			SF2-AH72-H	SF2-AH72-PN-H	72	1,470	57.874
			SF2-AH80-H	SF2-AH80-PN-H	80	1,630	64.173
			SF2-AH88-H	SF2-AH88-PN-H	88	1,790	70.472
			SF2-AH96-H	SF2-AH96-PN-H	96	1,950	76.772
			SF2-AA4-H	SF2-AA4-PN-H	4	190	7.48
			SF2-AA6-H	SF2-AA6-PN-H	6	270	10.63
			SF2-AA8-H	SF2-AA8-PN-H	8	350	13.78
			SF2-AA10-H	SF2-AA10-PN-H	10	430	16.929
			SF2-AA12-H	SF2-AA12-PN-H	12	510	20.079
			SF2-AA14-H	SF2-AA14-PN-H	14	590	23.228
			SF2-AA16-H	SF2-AA16-PN-H	16	670	26.378
			SF2-AA18-H	SF2-AA18-PN-H	18	750	29.528
SF2-AA20-H	SF2-AA20-PN-H	20	830	32.677			
SF2-AA24-H	SF2-AA24-PN-H	24	990	38.976			
SF2-AA28-H	SF2-AA28-PN-H	28	1,150	45.276			
SF2-AA32-H	SF2-AA32-PN-H	32	1,310	51.575			
SF2-AA36-H	SF2-AA36-PN-H	36	1,470	57.874			
SF2-AA40-H	SF2-AA40-PN-H	40	1,630	64.173			
SF2-AA44-H	SF2-AA44-PN-H	44	1,790	70.472			
SF2-AA48-H	SF2-AA48-PN-H	48	1,950	76.772			

ORDER GUIDE

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

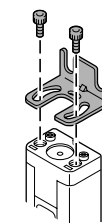
Designation	Appearance	Model No.	Description
Cable with connector on one end		SF2N-CC3	Length: 3 m 9.843 ft Weight: 400 g 14.11 oz approx. (two cables)
		SF2N-CC7	Length: 7 m 22.966 ft Weight: 870 g 30.688 oz approx. (two cables)
		SF2N-CC10	Length: 10 m 32.808 ft Weight: 1,200 g 42.329 oz approx. (two cables)
Cable with connector on both ends		SF2N-CCJ10	Length: 10 m 32.808 ft Weight: 1,200 g 42.329 oz approx. (two cables)
			These cables are used for wiring. 7-core (6-core for emitter) shielded cable with connector on one end, two cables per set Cable outer diameter: ϕ 6 mm ϕ 0.236 in Connector outer diameter: ϕ 14 mm ϕ 0.551 in max. Cable color: Gray (for emitter) Gray with black line (for receiver)
			This cable is used for cable extension. Shielded cable with connector on both ends, two cables per set Cable outer diameter: ϕ 6 mm ϕ 0.236 in Connector outer diameter: ϕ 14 mm ϕ 0.551 in max. Cable color: Gray (for emitter), Gray with black line (for receiver)

Spare parts (Accessories for sensor)

Designation	Model No.	Description
Rear mounting bracket	MS-SF2N-1	Used to mount the sensor on the rear surface (1 set for emitter and receiver)
U-shaped rear mounting intermediate supporting bracket (Note)	MS-SF2N-2	For SF2-A□ Used to hold the sensor at the intermediate position for protection against vibration (for rear surface mounting) (1 set for emitter and receiver)
	MS-SF4A-H2	For SF2-A□-H
L-shaped intermediate supporting bracket (Note)	MS-SF2N-L	Used to install the intermediate supporting bracket on the wall side, etc. (1 set for emitter and receiver)
Test rod	SF4-AH-TR	Used for standard sensing to detect the smallest objects (ϕ 30 mm ϕ 1.181 in), with 20 mm 0.787 in beam pitch

Note: The number of sets required varies depending on the product. Refer to 'DIMENSIONS' on P.15 and P.16 for further details.

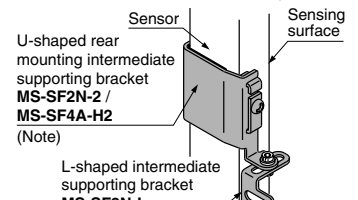
Rear mounting bracket



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

U-shaped rear mounting intermediate supporting bracket

L-shaped intermediate supporting bracket



Note: The above diagram is only applicable to the **MS-SF2N-2**. The **MS-SF4A-H2** has a different shape.

• **MS-SF2N-2 / MS-SF4A-H2**
Set of 2 Nos. each of U-shaped rear supporting bracket and retaining plate

• **MS-SF2N-L**
Two L-shaped bracket set
Two M3 (length 10 mm 0.394 in) pan head screws, two M4 (length 10 mm 0.394 in) hexagon-socket-head bolts and two nuts are attached.

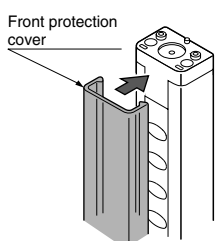
OPTIONS

Designation	Applicable beam channels	20 mm 0.787 in beam pitch	40 mm 1.575 in beam pitch	8 beam channels	12 beam channels	16 beam channels	20 beam channels	24 beam channels	28 beam channels	32 beam channels	36 beam channels	40 beam channels	48 beam channels	56 beam channels	64 beam channels	72 beam channels	80 beam channels	88 beam channels	96 beam channels
				4 beam channels	6 beam channels	8 beam channels	10 beam channels	12 beam channels	14 beam channels	16 beam channels	18 beam channels	20 beam channels	24 beam channels	28 beam channels	32 beam channels	36 beam channels	40 beam channels	44 beam channels	48 beam channels
Front protection cover	For SF2-A□	Model No.	FC-SF4A-H8	FC-SF4A-H12	FC-SF4A-H16	FC-SF4A-H20	FC-SF4A-H24	FC-SF4A-H28	FC-SF4A-H32	FC-SF4A-H36	FC-SF4A-H40	FC-SF4A-H48	FC-SF4A-H56	FC-SF4A-H64	FC-SF4A-H72	FC-SF4A-H80	FC-SF4A-H88	FC-SF4A-H96	
	For SF2-A□-H	Model No.	FC-SF4A-H8-H	FC-SF4A-H12-H	FC-SF4A-H16-H	FC-SF4A-H20-H	FC-SF4A-H24-H	FC-SF4A-H28-H	FC-SF4A-H32-H	FC-SF4A-H36-H	FC-SF4A-H40-H	FC-SF4A-H48-H	FC-SF4A-H56-H	FC-SF4A-H64-H	FC-SF4A-H72-H	FC-SF4A-H80-H	FC-SF4A-H88-H	FC-SF4A-H96-H	
Slit mask	For SF2-A□	Model No.	OS-SF4A-H8	OS-SF4A-H12	OS-SF4A-H16	OS-SF4A-H20	OS-SF4A-H24	OS-SF4A-H28	OS-SF4A-H32	OS-SF4A-H36	OS-SF4A-H40	OS-SF4A-H48	OS-SF4A-H56	OS-SF4A-H64	OS-SF4A-H72	OS-SF4A-H80	OS-SF4A-H88	OS-SF4A-H96	
	For SF2-A□-H	Model No.	OS-SF4A-H8-H	OS-SF4A-H12-H	OS-SF4A-H16-H	OS-SF4A-H20-H	OS-SF4A-H24-H	OS-SF4A-H28-H	OS-SF4A-H32-H	OS-SF4A-H36-H	OS-SF4A-H40-H	OS-SF4A-H48-H	OS-SF4A-H56-H	OS-SF4A-H64-H	OS-SF4A-H72-H	OS-SF4A-H80-H	OS-SF4A-H88-H	OS-SF4A-H96-H	

Note: The model Nos. given above denote a single unit, not a pair of units. 2 Nos. are required if they are to be mounted on, both, the emitter and the receiver.

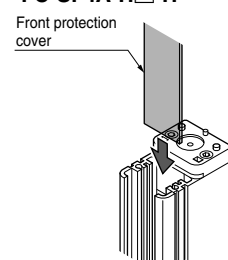
Front protection cover

• **FC-SF4A-H□**



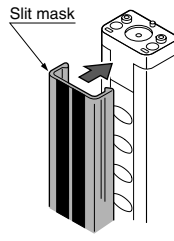
It protects sensing surface

• **FC-SF4A-H□-H**

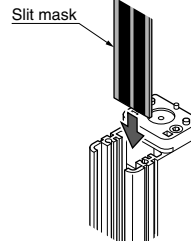


Slit mask

• **OS-SF4A-H□**



• **OS-SF4A-H□-H**



The slit mask restrains the amount of beam emitted or received and hence reduces the interference between neighbouring sensors. However, the operating range reduces when the slit mask is used.

