SF4-AH SERIES

Small Light Curtain Type 4

New

Industry's smallest Type 4 light curtain for safeguard

CE Conforming to Machine Directive & EMC Directive

c UL us Approved Listing

Conforming to OSHA / ANSI

Compliant with international safety standards

The **SF4-AH** series has surpassed the most stringent international safety levels and is compliant with the machinery directive and OSHA / ANSI standards. This series has been certified for usage in any workplace around the world.

CE Conforming to Machine Directive & EMC Directive | c UL us Approved Listing | Conforming to OSHA / ANSI

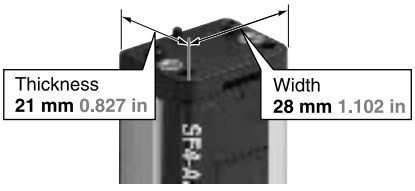
Europe CE marking based on Machine Directive and EMC Directive has been obtained, so that the sensors can be used in Control Category 4 equipment.
[Type 4 based on IEC 61496-1/2, EN 61496-1 and Control Category 4 based on EN 954-1]

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

The **SF4-AH** series is also compatible with mechanical equipment that conforms to the following regulations and standards: OSHA (1910.212/217), ANSI (B11.1 to B11.20) and ANSI / RIA 15.06.

Industry's smallest size*

The Type 4 achieves the smallest size in the industry, thus contributing to facility miniaturization.



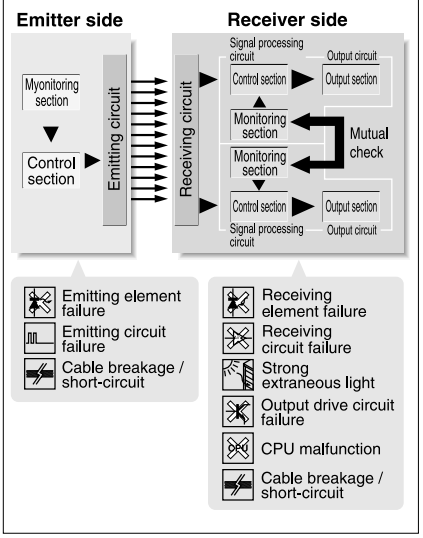
The highest standards of safety have now been achieved

It uses two independent CPUs, which mutually check the safety conditions. High reliability safety design is realized by incorporating dual circuits for signal processing and output.

Further, in order to ensure safety, FMEA (Failure Mode & Effect Analysis) has been used to prove safe operation.

The sensor unit continually performs self-checking on its internal circuitry, its cable integrity and even checks for interference from extraneous light.

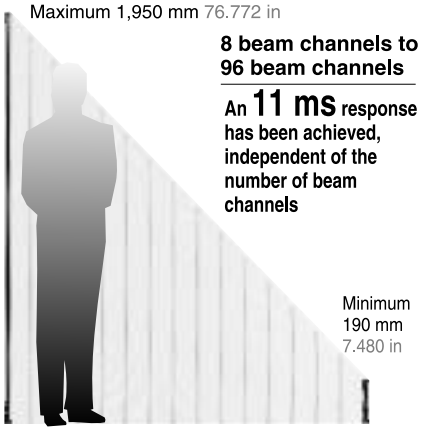
In the event of any fault or malfunction, the sensor outputs the same signal (OFF signal) as is produced during actual beam detection operation.



Reduced requirements for safety distance calculations

As a high-speed 11 ms response has been achieved, regardless of the number of beam channels, the calculation of safety distances for each individual sensor is no longer necessary. This high-speed response simplifies the entire process of safety distance calculation.

Increasing the safety distance response speed allows the safe distance between the danger areas and the light curtain to be reduced, thus allowing for miniaturization of the equipment.



8 beam channels to 96 beam channels

An 11 ms response has been achieved, independent of the number of beam channels

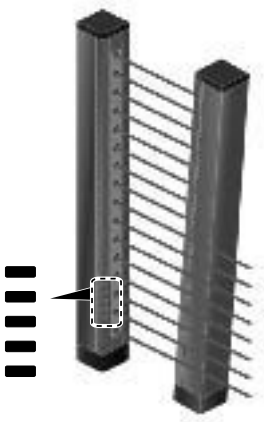
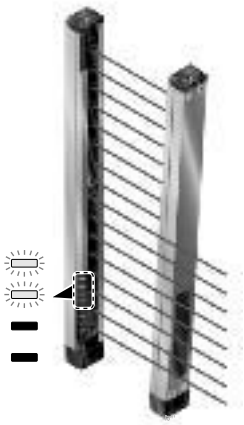
Can be utilized with equipment of all sizes – from small to large

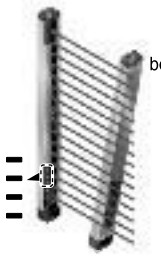
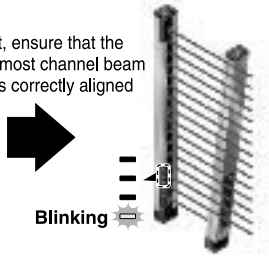
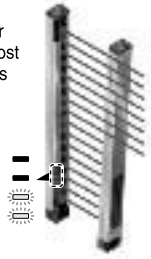
SF4-AH

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, the user can easily verify which beam axes have become aligned. Once all beams have become aligned, the indicators light up in green. Upon beginning alignment, as soon as the bottommost or the topmost beam axis (the standard beam axis) becomes aligned, the corresponding bottommost or topmost alignment indicator light begins 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.

When the upper half of all beam axes are aligned

Conventional unit	SF4-AH
After all beam channels received light, the number of indicators that light up will increase in accordance with the incident light level	Upper two indicators: ON Lower two indicators: OFF
	
Even though some beam channels are aligned, the user cannot determine which beam channels are aligned (Cannot determine which beam axes are not aligned)	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)

Beam axes are not correctly aligned	Only the bottommost channnel 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
	First, ensure that the bottommost channel beam axis is correctly aligned  Blinking	Rotate the receiver around the bottommost channel beam axis 	
All indicators light off	The bottommost indicator blinks red	The bottom two indicators light up in red	All indicators light up in green

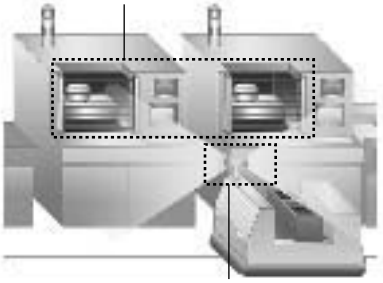
Recognizes extraneous light and prevents malfunctions

This function allows the sensor to recognize and reject interference from instantaneous 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 substantial improvements in work efficiency.

Mutual interference is reduced without the need for interference prevention lines

The ELCA (Extraneous Light Check & Avoid) function enhances the mutual interference prevention function.
ELCA decreases interference from extraneous light having a similar frequency as the light used by the **SF4-AH** series, thereby also minimizing mutual interference among nearby **SF4-AH** series sensor units.