Operating range

< **OS-SF4A-H□** • **OS-SF4A-H□-H** >

• Slit on the emitter side:

2.6 m 8.53 ft

• Slit on the receiver side:

2.6 m 8.53 ft

• Slit on both sides: 1.2 m 3.937 ft

SF2-A

OPTIONS

Designation	Model No.	Description
Large display unit for light curtain	SF-IND-2	<p>With the large indicators put on the light curtain, the operation is easily observable from various directions.</p> <p>Specifications</p> <ul style="list-style-type: none"> Supply voltage: 24 V DC \pm 15 % Current consumption: 12 mA or less Indicators: Orange LED (8 Nos. used) [Light up when external contact is ON] Ambient temperature: -10 to $+55$ °C $+14$ to $+131$ °F (No dew condensation or icing allowed) Material: POM (Base) Polycarbonate (Cover) Cold rolled carbon steel (SPCC) (Bracket) Cable: 0.3 mm² 2-core cabtyre cable, 3 m 9.843 ft long Weight: 70 g 2.469 oz approx. (including bracket) <p>I/O circuit diagrams</p> <p><In case of connection to NPN output type></p> <p>Color code (Brown) +V + 24 V DC \pm 15 % (Blue) -V Internal circuit — Users' circuit</p> <p>※1 Non-voltage contact or NPN open-collector transistor</p> <p><In case of connection to PNP output type></p> <p>Color code (Brown) +V + 24 V DC \pm 15 % (Blue) -V Internal circuit — Users' circuit</p> <p>※1 Non-voltage contact or PNP open-collector transistor</p>
Side mounting bracket	MS-SF2N-3	Used for side-mounting of sensors (four bracket set for emitter and receiver)
U-shaped side mounting intermediate supporting bracket (Note 1)	MS-SF2N-4 MS-SF4A-H4	Used to hold the sensor at the intermediate position for protection against vibration (for side mounting) (1 set for emitter and receiver)
Center sensor mounting bracket (Note 2)	MS-SF2N-5	Used for one-point rear mounting Convenient for mounting on an aluminum frame (four bracket set for emitter and receiver)
Test rod	SF2-AA-TR	Used for standard sensing to detect the smallest objects (ϕ 50 mm ϕ 1.969 in), with 40 mm 1.575 in beam pitch
Safety relay unit (Note 3)	SF-AC	Relay unit for PNP output type • Complies with safety categories up to 4 based on EN 954-1 (Categories up to 2 when it is combines with the SF2-A series)
Laser alignment tool (Note 4)	SF-LAT-2N	Easy to align the beam axis with the visible laser beam

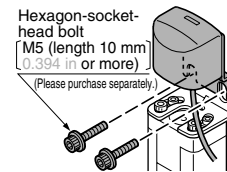
Notes: 1) The number of sets required varies depending on the product. Refer to 'DIMENSIONS' on P.15 and P.16 for further details.

2) Multiple beam channel sensors requiring the intermediate supporting bracket (20 mm 0.787 in beam pitch type: 36 beam channels or more, 40 mm 1.575 in beam pitch type: 18 beam channels or more) cannot mount on an aluminum frame with the center sensor mounting bracket.

3) Refer to the SF4-AH series catalog for further details about the Safety relay unit.

4) Refer to the SF-LAT-2N catalog for further details about the Laser alignment tool.

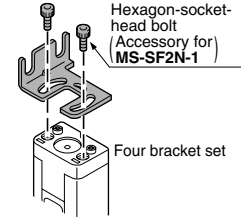
Large display unit for light curtain



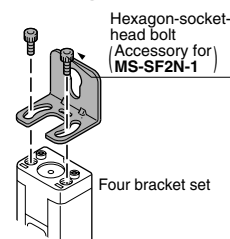
Attaches to upper edge of light curtain.

Tighten together the mounting bracket provided with the area sensor and the mounting bracket of SF-IND-2.

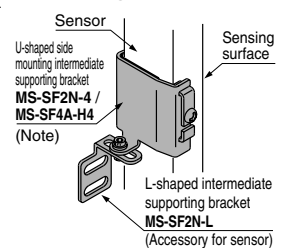
Side mounting bracket



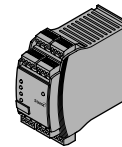
Center sensor mounting bracket



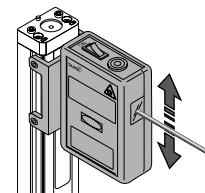
U-shaped side mounting intermediate supporting bracket L-shaped intermediate supporting bracket



Safety relay unit



Laser alignment tool



Note: The above diagram is only applicable to the MS-SF2N-4. The MS-SF4A-H4 has a different shape.

• MS-SF2N-4 / MS-SF4A-H4
Set of 2 Nos. each of U-shaped side supporting bracket and retaining plate

• MS-SF2N-L (Accessory for sensor)
Two L-shaped bracket set

Two M3 (length 10 mm 0.394 in) pan head screws, two M4 (length 10 mm 0.394 in) hexagon-socket-head bolts and two nuts are attached.

SPECIFICATIONS

Individual specifications

SF2-AH□(-H)

Type		20 mm 0.787 in beam pitch								
Item	Model No.	NPN output	SF2-AH8(-H)	SF2-AH12(-H)	SF2-AH16(-H)	SF2-AH20(-H)	SF2-AH24(-H)	SF2-AH28(-H)	SF2-AH32(-H)	SF2-AH36(-H)
		PNP output	SF2-AH8-PN(-H)	SF2-AH12-PN(-H)	SF2-AH16-PN(-H)	SF2-AH20-PN(-H)	SF2-AH24-PN(-H)	SF2-AH28-PN(-H)	SF2-AH32-PN(-H)	SF2-AH36-PN(-H)
No. of beam channels			8	12	16	20	24	28	32	36
Beam pitch			20 mm 0.787 in							
Protective height			190 mm 7.48 in	270 mm 10.63 in	350 mm 13.78 in	430 mm 16.929 in	510 mm 20.079 in	590 mm 23.228 in	670 mm 26.378 in	750 mm 29.528 in
Current consumption			Emitter: 45 mA or less, Receiver: 60 mA or less				Emitter: 55 mA or less, Receiver: 70 mA or less			
Weight (total of emitter and receiver)	SF2-AH□(-PN)		350 g 12.346 oz approx.	430 g 15.168 oz approx.	520 g 18.342 oz approx.	610 g 21.517 oz approx.	700 g 24.692 oz approx.	780 g 27.514 oz approx.	880 g 31.041 oz approx.	960 g 33.863 oz approx.
	SF2-AH□(-PN)-H		420 g 14.815 oz approx.	560 g 19.753 oz approx.	700 g 24.692 oz approx.	830 g 29.277 oz approx.	970 g 34.216 oz approx.	1,100 g 38.801 oz approx.	1,200 g 42.329 oz approx.	1,400 g 49.384 oz approx.

Type		20 mm 0.787 in beam pitch								
Item	Model No.	NPN output	SF2-AH40(-H)	SF2-AH48(-H)	SF2-AH56(-H)	SF2-AH64(-H)	SF2-AH72(-H)	SF2-AH80(-H)	SF2-AH88(-H)	SF2-AH96(-H)
		PNP output	SF2-AH40-PN(-H)	SF2-AH48-PN(-H)	SF2-AH56-PN(-H)	SF2-AH64-PN(-H)	SF2-AH72-PN(-H)	SF2-AH80-PN(-H)	SF2-AH88-PN(-H)	SF2-AH96-PN(-H)
No. of beam channels			40	48	56	64	72	80	88	96
Beam pitch			20 mm 0.787 in							
Protective height			830 mm 32.677 in	990 mm 38.976 in	1,150 mm 45.276 in	1,310 mm 51.575 in	1,470 mm 57.874 in	1,630 mm 64.173 in	1,790 mm 70.472 in	1,950 mm 76.772 in
Current consumption			Emitter: 60 mA or less, Receiver: 80 mA or less		Emitter: 65 mA or less, Receiver: 95 mA or less		Emitter: 70 mA or less, Receiver: 110 mA or less		Emitter: 80 mA or less, Receiver: 120 mA or less	
Weight (total of emitter and receiver)	SF2-AH□(-PN)		1,100 g 38.801 oz approx.	1,200 g 42.329 oz approx.	1,400 g 49.384 oz approx.	1,600 g 56.438 oz approx.	1,800 g 63.493 oz approx.	1,900 g 67.021 oz approx.	2,100 g 74.075 oz approx.	2,300 g 81.13 oz approx.
	SF2-AH□(-PN)-H		1,500 g 52.911 oz approx.	1,800 g 63.493 oz approx.	2,100 g 74.075 oz approx.	2,300 g 81.13 oz approx.	2,600 g 91.712 oz approx.	2,900 g 102.295 oz approx.	3,200 g 112.877 oz approx.	3,400 g 119.932 oz approx.

SF2-AA□(-H)

Type		40 mm 1.575 in beam pitch								
Item	Model No.	NPN output	SF2-AA4(-H)	SF2-AA6(-H)	SF2-AA8(-H)	SF2-AA10(-H)	SF2-AA12(-H)	SF2-AA14(-H)	SF2-AA16(-H)	SF2-AA18(-H)
		PNP output	SF2-AA4-PN(-H)	SF2-AA6-PN(-H)	SF2-AA8-PN(-H)	SF2-AA10-PN(-H)	SF2-AA12-PN(-H)	SF2-AA14-PN(-H)	SF2-AA16-PN(-H)	SF2-AA18-PN(-H)
No. of beam channels			4	6	8	10	12	14	16	18
Beam pitch			40 mm 1.575 in							
Protective height			190 mm 7.48 in	270 mm 10.63 in	350 mm 13.78 in	430 mm 16.929 in	510 mm 20.079 in	590 mm 23.228 in	670 mm 26.378 in	750 mm 29.528 in
Current consumption			Emitter: 40 mA or less, Receiver: 50 mA or less				Emitter: 45 mA or less, Receiver: 60 mA or less			
Weight (total of emitter and receiver)	SF2-AA□(-PN)		350 g 12.346 oz approx.	430 g 15.168 oz approx.	520 g 18.342 oz approx.	610 g 21.517 oz approx.	700 g 24.692 oz approx.	780 g 27.514 oz approx.	880 g 31.041 oz approx.	960 g 33.863 oz approx.
	SF2-AA□(-PN)-H		420 g 14.815 oz approx.	560 g 19.753 oz approx.	700 g 24.692 oz approx.	830 g 29.277 oz approx.	970 g 34.216 oz approx.	1,100 g 38.801 oz approx.	1,200 g 42.329 oz approx.	1,400 g 49.384 oz approx.

Type		40 mm 1.575 in beam pitch								
Item	Model No.	NPN output	SF2-AA20(-H)	SF2-AA24(-H)	SF2-AA28(-H)	SF2-AA32(-H)	SF2-AA36(-H)	SF2-AA40(-H)	SF2-AA44(-H)	SF2-AA48(-H)
		PNP output	SF2-AA20-PN(-H)	SF2-AA24-PN(-H)	SF2-AA28-PN(-H)	SF2-AA32-PN(-H)	SF2-AA36-PN(-H)	SF2-AA40-PN(-H)	SF2-AA44-PN(-H)	SF2-AA48-PN(-H)
No. of beam channels			20	24	28	32	36	40	44	48
Beam pitch			40 mm 1.575 in							
Protective height			830 mm 32.677 in	990 mm 38.976 in	1,150 mm 45.276 in	1,310 mm 51.575 in	1,470 mm 57.874 in	1,630 mm 64.173 in	1,790 mm 70.472 in	1,950 mm 76.772 in
Current consumption			Emitter: 50 mA or less, Receiver: 65 mA or less		Emitter: 50 mA or less, Receiver: 70 mA or less		Emitter: 55 mA or less, Receiver: 75 mA or less		Emitter: 60 mA or less, Receiver: 80 mA or less	
Weight (total of emitter and receiver)	SF2-AA□(-PN)		1,100 g 38.801 oz approx.	1,200 g 42.329 oz approx.	1,400 g 49.384 oz approx.	1,600 g 56.438 oz approx.	1,800 g 63.493 oz approx.	1,900 g 67.021 oz approx.	2,100 g 74.075 oz approx.	2,300 g 81.13 oz approx.
	SF2-AA□(-PN)-H		1,500 g 52.911 oz approx.	1,800 g 63.493 oz approx.	2,100 g 74.075 oz approx.	2,300 g 81.13 oz approx.	2,600 g 91.712 oz approx.	2,900 g 102.295 oz approx.	3,200 g 112.877 oz approx.	3,400 g 119.932 oz approx.

SF2-A

SPECIFICATIONS

Common specifications

Item	Type Model No.	20 mm 0.787 in beam pitch		40 mm 1.575 in beam pitch	
		NPN output SF2-AH□(-H)	PNP output SF2-AH□-PN(-H)	NPN output SF2-AA□(-H)	PNP output SF2-AA□-PN(-H)
Applicable standards	Category 2 based on EN 954-1 (Type 2 based on IEC 61496-1/2)				
Operating range	0.3 to 7 m 0.984 to 22.966 ft				
Detection capability	φ30 mm φ1.181 in opaque object		φ50 mm φ1.969 in opaque object		
Effective aperture angle	± 5 ° or less for a operating range exceeding 3 m 9.843 ft (conforming to IEC 61496-2 / UL 61496-2)				
Supply voltage	24 V DC ± 15 % Ripple P-P 10 % or less				
Control output (OSSD)	<NPN output type> NPN open-collector transistor • Maximum sink current: 200 mA • Applied voltage: same as supply voltage (between control output and 0 V) • Residual voltage: 2.0 V or less (at 200 mA sink current)		<PNP output type> PNP open-collector transistor • Maximum source current: 200 mA • Applied voltage: same as supply voltage (between control output and + V) • Residual voltage: 2.5 V or less (at 200 mA source current)		
	Operation mode	ON when all beam channels receive light, OFF when one or more beam channels interrupt light (OFF also in case of any malfunction in the sensor or the synchronization signal)			
	Protection circuit	Incorporated			
Response time	OFF response: 15 ms or less, ON response: 40 to 60 ms or less (when light received is stable)				
Alarm output	<NPN output type> NPN open-collector transistor • Maximum sink current: 60 mA • Applied voltage: same as supply voltage (between alarm output and 0 V) • Residual voltage: 2.0 V or less (at 60 mA sink current)		<PNP output type> PNP open-collector transistor • Maximum source current: 60 mA • Applied voltage: same as supply voltage (between alarm output and + V) • Residual voltage: 2.5 V or less (at 60 mA source current)		
	Operation mode	Normal operation: Alarm output ON, Failure resulting in emission halt, or when test input is applied: Alarm output OFF			
	Protection circuit	Incorporated			
Indicators	Emitter	Beam-axis alignment indicators: 2-color (Red / Green) LED × 4 (light up in red when the each beam channel receives light, blinks in red when the topmost or bottommost beam channel receives light, light up in green when all beam channels receive light) Operation indicator (Note 1): 2-color (Red / Green) LED (lights up in red when control output (OSSD) is OFF, lights up in green when control output (OSSD) is ON) Emission halt indicator: Orange LED (lights up when emission halts) Fault indicator: Yellow LED (lights up or blinks if a fault occurs in the sensor)			
	Receiver	Beam-axis alignment indicators: 2-color (Red / Green) LED × 4 (light up in red when the each beam channel receives light, blinks in red when the topmost or bottommost beam channel receives light, light up in green when all beam channels receive light) OSSD indicator: 2-color (Red / Green) LED (lights up in red when control output (OSSD) is OFF, light up in green when control output (OSSD) is ON) Unstable incident beam indicator: Orange LED (lights up when light received is unstable) Fault indicator: Yellow LED (lights up or blinks if a fault occurs in the sensor)			
Emission halt function	Incorporated				
Environmental resistance	Degree of protection	IP65 (IEC)			
	Ambient temperature / Ambient humidity	- 10 to + 55 °C + 14 to + 131 °F (No dew condensation or icing allowed), Storage: - 25 to + 70 °C - 13 to + 158 °F / 30 to 85 % RH, Storage: 30 to 95 % RH			
	Ambient illuminance	Sunlight: 20,000 lx at the light-receiving face, Incandescent light: 3,500 lx at the light-receiving face			
	Dielectric strength voltage / Insulation resistance	1,000 V AC for one min. between all supply terminals connected together and enclosure (Note 2) / 20MΩ, or more, with 500 V DC megger between all supply terminals connected together and enclosure (Note 2)			
	Vibration resistance / Shock resistance	10 to 55 Hz frequency, 0.75 mm 0.03 in amplitude in X, Y and Z directions for two hours each / 300 m/s ² acceleration (30 G approx.) in X, Y and Z directions for three times each			
Emitting element	Infrared LED (Peak emission wavelength: 870 nm 0.034 mil)				
Material	Enclosure: Aluminium, Resin case: ABS, Lens: Polycarbonate, Cap: PBT				
Cable	Emitter: 6-core (0.3 mm ² × 4-core, 0.2 mm ² × 2-core) shielded cable, 0.5 m 1.64 ft long, with a connector at the end Receiver: 7-core (0.3 mm ² × 5-core, 0.2 mm ² × 2-core) shielded cable, 0.5 m 1.64 ft long, with a connector at the end				
Cable extension	Extension up to total 20.5 m 67.257 ft is possible, for both emitter and receiver, with optional mating cables.				
Accessories	MS-SF2N-1 (Rear mounting bracket): 1 set for emitter and receiver MS-SF2N-2 (U-shaped rear mounting intermediate supporting bracket, MS-SF4A-H2 for 'H' type): (Note 3) MS-SF2N-L (L-shaped intermediate supporting bracket): (Note 3) SF2-AH-TR (Test rod): 1 No. [SF2-AH□(-PN) only]				

Notes: 1) Since the color of operation indicator changes according to the ON / OFF state of control output (OSSD), the operation indicator is marked as OSSD on the sensor.

2) Surge absorber is connected between the main body enclosure and the supply terminals, to avoid faulty operation due to surge. For this reason, the values for dielectric strength voltage and insulation resistance are given for the condition when the surge absorber has been removed.

3) U-shaped rear mounting intermediate supporting bracket (**MS-SF2N-2** or **MS-SF4A-H2**) and L-shaped intermediate supporting bracket (**MS-SF2N-L**) are attached with the following sensors. The number of attached U-shaped rear mounting intermediate supporting bracket and L-shaped intermediate supporting bracket are different depending on the sensor as follows.