Reducing mutual interference



High immunity to interference from extraneous light

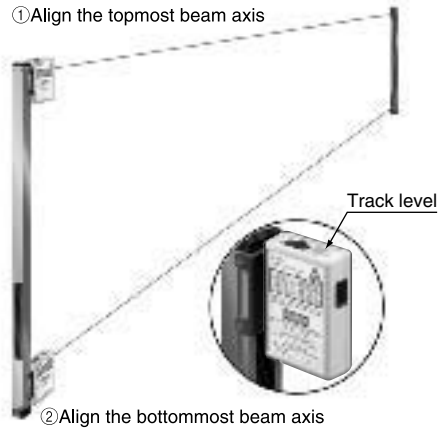
The SF4-AH series is equipped with emitting light amount control function which minimizes interference with peripheral sensors

Reducing the amount of light emitted from the emitter minimizes the effects of such emitted light on peripheral equipment.
(This function can be selected by using the Handy-controller.)

SF4-AH

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

By using the **SF-LAT-2N** laser alignment tool, you can quickly and easily align beam axes. The laser beam spot is easy to see, even when light curtain units are installed far apart. In addition, as the **SF-LAT-2N** laser alignment tool is battery-operated, beam axes can be aligned before powering up the light curtain itself.

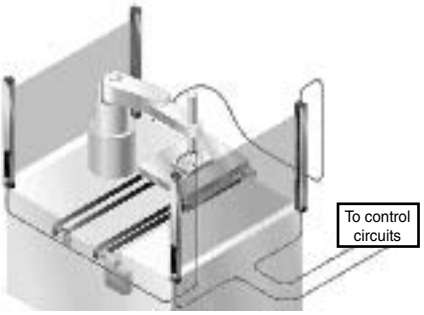


Reductions in total costs are possible by using series connections

Using the optional serial connection cable, a maximum of 3 sets (a total of 128 beam channels) of sensors can be connected in series. Previously, separate wiring was required for 3 sets of sensors. But now, wiring equivalent to that of only one set is required, thus saving troublesome wiring and costs. Moreover, fewer power connections are required, thus only one safety relay unit is needed, reducing costs even further.

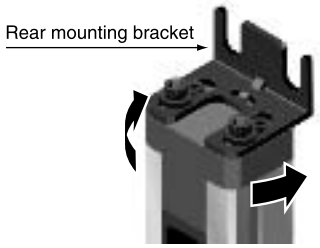
Up to 3 sets (a total of 128 beam channels) can be connected in series

Series connection cables are available in lengths of up to 3 m 9.843 ft !



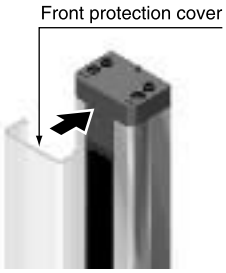
Mounting bracket enables easy beam-axis alignment

The beam-axis alignment is easy since angle adjustment is possible with the enclosed rear mounting bracket (**MS-SF2N-1**). Alternatively, the side mounting bracket (**MS-SF2N-3**) is also available as an option.



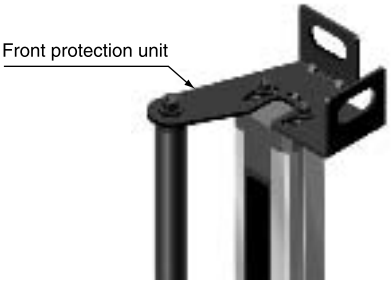
Front protection cover protects the sensing surface

In the event that the **SF4-AH** 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.



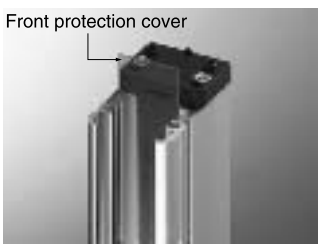
Impact protection for the sensing surface

A front protection unit is now available that will prevent damage to the sensing surface, due to impacts from objects sensed (optional).



Spatter protection for the sensing surface (for PNP output type)

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. The ELCA function implements all possible measures to prevent malfunctions caused by spatter.



SF4-AH

Our SF-HC handy controller enables each setting to be performed by hand

Our product lineup now includes a Handy-controller that enables the user to select a variety of settings.
Function settings can be easily performed by anyone.

• Any valid beam channels can be selected! The SF4-AH series now incorporates a fixed blanking function.

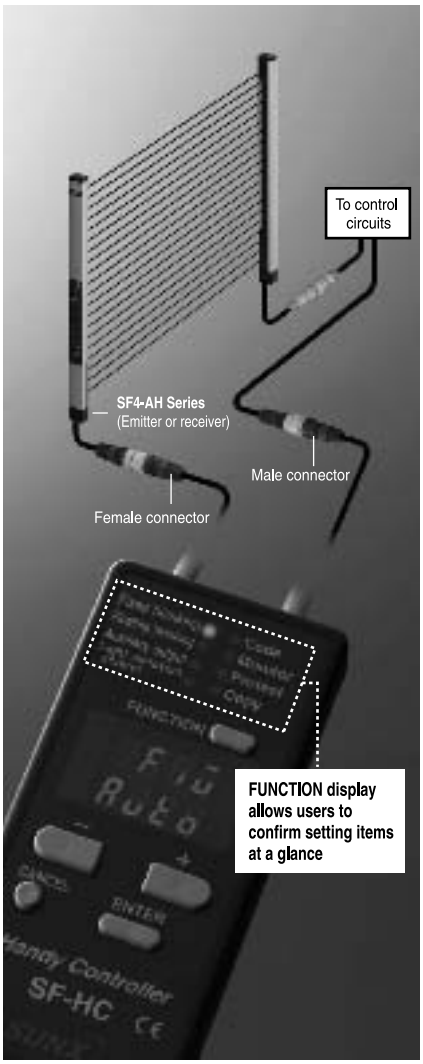
The **SF4-AH** series is equipped with a fixed blanking function that allows specific beam channels to be selectively blocked, without causing the control output (OSSD) to output the OFF signal. This function is convenient for use with applications in which certain fixed obstacles always block specific 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.

• Automatic blanking of beam channels! The SF4-AH series now 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 number of preset beam channels, then the control output (OSSD) will not output the OFF signal. This function is useful when the positions of obstacles within the sensing area must be changed during workpiece re-arrangement, or when material must be thrown through the light curtain's sensing area.

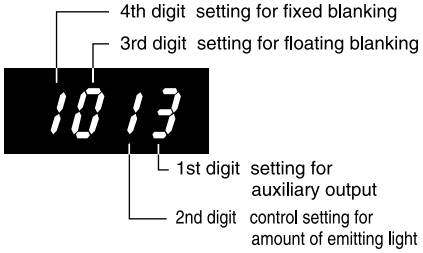
■Minimum size of objects detected

When 1 beam channel has been preset: ϕ50 mm ϕ1.969 in
When 2 beam channels have been preset: ϕ70 mm ϕ2.756 in
When 3 beam channels have been preset: ϕ90 mm ϕ3.543 in



• Each function can be directly preset using numeric input! Code selection function

Each function can be selected directly by using only a 4-digit code (numeral) in accordance with the code table.