SF2-AH36(-PN)(-H), **SF2-AH40(-PN)(-H)**, **SF2-AA18(-PN)(-H)**, **SF2-AA20(-PN)(-H)**: 1 set

SF2-AH48(-PN)(-H), **SF2-AA24(-PN)(-H)**: 2 sets

SF2-AH56(-PN)(-H), **SF2-AH64(-PN)(-H)**, **SF2-AH72(-PN)(-H)**, **SF2-AA28(-PN)(-H)**, **SF2-AA32(-PN)(-H)**, **SF2-AA36(-PN)(-H)**: 3 sets

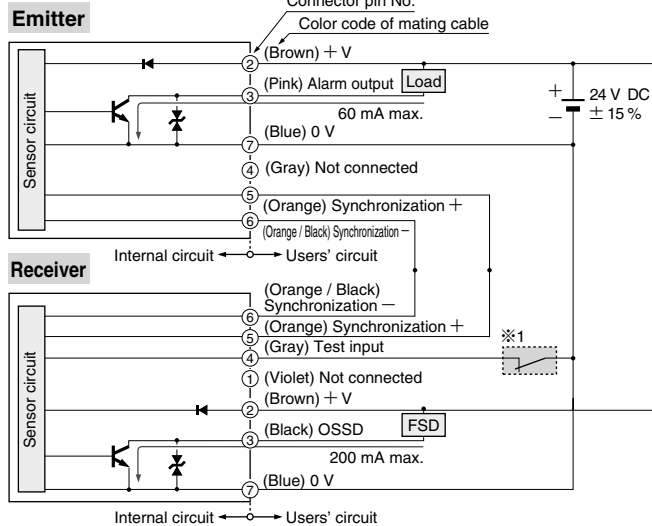
SF2-AH80(-PN)(-H), **SF2-AA40(-PN)(-H)**: 4 sets

SF2-AH88(-PN)(-H), **SF2-AH96(-PN)(-H)**, **SF2-AA44(-PN)(-H)**, **SF2-AA48(-PN)(-H)**: 5 sets

I/O CIRCUIT AND WIRING DIAGRAMS

NPN output type

I/O circuit diagram



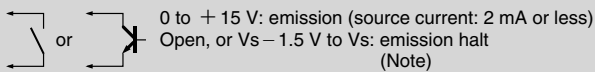
Note: Unused wires must be insulated to ensure that they do not come into contact with wires already in use.

CAUTION

Use a safety relay unit or an equivalent safety control circuit for FSD.

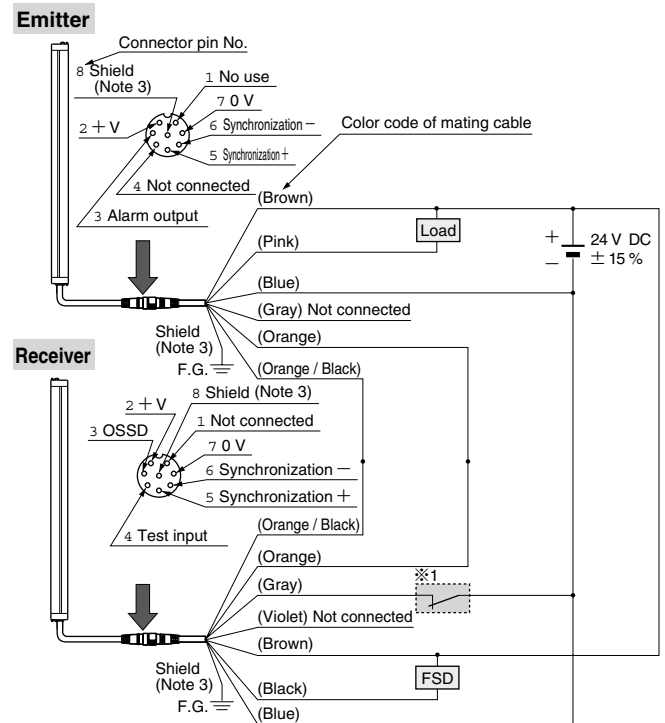
※1

Non-voltage contact or NPN open-collector transistor



Note: Vs is the same voltage as the voltage of the power supply to be used.

Wiring diagram



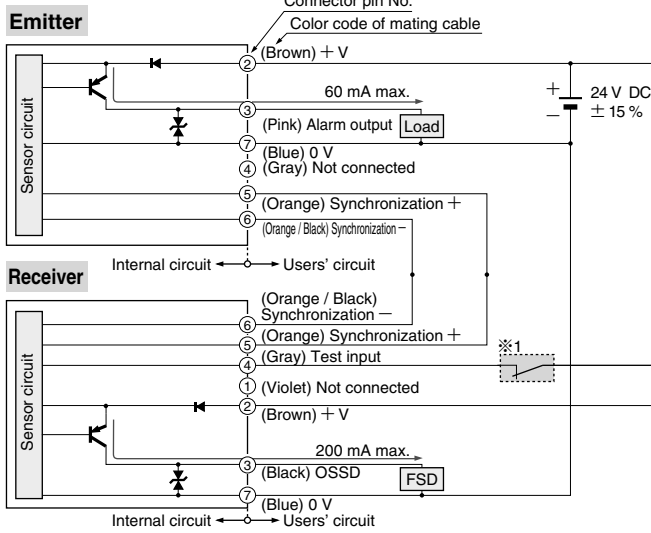
- Notes: 1) Unused wires must be insulated to ensure that they do not come into contact with wires already in use.
 2) Conductor's section area of cord of mating cables are 0.2 mm² (synchronization wire) and 0.3 mm² (exclude synchronization wire).
 3) Connect the shield wire to the frame ground (F.G.) without fail.

SF2-A

I/O CIRCUIT AND WIRING DIAGRAMS

PNP output type

I/O circuit diagram



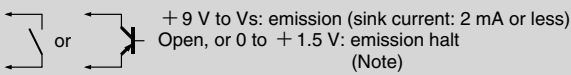
Note: Unused wires must be insulated to ensure that they do not come into contact with wires already in use.

CAUTION

Use a safety relay unit or an equivalent safety control circuit for FSD.

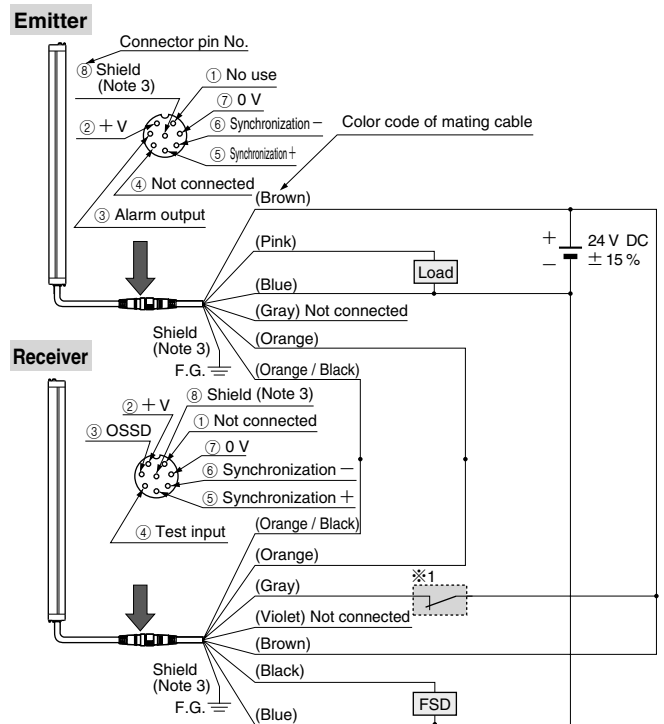
※1

Non-voltage contact or PNP open-collector transistor



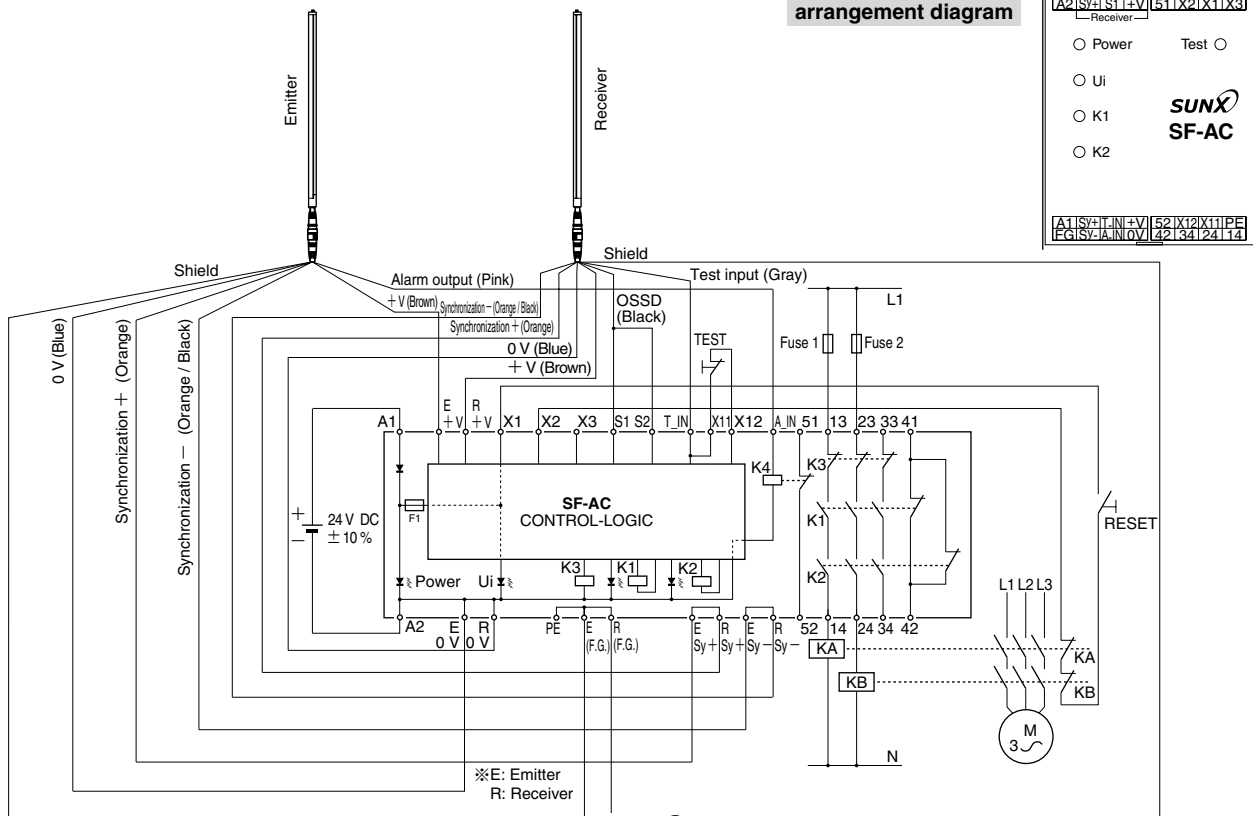
Note: Vs is the same voltage as the voltage of the power supply to be used.