• Auxiliary output has selectable output configuration

The output configuration of the auxiliary output can be changed.
The output is selectable from among the following configurations: same action as control output; reverse action of control output; ON when light is not being emitted (at time of lockout); and OFF when light is not being emitted (at time of lockout).

Code	4th digit	3rd digit	2nd digit	1st digit
	Fixed blanking	Floating blanking	Control for amount of emitting light	Auxiliary output
0	Invalid	Invalid	Invalid	Reverse action of control output
1	Valid / auto setting	Number of beam channel preset = 1 Invalid setting for both beam channel ends = invalid	Valid	Same action as control output
2	–	Number of beam channel preset = 2 Invalid setting for both beam channel ends = invalid	–	When light is not being emitted (at time of lockout): ON
3	–	Number of beam channel preset = 3 Invalid setting for both beam channel ends = invalid	–	When light is not being emitted (at time of lockout): OFF
1.	–	Number of beam channel preset = 1 Invalid setting for both beam channel ends = valid	–	–
2.	–	Number of beam channel preset = 2 Invalid setting for both beam channel ends = valid	–	–
3.	–	Number of beam channel preset = 3 Invalid setting for both beam channel ends = valid	–	–

• A variety of other functions can be selected

Control for amount of emitting light

This function reduces the amount of emitting light. It is useful when the effects from emitted light on other equipment must be minimized. (operating range 5 m 16.404 ft)

Monitoring function of settings details

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

Protection function

This function locks the sensor using a four-digit password. This function will not allow changes to sensor function settings unless the password is input, thus preventing third parties from accidentally changing the settings.

Copy function

Allows settings to be copied to other sensors. If the same setting must be input several times into different sensors, this function will reduce the time required for the inputting settings.

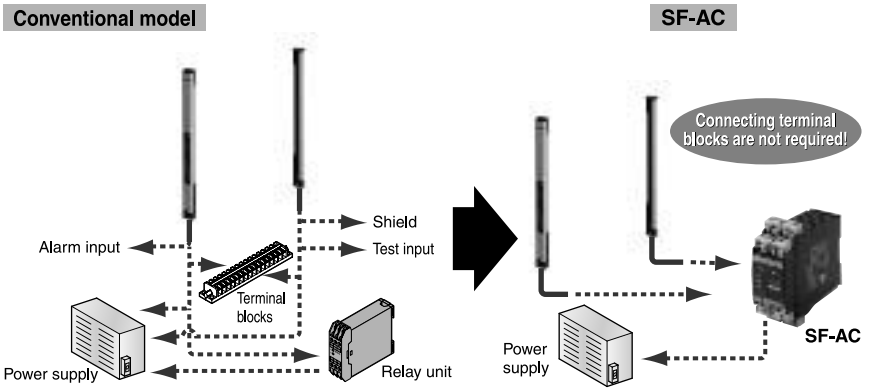
SF4-AH

The SF-AC safety relay unit especially made for the PNP output type light curtain is available

The **SF-AC**, an exclusive safety relay unit for the PNP output type light curtain, is also available. Safety will be enhanced even further.

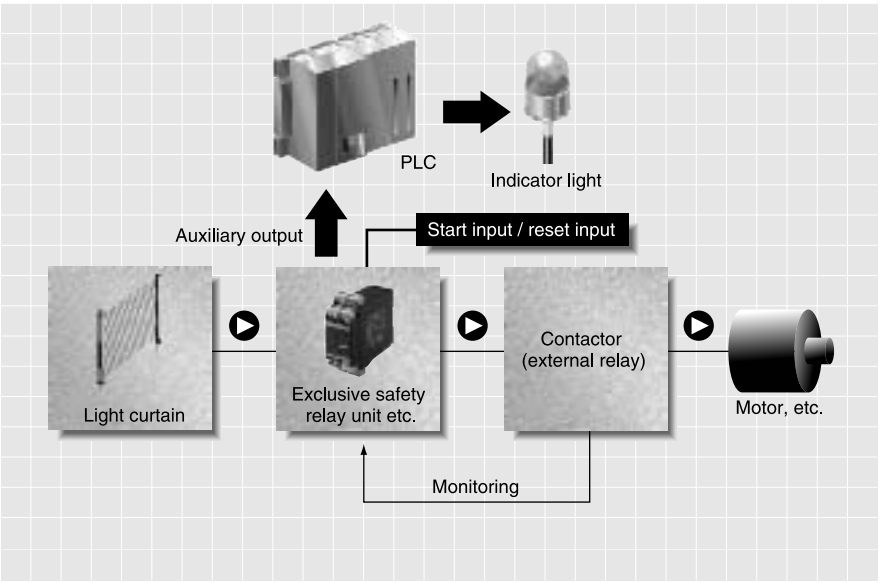
• A connecting terminal blocks are not needed

As **SF-AC** incorporates a power supply terminals and synchronization lines terminals for the light curtain, so terminal blocks are not required.



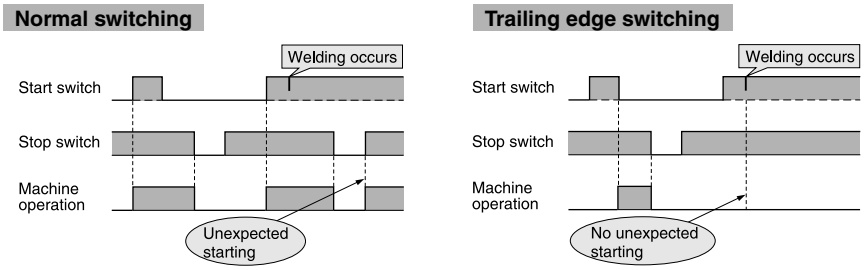
• Incorporates a 2-channel auxiliary output

SF-AC incorporates both an auxiliary output that operates together with the light curtain's control output (OSSD), and an alarm output that functions together with the light curtain's auxiliary output (non-safety output). These features allow for monitoring of light curtain activity.



• Unexpected start due to start-switch welding prevented

The unit is equipped with a trailing edge switching function, which causes an ON signal to be sent when the start-switch signal is falling. This prevents unexpected starting which can occur if the start switch gets welded.



• Corresponds to up to Control Category 4

Can correspond to Control Category 4 through a combination with the **SF4-AH** series / **SF2-EH** series as well as to Control Category 2 through a combination with the **SF2-A** series / **SF2-N** series.

• Installation time and labor can be saved due to the usage of detachable terminal blocks

As wiring can be performed with the terminal blocks removed, it is not necessary to detach the controller from the control panel when performing maintenance, thus reducing the number of installation procedures required. Also, when replacing the relay units, you simply insert new terminals without having to manipulate the wiring.

• Maintenance free

Equipped with a hybrid fuse that enables recovery with only the reintroduction of the power supply making fuse replacement unnecessary.

• 10 ms high-speed response

We have realized the highest-class response time, 10 ms, for the relay output making for even more enhanced safety.

• A contact point mechanical lifetime of 10 million operations

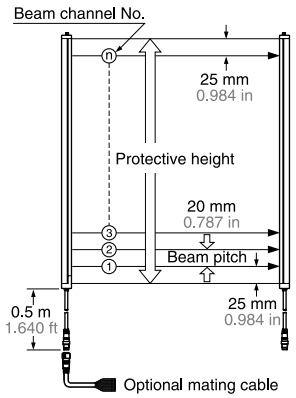
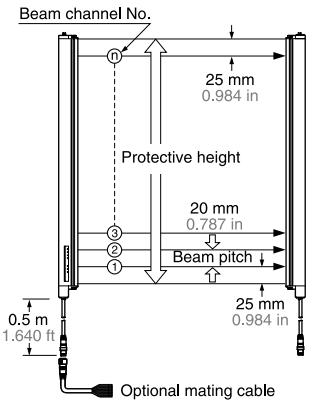
Longer usage is possible due to the long contact point lifetime.

SF4-AH

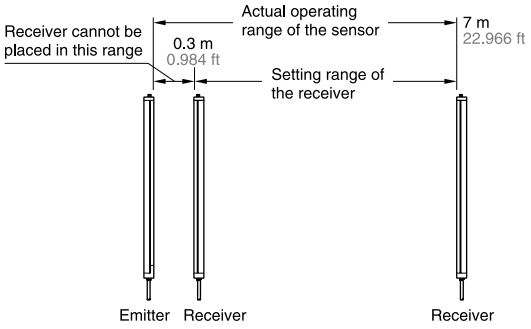
ORDER GUIDE

Sensors

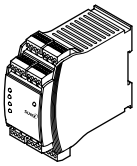
Mating cable is not supplied with the sensor. Please order it separately.

Type	Appearance	Operating range (Note 1)	Model No. NPN output	Model No. PNP output	Number of beam channels	Protective height (mm in)(Note 2)
Normal case		0.3 to 7 m 0.984 to 22.966 ft	**SF4-AH8-N**	**SF4-AH8**	8	190 7.480
			SF4-AH12-N	**SF4-AH12**	12	270 10.630
			SF4-AH16-N	**SF4-AH16**	16	350 13.780
			SF4-AH20-N	**SF4-AH20**	20	430 16.929
			SF4-AH24-N	**SF4-AH24**	24	510 20.079
			SF4-AH28-N	**SF4-AH28**	28	590 23.228
			SF4-AH32-N	**SF4-AH32**	32	670 26.378
			SF4-AH36-N	**SF4-AH36**	36	750 29.528
			SF4-AH40-N	**SF4-AH40**	40	830 32.677
			SF4-AH48-N	**SF4-AH48**	48	990 38.976
			SF4-AH56-N	**SF4-AH56**	56	1,150 45.276
			SF4-AH64-N	**SF4-AH64**	64	1,310 51.575
			SF4-AH72-N	**SF4-AH72**	72	1,470 57.874
			SF4-AH80-N	**SF4-AH80**	80	1,630 64.173
			SF4-AH88-N	**SF4-AH88**	88	1,790 70.472
			SF4-AH96-N	**SF4-AH96**	96	1,950 76.772
With spatter protection hood			———	**SF4-AH8-H**	8	190 7.480
			———	**SF4-AH12-H**	12	270 10.630
			———	**SF4-AH16-H**	16	350 13.780
			———	**SF4-AH20-H**	20	430 16.929
			———	**SF4-AH24-H**	24	510 20.079
			———	**SF4-AH28-H**	28	590 23.228
			———	**SF4-AH32-H**	32	670 36.378
			———	**SF4-AH36-H**	36	750 29.528
			———	**SF4-AH40-H**	40	830 32.677
			———	**SF4-AH48-H**	48	990 38.976
			———	**SF4-AH56-H**	56	1,150 45.276
			———	**SF4-AH64-H**	64	1,310 51.575
			———	**SF4-AH72-H**	72	1,470 57.874
			———	**SF4-AH80-H**	80	1,630 64.173
			———	**SF4-AH88-H**	88	1,790 70.472
			———	**SF4-AH96-H**	96	1,950 76.772

Notes: 1) The operating range is the possible setting distance between the emitter and the receiver. The sensor can detect less than 0.3 m 0.984 ft away.



Safety relay unit

Designation	Appearance	Model No.	Description
Safety relay unit (For PNP output type light curtain)		**SF-AC**	Safety relay unit for PNP output type • Complies with Control Categories up to 4 based on EN 954-1

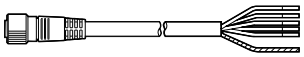
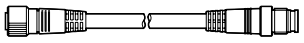
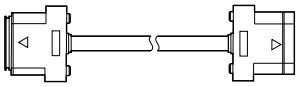
SF4-AH

ORDER GUIDE

Handy-controller

Designation	Appearance	Model No.
Handy-controller		**SF-HC**

Mating cables

Designation	Appearance	Model No.	Description	
Cable with connector on one end		**SF4A-CC3**	Length: 3 m 9.843 ft Weight: 380 g approx. (two cables)	These cables are used for wiring. 6-core shielded cable with connector on one end, two cables per set 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)
		SF4A-CC7	Length: 7 m 22.966 ft Weight: 800 g approx. (two cables)	
		SF4A-CC10	Length: 10 m 32.808 ft Weight: 1,120 g approx. (two cables)	
Cable with connector on both ends		**SF4A-CCJ10**	Length: 10 m 32.808 ft Weight: 1,160 g approx. (two cables)	This cable is used for cable extension. Shielded cable with connector on both ends, two cables per set 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)
Cable for series connection (Note)		**SF4A-CSL02**	Length: 200 mm 7.874 in Weight: 70 g approx. (two cables)	Used to connect sensors in series Shielded cable with connector on both ends, two cables per set (common for emitter and receiver) Cable outer diameter: ϕ6 mm ϕ0.236 in Cable color: Gray (common for emitter and receiver)
		SF4A-CSL05	Length: 500 mm 19.685 in Weight: 100 g approx. (two cables)	
		SF4A-CSL10	Length: 1 m 3.281 ft Weight: 160 g approx. (two cables)	
		SF4A-CSL30	Length: 3 m 9.843 ft Weight: 380 g approx. (two cables)	

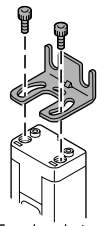
Note: Note that the dimensions of the **SF4-AH** series will change when using the cable for series connection (**SF4A-CSL□**).

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 **SF4-AH□(-N)** — 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 **SF4-AH□-H** — Used to hold the sensor at the intermediate position for protection against vibration (for rear surface mounting) (1 set for emitter and receiver)
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 (ϕ30 mm ϕ1.181 in), with 20 mm 0.787 in beam pitch

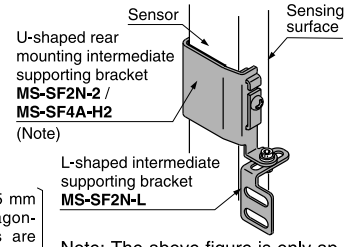
Note: The number of sets required varies depending on the product.