Wiring diagram

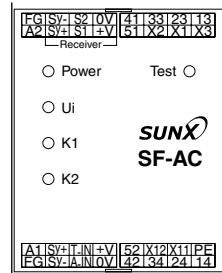


- Notes: 1) Unused wires must be insulated to ensure that they do not come into contact with wires already in use.
 2) Conductor's section area of cord of mating cables are 0.2 mm² (synchronization wire) and 0.3 mm² (exclude synchronization wire).
 3) Connect the shield wire to the frame ground (F.G.) without fail.

SF-AC Wiring diagram (Control category 2)

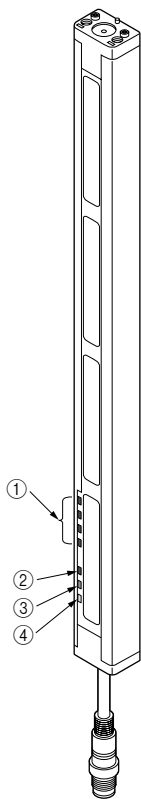


SF-AC Terminal arrangement diagram



PRECAUTIONS FOR PROPER USE

Part description and function

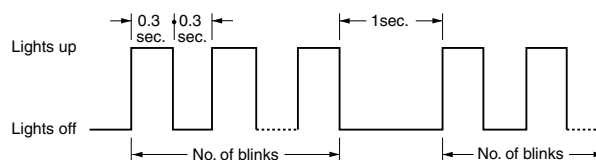


	Description	Function
Emitter	① Beam-axis alignment indicators [RECEPTION] (Red / Green LED)	Top: Blinks in red when the topmost beam channel receives light, lights up in red when sensor top receives light. Upper middle: Lights up in red when sensor upper middle receives light. Lower middle: Lights up in red when sensor lower middle receives light. Bottom: Blinks in red when the bottommost beam channel receives light, lights up in red when sensor bottom receives light. Lights up in green when all beam channels (top, upper middle, lower middle and bottom) receive light.
	② Operation indicator [OSSD] (Note 1) (Red / Green LED)	Lights up in red when control output (OSSD) is OFF, lights up in green when control output (OSSD) is ON.
	③ Emission halt indicator [HALT] (Orange LED)	Lights up when emission halts.
	④ Fault indicator [FAULT] (Yellow LED)	Lights up or blinks when a fault occurs in the sensor. (Note 2) Lights up: Malfunction of internal circuit Blinks: Effects from noise, power supply or malfunction of internal circuit
Receiver	① Beam-axis alignment indicators [RECEPTION] (Red / Green LED)	Top: Blinks in red when the topmost beam channel receives light, lights up in red when sensor top receives light. Upper middle: Lights up in red when sensor upper middle receives light. Lower middle: Lights up in red when sensor lower middle receives light. Bottom: Blinks in red when the bottommost beam channel receives light, lights up in red when sensor bottom receives light. Lights up in green when all beam channels (top, upper middle, lower middle and bottom) receive light.
	② OSSD indicator [OSSD] (Red / Green LED)	Lights up in red when control output (OSSD) is OFF, lights up in green when control output (OSSD) is ON.
	③ Unstable incident beam indicator [STB.] (Orange LED)	Lights up when light received is unstable.
	④ Fault indicator [FAULT] (Yellow LED)	Lights up or blinks when a fault occurs in the sensor. (Note 2) Lights up: Fault occurs in OSSD circuit. (please contact our office.) 1 blink: Received extraneous light error 2 blinks: Effects from noise, power supply or malfunction of internal circuitry

Notes: 1) Since the color of the operation indicator changes according to the ON / OFF state of OSSD, the operation indicator is marked as OSSD on the sensor.

2) Blink cycle of the fault indicator shows as below. Please check the number of blinks after the fault indicator lights off while 1 sec. approx.

Blink cycle of fault indicator



Wiring

- 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.



- Do not utilize this sensor in 'PSDI Mode', in which the sensor is utilized as an activator for machinery.
- This sensor is a Type 2 electro-sensitive protective equipment. It is specified that this sensor be utilized only within systems implementing safety categories 2, 1 and B (safety-related categories for control systems), as determined by European Standard EN 954-1. This sensor must never be utilized in any system that requires the usage of category 4 equipment, such as press machines; nor for systems requiring category 3 equipment.


Refer to the instruction manual enclosed with this product for detailed instructions.

- 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.

SF2-A

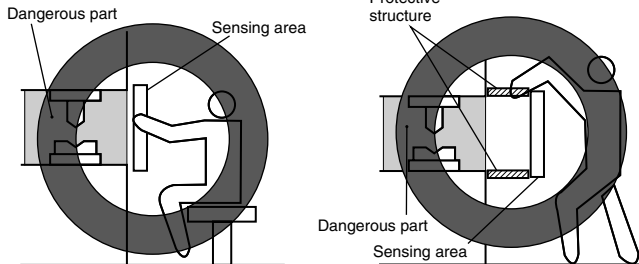
PRECAUTIONS FOR PROPER USE

Sensing area

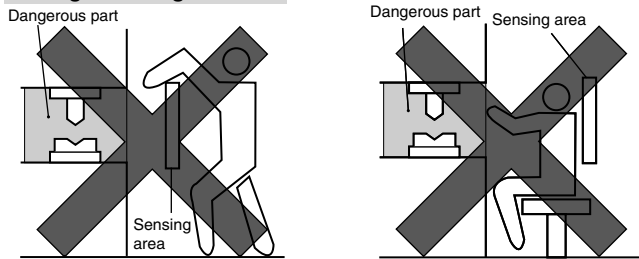


- Make sure to install this product such that any part of the human body must pass through its sensing area in order to reach the dangerous parts of the machinery. If the human body is not detected, there is a danger of serious injury or death.
- Do not use any reflective type or retroreflective type arrangement.


Correct mounting method



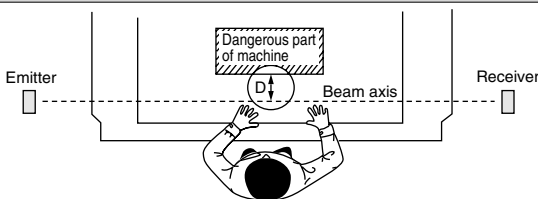
Wrong mounting method



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. If the safety distance is miscalculated or if sufficient distance is not maintained, there is a danger of serious injury or death.
- Before designing the system, refer to the relevant standards of the region where this device is to be used and then install this device.



- Safety distance is calculated based on the following equation when a person moves perpendicular (normal intrusion) to the sensing area of the sensor. (Please check the latest standards for the equation.)