Rear mounting bracket
• **MS-SF2N-1**



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
• **MS-SF2N-2**
• **MS-SF4A-H2**
• **MS-SF2N-L**



Note: The above figure 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 pcs. 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.

SF4-AH

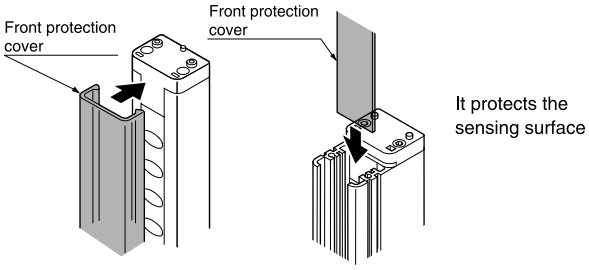
OPTIONS

Designation			Applicable beam channels: 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
Front protection cover	For SF4-AH□(-N)	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 SF4-AH□-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 SF4-AH□(-N)	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 SF4-AH□-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
Front protection unit		Model No.	MC-SF4AH-8	MC-SF4AH-12	MC-SF4AH-16	MC-SF4AH-20	MC-SF4AH-24	MC-SF4AH-28	MC-SF4AH-32	MC-SF4AH-36	MC-SF4AH-40	MC-SF4AH-48	MC-SF4AH-56	MC-SF4AH-64	MC-SF4AH-72	MC-SF4AH-80	MC-SF4AH-88	MC-SF4AH-96

Note: The model Nos. given above denote a single unit, not a pair of units. 2 pcs. (2 sets) are required to mount the emitter / receiver.

Front protection cover

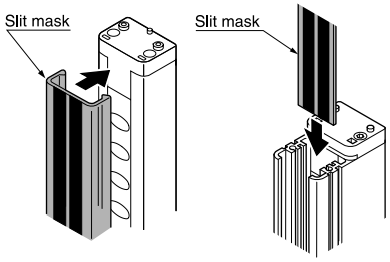
• **FC-SF4A-H□** • **FC-SF4A-H□-H**



It protects the sensing surface

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 neighboring sensors.
It is also used in cases when the beam intensity is too strong penetrating through the sensing object.
However, the operating range reduces when the slit mask is used.

Operating range

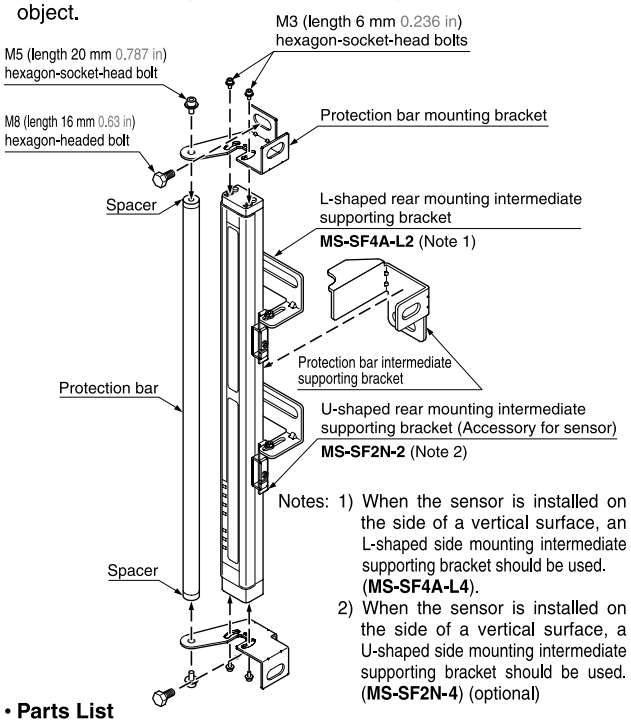
In case of mounting OS-SF4A-H□
- Slit on the emitter side: 4 m 13.123 ft
- Slit on the receiver side: 3 m 9.843 ft
- Slit on both sides: 2 m 6.562 ft

In case of mounting OS-SF4A-H□-H
- Slit on the emitter side: 3 m 9.843 ft
- Slit on the receiver side: 3 m 9.843 ft
- Slit on both sides: 1.5 m 4.921 ft

Front protection unit

• **MC-SF4AH-□**

It protects sensing surface from damage due to striking of an object.



Notes: 1) When the sensor is installed on the side of a vertical surface, an L-shaped side mounting intermediate supporting bracket should be used. (**MS-SF4A-L4**).
2) When the sensor is installed on the side of a vertical surface, a U-shaped side mounting intermediate supporting bracket should be used. (**MS-SF2N-4**) (optional)

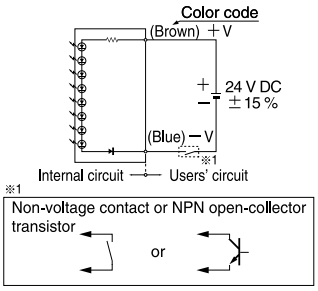
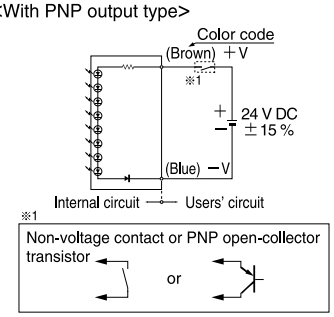
• **Parts List**

Designation	Model No.	Number	Remarks
Protection bar	———	1 pc.	Material: Aluminum
Protection bar mounting bracket	———	2 pcs.	Material: Cold rolled carbon steel (SPCC)
Protection bar intermediate supporting bracket	———	1 pc. (Note 1)	Material: Cold rolled carbon steel (SPCC)
L-shaped rear mounting intermediate supporting bracket	**MS-SF4A-L2**	0 to 5 pcs. (Note 2)	Material: Cold rolled carbon steel (SPCC)
L-shaped side mounting intermediate supporting bracket	**MS-SF4A-L4**	0 to 5 pcs. (Note 2)	Material: Cold rolled carbon steel (SPCC)
Spacer	———	2 pcs.	Material: Aluminum
M5 hexagon-socket-head bolt	———	2 pcs.	Length 20 mm 0.787 in
M3 hexagon-socket-head bolt	———	4 pcs.	Length 6 mm 0.236 in
M8 hexagon-headed bolt	———	2 to 8 pcs. (Note 2)	Length 16 mm 0.630 in

Notes: 1) The protection bar intermediate supporting bracket is attached with the front protection unit for 40 beam channels or more.
2) The number of accessories varies depending on the product.

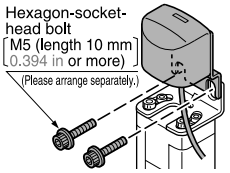
SF4-AH

OPTIONS

Designation	Model No.	Description
Large display unit for light curtain	**SF-IND-2**	With the large display unit put on the light curtain, the operation is easily observable from various directions. **Specifications** • Supply voltage: 24 V DC ±15 % • Current consumption: 12 mA or less • Indicators: Orange LED (8 pcs. used) [Light up when external contact is ON] • Ambient temperature: −10 to +55 °C +14 to +55 °F (No dew condensation or icing allowed) • Material: POM (Case) 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 approx. (including bracket) **I/O circuit diagrams** <With NPN output type>  <With PNP output type> 
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**	For **SF4-AH□(-N)** — Used to hold the sensor at the intermediate position for protection against vibration (for side mounting) (1 set for emitter and receiver)
	MS-SF4A-H4	For **SF4-AH□-H**
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)
Laser alignment tool	**SF-LAT-2N**	Easy to align the beam axis with the visible laser beam

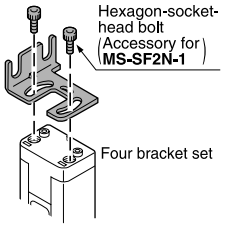
Notes: 1) The number of sets required varies depending on the product. Refer to '**DIMENSIONS**' on p. 372 for further details.
2) Multiple beam channel sensors requiring the intermediate supporting bracket (36 beam channels or more) cannot be mounted on an aluminum frame with the center sensor mounting bracket.

Large display unit for light curtain
• **SF-IND-2**

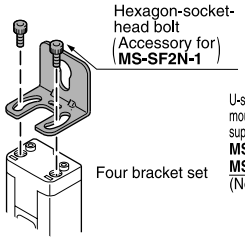


Attaches to upper edge of light curtain.
Tighten together the mounting bracket provided with the area sensor and the mounting bracket of **SF-IND-2**.

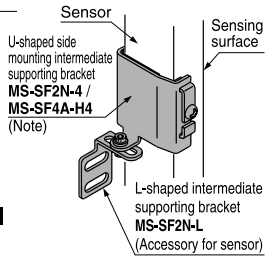
Side mounting bracket
• **MS-SF2N-3**



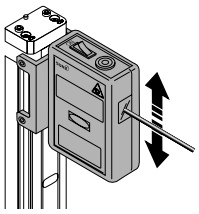
Center sensor mounting bracket
• **MS-SF2N-5**



U-shaped side mounting intermediate supporting bracket
• **MS-SF2N-4**
• **MS-SF4A-H4**



Laser alignment tool
• **SF-LAT-2N**



Note: The above figure 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 pcs. 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

Item \ Model No.									
	NPN output	SF4-AH8-N	SF4-AH12-N	SF4-AH16-N	SF4-AH20-N	SF4-AH24-N	SF4-AH28-N	SF4-AH32-N	SF4-AH36-N
	PNP output	SF4-AH8(-H)	SF4-AH12(-H)	SF4-AH16(-H)	SF4-AH20(-H)	SF4-AH24(-H)	SF4-AH28(-H)	SF4-AH32(-H)	SF4-AH36(-H)
No. of beam channels		8	12	16	20	24	28	32	36
Beam pitch		20 mm 0.787 in							
Protective height		190 mm 7.480 in	270 mm 10.630 in	350 mm 13.780 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: 55 mA or less, Receiver: 80 mA or less				Emitter: 75 mA or less, Receiver: 90 mA or less,			
Weight (Total of emitter and receiver)	SF4-AH□(-N)	390 g approx.	490 g approx.	600 g approx.	710 g approx.	810 g approx.	880 g approx.	950 g approx.	1,000 g approx.
	SF4-AH□-H	490 g approx.	640 g approx.	800 g approx.	950 g approx.	1,100 g approx.	1,200 g approx.	1,400 g approx.	1,500 g approx.

Item \ Model No.									
	NPN output	SF4-AH40-N	SF4-AH48-N	SF4-AH56-N	SF4-AH64-N	SF4-AH72-N	SF4-AH80-N	SF4-AH88-N	SF4-AH96-N
	PNP output	SF4-AH40(-H)	SF4-AH48(-H)	SF4-AH56(-H)	SF4-AH64(-H)	SF4-AH72(-H)	SF4-AH80(-H)	SF4-AH88(-H)	SF4-AH96(-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: 90 mA or less, Receiver: 100 mA or less		Emitter: 110 mA or less, Receiver: 115 mA or less		Emitter: 130 mA or less, Receiver: 125 mA or less		Emitter: 150 mA or less, Receiver: 135 mA or less	
Weight (Total of emitter and receiver)	SF4-AH□(-N)	1,100 g approx.	1,400 g approx.	1,700 g approx.	1,900 g approx.	2,100 g approx.	2,300 g approx.	2,500 g approx.	2,700 g approx.
	SF4-AH□-H	1,600 g approx.	1,800 g approx.	2,000 g approx.	2,600 g approx.	2,900 g approx.	3,100 g approx.	3,300 g approx.	3,900 g approx.

Common specifications

Item \ Model No.		NPN output SF4-AH□-N	PNP output SF4-AH□(-H)
Applicable standards		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		0.3 to 7 m 0.984 to 22.966 ft	
Detection capability		ϕ30 mm ϕ1.181 in opaque object (Note 1)	
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)		Semiconductor output (NPN output equivalent) 2 outputs • Maximum sink current: 200 mA • Applied voltage: Same as supply voltage (between control output and 0 V) • Residual voltage: 2 V or less (at 200 mA sink current)	Semiconductor output (PNP output equivalent) 2 outputs • 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 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)	
	Protection circuit	Incorporated	
Response time		In normal operation: OFF response 11 ms or less, ON response 70 ms or less In the blanking function set condition: OFF response 15 ms or less, ON response 70 ms or less (Note 2)	
	Series connection	In normal operation: OFF response 20 ms or less, ON response 70 ms or less In the blanking function set condition: OFF response 20 ms or less, ON response 70 ms or less (Note 2)	
Auxiliary output (Non-safety output)		NPN open-collector transistor • Maximum sink current: 60 mA • Applied voltage: Same as supply voltage (between auxiliary output and 0 V) • Residual voltage: 2 V or less (at 60 mA sink current)	PNP open-collector transistor • Maximum source current: 60 mA • Applied voltage: Same as supply voltage (between auxiliary output and + V) • Residual voltage: 2.5 V or less (at 60 mA source current)
	Operation mode	OFF when control outputs are ON, ON when control outputs are OFF	
	Protection circuit	Incorporated	
Indicators	Emitter	Beam-axis alignment indicators: 2-color (Red / Green) LED × 4 (lights up in red when each beam channel receives light, blinks in red when the topmost or bottommost beam channel receives light, lights up in green when all beam channels receive light), Operation indicator (Note 3): 2-color (Red / Green) LED (Note 3) (lights up in red when control outputs are OFF, lights up in green when control outputs are ON), Emission halt / Emission amount control indicator: Orange LED (emission in normal mode: lights off, emission in short mode: lights up, blinks 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 (lights up in red when each beam channel receives light, blinks in red when the topmost or bottommost beam channel receives light, lights up in green when all beam channels receive light), OSSD indicator: 2-color (Red / Green) LED (lights up in red when control outputs are OFF, lights up in green when control outputs are ON), Blanking indicator: Orange LED (Note 3) (lights up when blanking function is used, blinks when connecting Handy-controller), Fault indicator: Yellow LED (lights up or blinks if a fault occurs in the sensor)	
Interference prevention function		Incorporated (In cace of series connection: 3 sets max., Max. beam channels 192 beam channels)	
Test input (emission halt) function		Incorporated	
Test input (emission halt input)		Emission: 0 to + 1.5 V (sink current: 2 mA or less) Emission halt: Open, or + 9 V to Vs (Note 4)	Emission: + 9 V to Vs (sink current: 2 mA or less)(Note 4) Emission halt: Open, or 0 to + 1.5 V
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 5) / 20 MΩ, or more, with 500 V DC megger between all supply terminals connected together and enclosure (Note 5)	
	Vibration resistance / Shock resistance	10 to 55 Hz frequency, 0.75 mm 0.030 in amplitude in X, Y and Z directions for two hours each / 300 m/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, Front case: Polycarbonate, Lens: Polycarbonate, Cap: Polycarbonate and ABS	
Cable		6-core (0.3 mm² × 4-core, 0.2 mm² × 2-core) oil resistant shielded cable, 0.5 m 1.640 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 sensor 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 6), **MS-SF2N-L** (L-shaped intermediate supporting bracket): (Note 6), **SF4-AH-TR** (Test rod): 1 pc.	