For use in Europe (as per EN 999)

- Equation ① $D = K \times T + C$
- D: Safety distance (mm)
Minimum required distance between the surface of the sensing area and dangerous part of machine.
- K: Intrusion speed of operator's body (mm/sec.)
Normally, taken as SF2-AH□(-PN)(-H) 2,000 (mm/sec.), SF2-AA□(-PN)(-H) 1,600 (mm/sec.) for calculation.
- T: Response time of total equipment (sec.)
 $T = T_m + T_{SF2}$
T_m: Maximum halt time of device (sec.)
T_{SF2}: Response time of the SF2-A series 0.015 (sec.)
- C: Additional distance calculated from the size of the minimum sensing object of the sensor (mm)
Note that the value of C is not 0 or less.
 $C = 8 \times (d - 14)$
- d: Minimum sensing object diameter
SF2-AH□(-PN)(-H) 30 (mm) 1.181 (in)
For SF2-AA□(-PN)(-H), C = 850 mm 33.465 in

For use in U.S.A. (as per ANSI B11.19)

- Equation ② $D = K \times (T_s + T_c + T_{SF2} + T_{bm}) + D_{pf}$
- D: Safety distance (mm)
Minimum required distance between the surface of the sensing area and dangerous part of machine.
- K: Intrusion speed [Recommended value in OSHA is 63 (inch/sec.) [≒1,600 (mm/sec.)]]
ANSI B11.19 does not define the intrusion speed (K). When determining K, consider possible factors including physical ability of operators.
- T_s: Halt 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_{SF2}: Response time of the SF2-A series 0.015 (sec.)
- T_{bm}: Additional halt time tolerance for the brake monitor (sec.)
 $T_{bm} = T_a - (T_s + T_c)$
T_a: Setting time of brake monitor (sec.)
When the machine is not equipped with a brake monitor, it is recommended that 20%, or more, of (T_s + T_c) is taken as additional halting time.
- D_{pf}: Additional distance calculated from the size of the minimum sensing object of the sensor (mm)
SF2-AH□(-PN)(-H) D_{pf} = 78.2 mm 3.079 in,
SF2-AA□(-PN)(-H) D_{pf} = 146.2 mm 5.756 in
 $D_{pf} = 3.4 \times (d - 0.276)$ (inch)
 $D_{pf} = 3.4 \times (d - 7)$ (mm)
- d: Minimum sensing object diameter 1.2 (inch) ≒ 30 (mm)
SF2-AH□(-PN)(-H)
Minimum sensing object diameter 2.0 (inch) ≒ 50 (mm)
SF2-AA□(-PN)(-H)
Note that the value of D_{pf} is not 0 or less.

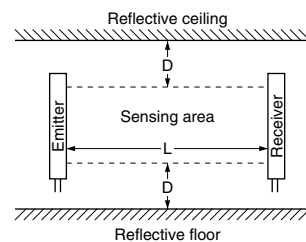
Influence of reflective surface



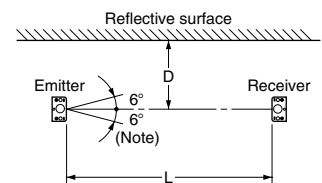
Install the sensor by considering the effect of nearby reflective surfaces and taking suitable countermeasures. Failure to do so may cause the sensor not to detect, resulting in serious injury or death.

- Keep the minimum distance given below, between the sensor and a reflective surface.

Side view



Top view



Distance between emitter and receiver, L	Allowed setting distance, D
0.3 to 3 m 0.984 to 9.843 ft	0.31 m 1.017 ft
3 to 7 m 9.843 to 22.966 ft	$L \times \tan \theta$ $\theta = 6^\circ$ $= L \times 0.105$ (m) 0.344 (ft)



Note: The effective aperture angle for this sensor is $\pm 5^\circ$ (with $L > 3$ m 9.843 ft) as required by IEC 61496-2. However, install this sensor away from the reflective surfaces, assuming a effective aperture angle of $\pm 6^\circ$ to provide for misalignment, etc., during installation.

PRECAUTIONS FOR PROPER USE

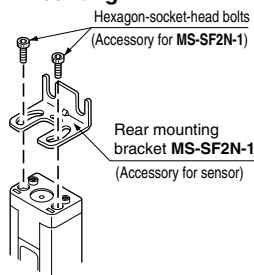
Mounting

- The minimum bending radius of the cable is R30 mm 1.181 in. Mount the sensor considering the cable bending radius.

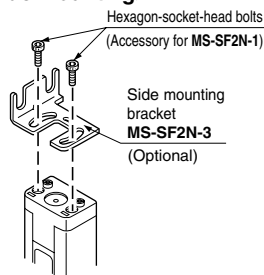
Mounting of sensor mounting bracket (MS-SF2N-1/3/5)

- Choose the sensor mounting bracket based on the mounting direction (side or rear), and temporarily tighten the brackets with two M3 (length 5 mm 0.197 in) hexagon-socket-head bolts for adjusting the mounting angle. After the beam-axis alignment, tighten then bolts completely. When mounting the sensor, the tightening torque should be 0.6 N·m or less.

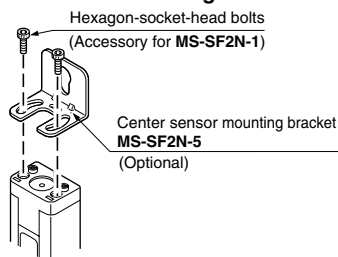
<Back mounting>



<Side mounting>



<Center sensor mounting bracket>



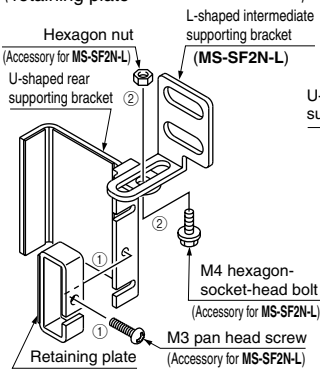
Note: Multiple beam channel sensors requiring the intermediate supporting bracket (20 mm 0.787 in beam pitch type: 36 beam channels or more, 40 mm 1.575 in beam pitch type: 18 beam channels or more) cannot mount on an aluminum frame with the center sensor mounting bracket (MS-SF2N-5).

Mounting of intermediate supporting bracket (MS-SF2N-2/4, MS-SF4A-H2/H4)

- Place the retaining plate on the U-shaped rear / side supporting bracket and temporarily tighten them with M3 (length 10 mm 0.394 in) pan head screw.
- Temporarily tighten the L-shaped intermediate supporting bracket to the U-shaped rear / side supporting bracket with a M4 (length 10 mm 0.394 in) hexagon-socket-head bolt.

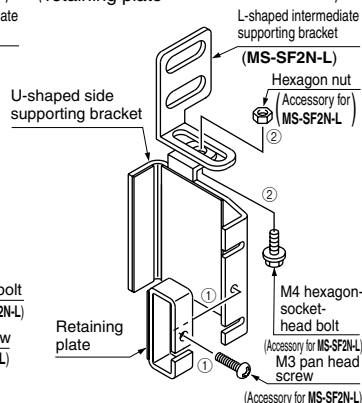
<Back mounting>

MS-SF2N-2 / MS-SF4A-H2
(U-shaped rear supporting bracket, retaining plate)



<Side mounting>

MS-SF2N-4 / MS-SF4A-H4
(U-shaped side supporting bracket, retaining plate)

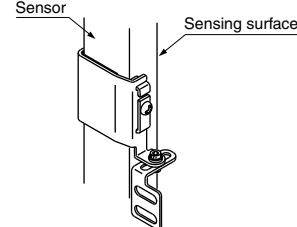


Note: The above diagrams are only applicable to the MS-SF2N-2/4. The MS-SF4A-H2/H4 have different shapes.

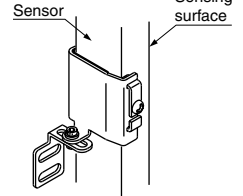
- Clamp the sensor main body with the U-shaped rear / side supporting bracket and completely tighten M3 pan head screw that secures the retaining plate. (Tightening torque: 0.4 N·m or less)

After the beam-axis alignment, ensure that the M4 hexagon-socket-head bolt, which was used to temporarily attach the L-shaped intermediate supporting bracket to the U-shaped rear / side supporting bracket, is now fully tightened. (Tightening torque: 1.8 N·m or less)

<Back mounting>



<Side mounting>



Note: The above illustrations show how to mount the emitter onto the intermediate supporting brackets. Note that the top and bottom orientation will be reversed when mounting the receiver to the supporting brackets.

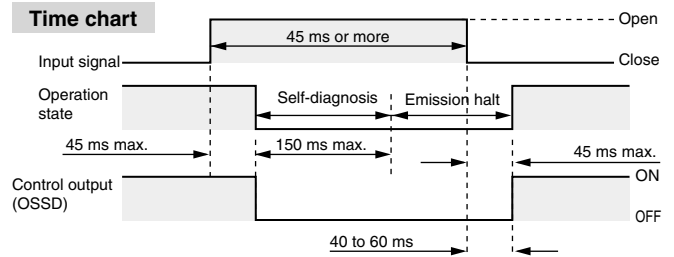
Test input (self-diagnosis function) / Emission halt function



In order to maintain safety, carry out the self-diagnosis at least once a day.

- If the test input wire is made open for 45 ms or more, or connected to $V_s - 1.5\text{ V}$ to V_s (PNP output type: 0 to +1.5 V) detailed diagnosis, in addition to the internal self-diagnosis being done during normal operation, is carried out. In case no abnormality is discovered during self-diagnosis, and if the test input is continued to be kept open after that, emission halt state is achieved. In case an abnormality is discovered during self-diagnosis, the device is put in the lockout state at that instant, and the OSSD and alarm outputs are fixed at the OFF state.
- Emission halt state is achieved when no abnormality is detected during self-diagnosis and the test input is continued to be kept open after that. During emission halt, OSSD and alarm output become OFF. By using this function, malfunction due to extraneous noise, or abnormality in OSSD and alarm output, can be determined even from the equipment side.

Time chart



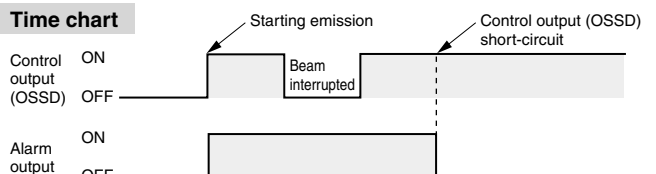
Alarm output



Be sure to use the alarm output.