Notes: 1) In this device, the floating blanking function can be set by using the Handy-controller (**SF-HC**)(optional). When the floating blanking function is used, the size of the min. sensing object is changed. For details on the floating blanking function, refer to p.359.
2) Refer to p.359 for detail on the emission amount control function and the blanking function.
3) Since the color of the operation indicator changes according to the ON / OFF state of the control outputs (OSSD1, OSSD2), the operation indicator is marked as 'OSSD' on the sensor.
4) Vs is the same value as the voltage of the used power supply to be used.
5) 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.
6) **MS-SF2N-2** / **MS-SF4A-H2** (U-shaped rear mounting intermediate supporting bracket) and **MS-SF2N-L** (L-shaped intermediate supporting bracket) 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.
SF4-AH36(-N/H), **SF4-AH40(-N/H)**: 1 set, **SF4-AH48(-N/H)**: 2 sets, **SF4-AH56(-N/H)**, **SF4-AH64(-N/H)**, **SF4-AH72(-N/H)**: 3 sets **SF4-AH80(-N/H)**: 4 sets, **SF4-AH88(-N/H)**, **SF4-AH96(-N/H)**: 5 sets

SF4-AH

SPECIFICATIONS

Safety relay unit for PNP output type light curtain

Item \ Model No.	SF-AC
Standards	BG, UL and CSA
Control category	ISO 13849-1 (EN 954-1) compliance up to Category 4 standards
Supply voltage	24 V DC ±10 % Ripple P-P 10 % or less
Fuse (power supply)	Hybrid fuse, triggering current: 1.1 A or more, Reset after power down
Power consumption	1.7 W approx. (without light curtain)
Power supply for light curtain	24 V DC ±10 %
Enabling path	NO contact ×3
Switching current (13-14, 23-24, 33-34)	Max. 6 A 30 V DC / 6 A 230 V AC, resistive load
Fuse	6 A (slow blow)
Auxiliary output	NC contact ×1
Switching current (41-42)	Max. 1 A 24 V DC
Fuse	1 A (slow blow)
Alarm output (Note)	NC contact ×1 (Non-safety contact, related to input 'Alarm in')
Switching current (51-52)	Max.1 A 24 V DC, Min. 5 mA 24 V DC
Fuse	1 A (slow blow)
Utilization category	AC-15, DC-13 (EN 60947-5-1)
Pick-up delay	40 ms or less / 50 ms or less (Auto / Manual)
Drop-out delay	10 ms or less
Contact material / contacts	AgSnO, Self cleaning, positively driven
Contact resistance	100 mΩ or less
Mechanical lifetime	10 million times (switching frequency 180 times/min.)
Electrical lifetime	100,000 times (switching frequency 20 times/min. rated load)
Indicators: Power	Green LED (lights up when the power is supplied)
Indicators: Internal circuit operation (Ui)	Green LED (lights up when both conditions are present: unit is powered up and hybrid fuse is at normal state)
Indicators: Relay operation (K1 / K2)	Green LED ×2 (lights up when enabling contacts are closed)
Indicators: Test input (Test)	Yellow LED (lights up when X11-X12 is opened)
Trailing edge function	Incorporated
Test input polarity selection function	Incorporated (Selectable PNP or NPN test input polarity by internal switch
Environmental resistance: Degree of protection	Enclosure: IP40, Terminal: IP20
Environmental resistance: Ambient temperature / Ambient humidity	−10 to +55 °C +14 to +131 °F, Storage: −10 to +55 °C +14 to +131 °F / 35 to 85 % RH, Storage: 35 to 85 % RH
Environmental resistance: Vibration resistance	10 to 55 Hz frequency, 0.35 mm 0.014 in amplitude in X, Y, Z directions for three times each (in power OFF state)
Connection terminal	Removable European terminal
Tightening torque	0.6 N·m
Weight	460 g approx.
Material	Enclosure: Polycarbonate

Note: The alarm output is 'open' when the alarm input from the light curtain is ON. Refer to each light curtain for details pertaining to each type of alarm.

Handy-controller

Item \ Model No.	SF-HC
Supply voltage	24 V DC±10 % Ripple P-P10 % or less (common to sensor power supply)
Current consumption	45 mA or less
Communication method	RS-485 two-way communications (Specific procedure)
Digital display	4-digit red LED ×2 (Selected beam channels, setting contents etc. are displayed.)
Function indicator	Green LED ×8 (set function is displayed.)
Functions	Fixed blanking (shipping setting status: ineffective) / Floating blanking (shipping setting status: ineffective) / Auxiliary output (shipping setting status: Negative Logic of OSSD) / Emitting light amount control (shipping setting status: ineffective) / Code setting / Setting contents monitoring / Protecting (shipping setting status: ineffective) (the preset password at shipping is '0000') / Copy function
Ambient temperature	−10 to +55 °C +14 to +131 °F (No dew condensation or icing allowed), Storage: −25 to +70 °C −13 to +158 °F
Ambient humidity	30 to 85 % RH, Storage: 30 to 85 % RH
Voltage withstandability	1,000 V AC for one min. between all supply terminals connected together and enclosure
Insulation resistance	20 MΩ, or more, with 500 V DC megger between all supply terminals connected together and enclosure
Cable	Shielded cable, 0.5 m 1.640 ft long, with a connector at the end (2 cables)
Weight	190 g approx.