- Since the occurrence of a fault, such as that due to an external short-circuit, cannot be conveyed to the equipment side by control output (OSSD), the alarm output generates a warning signal. Design a system such that the equipment can be stopped when either control output (OSSD) or alarm output is output.

Time chart



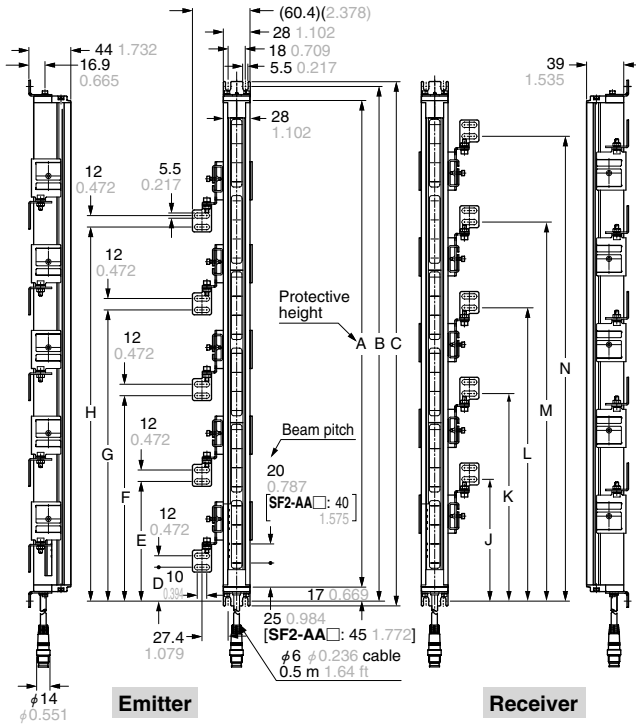
DIMENSIONS (Unit: mm in)

SF2-AH□(-PN)-H
SF2-AA□(-PN)-H Sensor

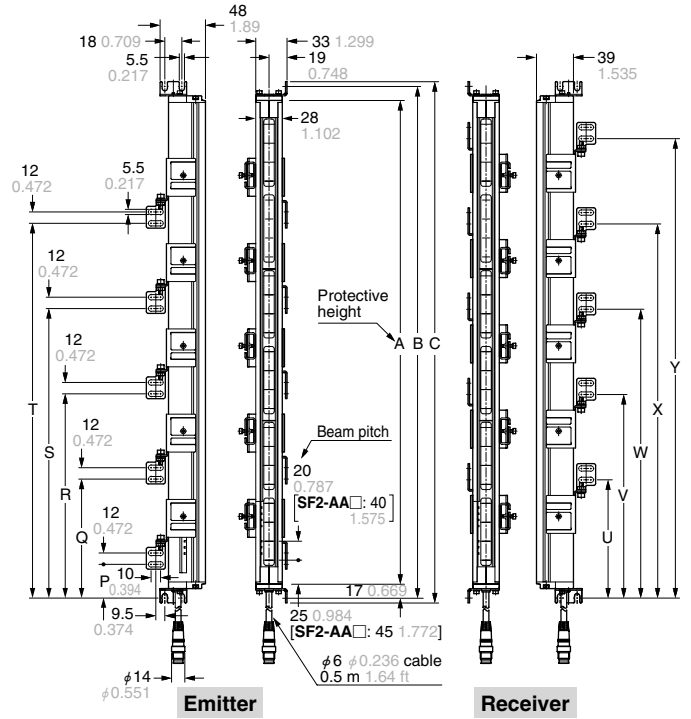
Assembly dimensions

Mounting drawing for the sensor on which the sensor mounting brackets and the intermediate supporting brackets are mounted.

<Back mounting>



<Side mounting>



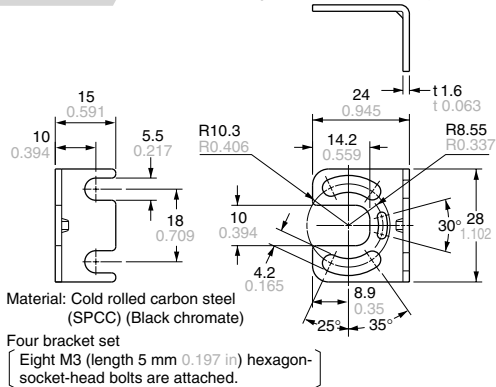
Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N
SF2-AH8(-PN)-H	190	222	232	-	-	-	-	-	-	-	-	-	-
SF2-AA4(-PN)-H	7.48	8.74	9.134	-	-	-	-	-	-	-	-	-	-
SF2-AH12(-PN)-H	270	302	312	-	-	-	-	-	-	-	-	-	-
SF2-AA6(-PN)-H	10.63	11.89	12.283	-	-	-	-	-	-	-	-	-	-
SF2-AH16(-PN)-H	350	382	392	-	-	-	-	-	-	-	-	-	-
SF2-AA8(-PN)-H	13.78	15.039	15.433	-	-	-	-	-	-	-	-	-	-
SF2-AH20(-PN)-H	430	462	472	-	-	-	-	-	-	-	-	-	-
SF2-AA10(-PN)-H	16.929	18.189	18.583	-	-	-	-	-	-	-	-	-	-
SF2-AH24(-PN)-H	510	542	552	-	-	-	-	-	-	-	-	-	-
SF2-AA12(-PN)-H	20.079	21.339	21.372	-	-	-	-	-	-	-	-	-	-
SF2-AH28(-PN)-H	590	622	632	-	-	-	-	-	-	-	-	-	-
SF2-AA14(-PN)-H	23.228	24.488	24.882	-	-	-	-	-	-	-	-	-	-
SF2-AH32(-PN)-H	670	702	712	-	-	-	-	-	-	-	-	-	-
SF2-AA16(-PN)-H	26.378	27.638	28.031	-	-	-	-	-	-	-	-	-	-
SF2-AH36(-PN)-H	750	782	792	337	-	-	-	-	433	-	-	-	-
SF2-AA18(-PN)-H	29.528	30.787	31.181	13.288	-	-	-	-	17.047	-	-	-	-
SF2-AH40(-PN)-H	830	862	872	377	-	-	-	-	473	-	-	-	-
SF2-AA20(-PN)-H	32.677	33.937	34.331	14.842	-	-	-	-	18.622	-	-	-	-
SF2-AH48(-PN)-H	990	1,022	1,032	377	537	-	-	-	473	633	-	-	-
SF2-AA24(-PN)-H	38.976	40.236	40.63	14.842	21.142	-	-	-	18.622	24.921	-	-	-
SF2-AH56(-PN)-H	1,150	1,182	1,192	377	537	697	-	-	473	633	793	-	-
SF2-AA28(-PN)-H	45.276	46.535	46.929	14.842	21.142	27.441	-	-	18.622	24.921	31.22	-	-
SF2-AH64(-PN)-H	1,310	1,342	1,352	457	617	777	-	-	553	713	873	-	-
SF2-AA32(-PN)-H	51.575	52.835	53.228	17.992	24.291	30.59	-	-	21.772	28.071	34.37	-	-
SF2-AH72(-PN)-H	1,470	1,502	1,512	537	697	857	-	-	633	793	953	-	-
SF2-AA36(-PN)-H	57.874	59.134	59.527	21.142	27.441	33.74	-	-	24.921	31.22	37.52	-	-
SF2-AH80(-PN)-H	1,630	1,662	1,672	537	697	857	1,017	-	633	793	953	1,113	-
SF2-AA40(-PN)-H	64.173	65.433	65.827	21.142	27.441	33.74	40.039	-	24.921	31.22	37.52	43.819	-
SF2-AH88(-PN)-H	1,790	1,822	1,832	537	697	857	1,017	1,177	633	793	953	1,113	1,273
SF2-AA44(-PN)-H	70.472	71.732	72.126	21.142	27.441	33.74	40.039	46.338	24.921	31.22	37.52	43.819	50.118
SF2-AH96(-PN)-H	1,950	1,982	1,992	617	777	937	1,097	1,257	713	873	1,033	1,193	1,353
SF2-AA48(-PN)-H	76.772	78.031	78.425	24.291	30.59	36.89	43.189	49.488	28.071	34.37	40.669	46.968	53.268

Model No.	A	B	C	P	Q	R	S	T	U	V	W	X	Y
SF2-AH8(-PN)-H	190	222	232	-	-	-	-	-	-	-	-	-	-
SF2-AA4(-PN)-H	7.48	8.74	9.134	-	-	-	-	-	-	-	-	-	-
SF2-AH12(-PN)-H	270	302	312	-	-	-	-	-	-	-	-	-	-
SF2-AA6(-PN)-H	10.63	11.89	12.283	-	-	-	-	-	-	-	-	-	-
SF2-AH16(-PN)-H	350	382	392	-	-	-	-	-	-	-	-	-	-
SF2-AA8(-PN)-H	13.78	15.039	15.433	-	-	-	-	-	-	-	-	-	-
SF2-AH20(-PN)-H	430	462	472	-	-	-	-	-	-	-	-	-	-
SF2-AA10(-PN)-H	16.929	18.189	18.583	-	-	-	-	-	-	-	-	-	-
SF2-AH24(-PN)-H	510	542	552	-	-	-	-	-	-	-	-	-	-
SF2-AA12(-PN)-H	20.079	21.339	21.372	-	-	-	-	-	-	-	-	-	-
SF2-AH28(-PN)-H	590	622	632	-	-	-	-	-	-	-	-	-	-
SF2-AA14(-PN)-H	23.228	24.488	24.882	-	-	-	-	-	-	-	-	-	-
SF2-AH32(-PN)-H	670	702	712	-	-	-	-	-	-	-	-	-	-
SF2-AA16(-PN)-H	26.378	27.638	28.031	-	-	-	-	-	-	-	-	-	-
SF2-AH36(-PN)-H	750	782	792	340	-	-	-	-	430	-	-	-	-
SF2-AA18(-PN)-H	29.528	30.787	31.181	13.386	-	-	-	-	16.929	-	-	-	-
SF2-AH40(-PN)-H	830	862	872	380	-	-	-	-	470	-	-	-	-
SF2-AA20(-PN)-H	32.677	33.937	34.331	14.961	-	-	-	-	18.504	-	-	-	-
SF2-AH48(-PN)-H	990	1,022	1,032	380	540	-	-	-	470	630	-	-	-
SF2-AA24(-PN)-H	38.976	40.236	40.63	14.961	21.26	-	-	-	18.504	24.803	-	-	-
SF2-AH56(-PN)-H	1,150	1,182	1,192	380	540	700	-	-	470	630	790	-	-
SF2-AA28(-PN)-H	45.276	46.535	46.929	14.961	21.26	27.559	-	-	18.504	24.803	31.102	-	-
SF2-AH64(-PN)-H	1,310	1,342	1,352	460	620	780	-	-	550	710	870	-	-
SF2-AA32(-PN)-H	51.575	52.835	53.228	18.11	24.409	30.709	-	-	21.654	27.953	34.252	-	-
SF2-AH72(-PN)-H	1,470	1,502	1,512	540	700	860	-	-	630	790	950	-	-
SF2-AA36(-PN)-H	57.874	59.134	59.527	21.26	27.559	33.858	-	-	24.803	31.102	37.402	-	-
SF2-AH80(-PN)-H	1,630	1,662	1,672	540	700	860	1,020	-	630	790	950	1,110	-
SF2-AA40(-PN)-H	64.173	65.433	65.827	21.26	27.559	33.858	40.157	-	24.803	31.102	37.402	43.701	-
SF2-AH88(-PN)-H	1,790	1,822	1,832	540	700	860	1,020	1,180	630	790	950	1,110	1,270
SF2-AA44(-PN)-H	70.472	71.732	72.126	21.26	27.559	33.858	40.157	46.457	24.803	31.102	37.402	43.701	50
SF2-AH96(-PN)-H	1,950	1,982	1,992	620	780	940	1,100	1,260	710	870	1,030	1,190	1,350
SF2-AA48(-PN)-H	76.772	78.031	78.425	24.409	30.709	37.008	43.307	49.606	27.953	34.252	40.551	46.85	53.15

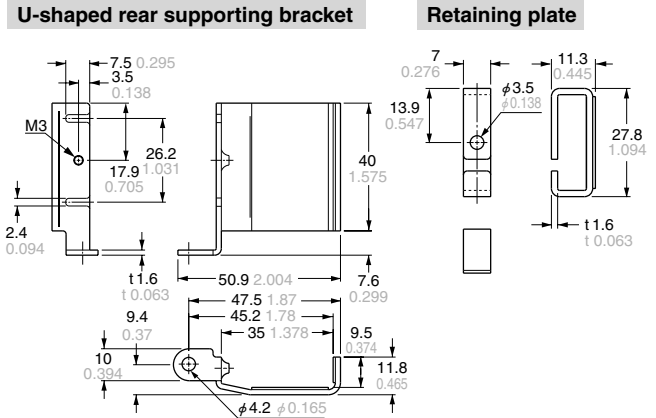
SF2-A

DIMENSIONS (Unit: mm in)

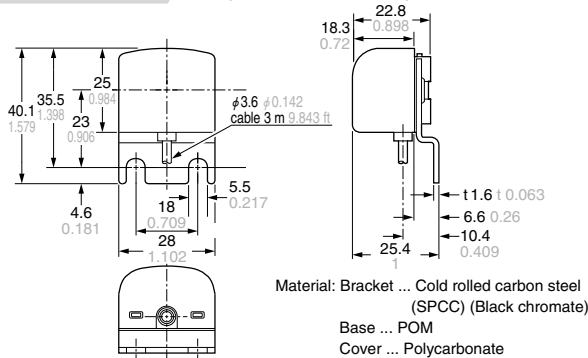
MS-SF2N-1 Rear mounting bracket (Accessory for sensor)



MS-SF2N-2 U-shaped rear mounting intermediate supporting bracket for SF2-AH□/AA□ (Accessory for SF2-AH□ having 36 beam channels or more and SF2-AA□ having 18 beam channels or more)

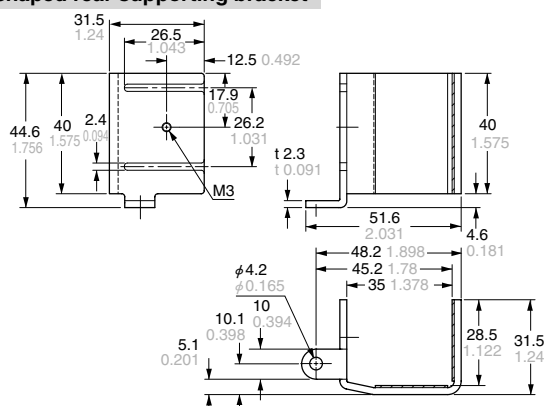


SF-IND-2 Large display unit for light curtain (Optional)

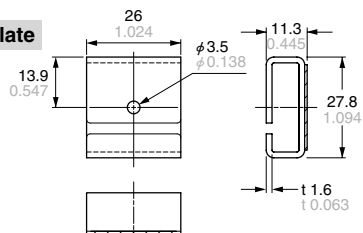


MS-SF4A-H2 U-shaped rear mounting intermediate supporting bracket for SF2-AH□/AA□-H (Accessory for SF2-AH□-H having 36 beam channels or more and SF2-AA□-H having 18 beam channels or more)

U-shaped rear supporting bracket



Retaining plate



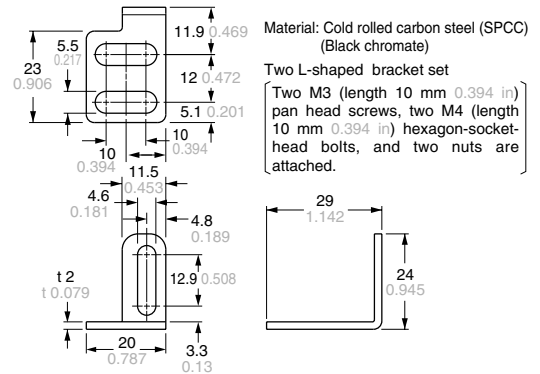
Material: Cold rolled carbon steel (SPCC) (Black chromate)

Set of 2 Nos. each of U-shaped rear supporting bracket and retaining plate (Note)

Note: MS-SF4A-H2 (U-shaped rear mounting intermediate supporting bracket) is attached with the following sensors. The number of attached U-shaped rear mounting intermediate supporting brackets is different depending on the sensor as follows.

SF2-AH36(-PN)-H, SF2-AH40(-PN)-H, SF2-AA18(-PN)-H, SF2-AA20(-PN)-H: 1 set
SF2-AH48(-PN)-H, SF2-AA24(-PN)-H: 2 sets
SF2-AH56(-PN)-H, SF2-AH64(-PN)-H, SF2-AH72(-PN)-H, SF2-AA28(-PN)-H, SF2-AA32(-PN)-H, SF2-AA36(-PN)-H: 3 sets
SF2-AH80(-PN)-H, SF2-AA40(-PN)-H: 4 sets
SF2-AH88(-PN)-H, SF2-AH96(-PN)-H, SF2-AA44(-PN)-H, SF2-AA48(-PN)-H: 5 sets

MS-SF2N-L L-shaped intermediate supporting bracket (Accessory for SF2-AH□(-H) having 36 beam channels or more and SF2-AA□(-H) having 18 beam channels or more)



Note: MS-SF2N-L (L-shaped intermediate supporting bracket) is attached with the following sensors. The number of attached L-shaped intermediate supporting brackets is different depending on the sensor as follows.

SF2-AH36(-PN)-(-H), SF2-AH40(-PN)-(-H), SF2-AA18(-PN)-(-H), SF2-AA20(-PN)-(-H): 1 set
SF2-AH48(-PN)-(-H), SF2-AA24(-PN)-(-H): 2 sets
SF2-AH56(-PN)-(-H), SF2-AH64(-PN)-(-H), SF2-AH72(-PN)-(-H), SF2-AA28(-PN)-(-H), SF2-AA32(-PN)-(-H), SF2-AA36(-PN)-(-H): 3 sets
SF2-AH80(-PN)-(-H), SF2-AA40(-PN)-(-H): 4 sets
SF2-AH88(-PN)-(-H), SF2-AH96(-PN)-(-H), SF2-AA44(-PN)-(-H), SF2-AA48(-PN)-(-H): 5 sets