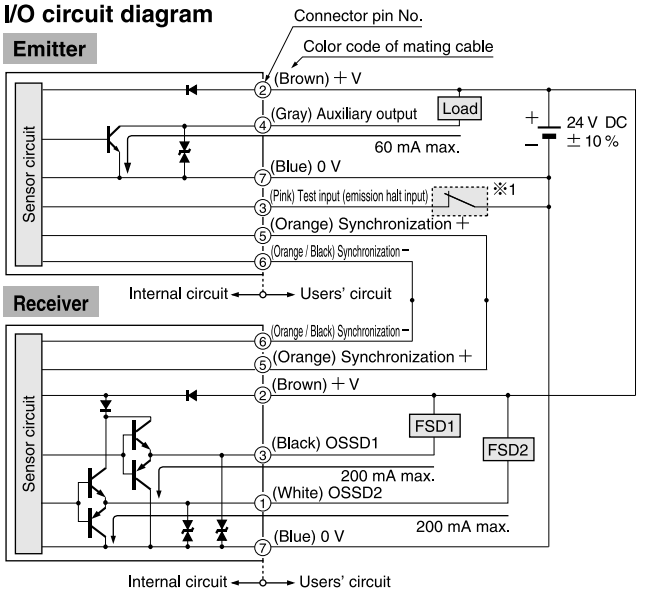
Laser alignment tool

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

I/O CIRCUIT AND WIRING DIAGRAMS

NPN output type

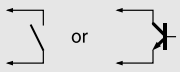
I/O circuit diagram



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

※1

Non-voltage contact or NPN open-collector transistor

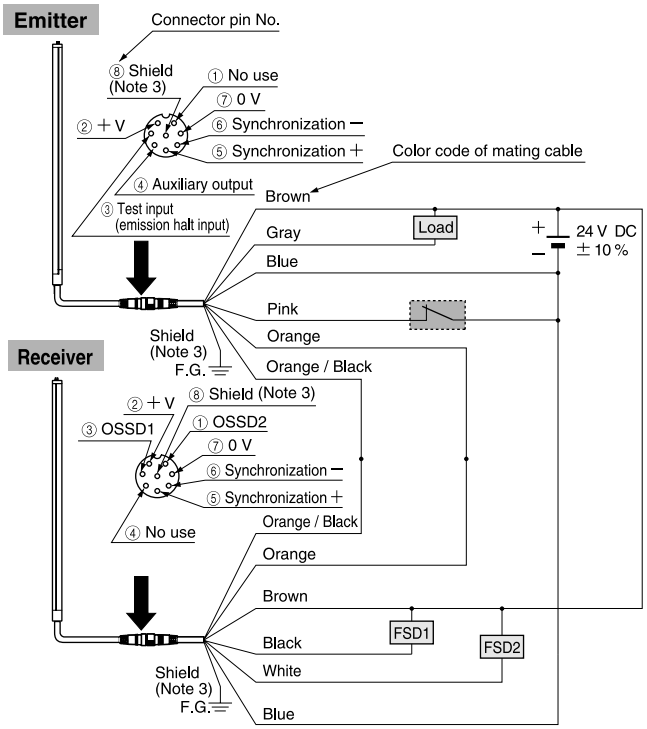


or

• Test input (emission halt input)
High (open, or + 9 V to Vs): Emission halt
Low (0 to + 1.5 V) : Emission (source current: 2 mA or less) (Note)

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

Wiring diagram



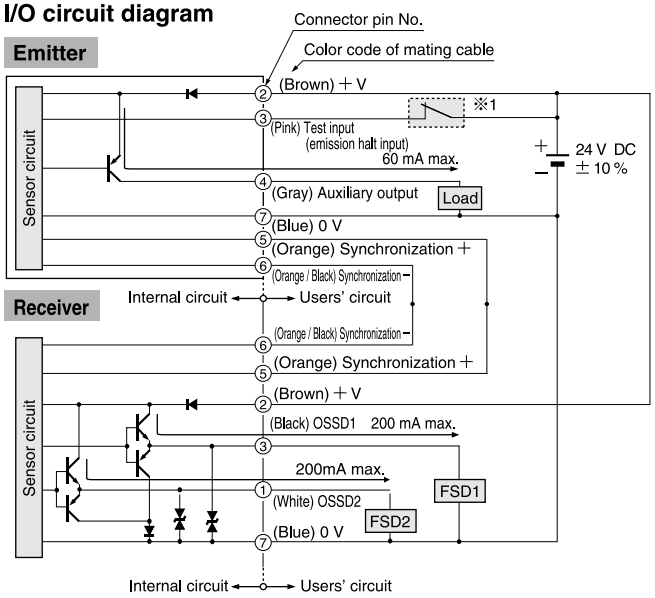
Notes: 1) Unused wires must be insulated to ensure that they do not come into contact with wires already in use.
2) Conductor cross-section area of lead wire of mating cable is 0.2 mm^2 (synchronization wire) and 0.3 mm^2 (exclude synchronization wire).
3) Be sure to connect the shield wire to the frame ground (F.G.).

SF4-AH

I/O CIRCUIT AND WIRING DIAGRAMS

PNP output type

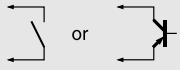
I/O circuit diagram



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

※1

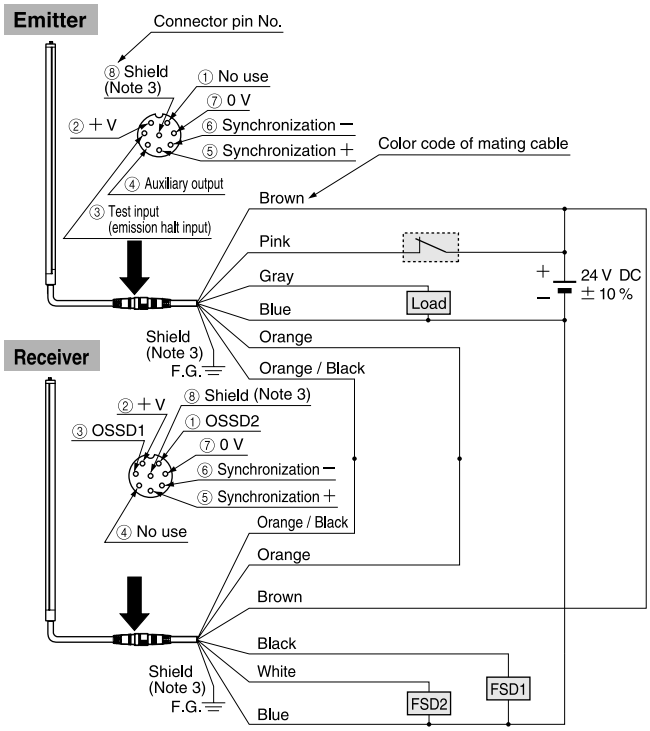
Non-voltage contact or PNP open-collector transistor



- Test input (emission halt input)
  Low (open, or 0 to + 1.5 V): Emission halt
  High (+ 9 V to Vs) : Emission (sink current: 2 mA or less) (Note)

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

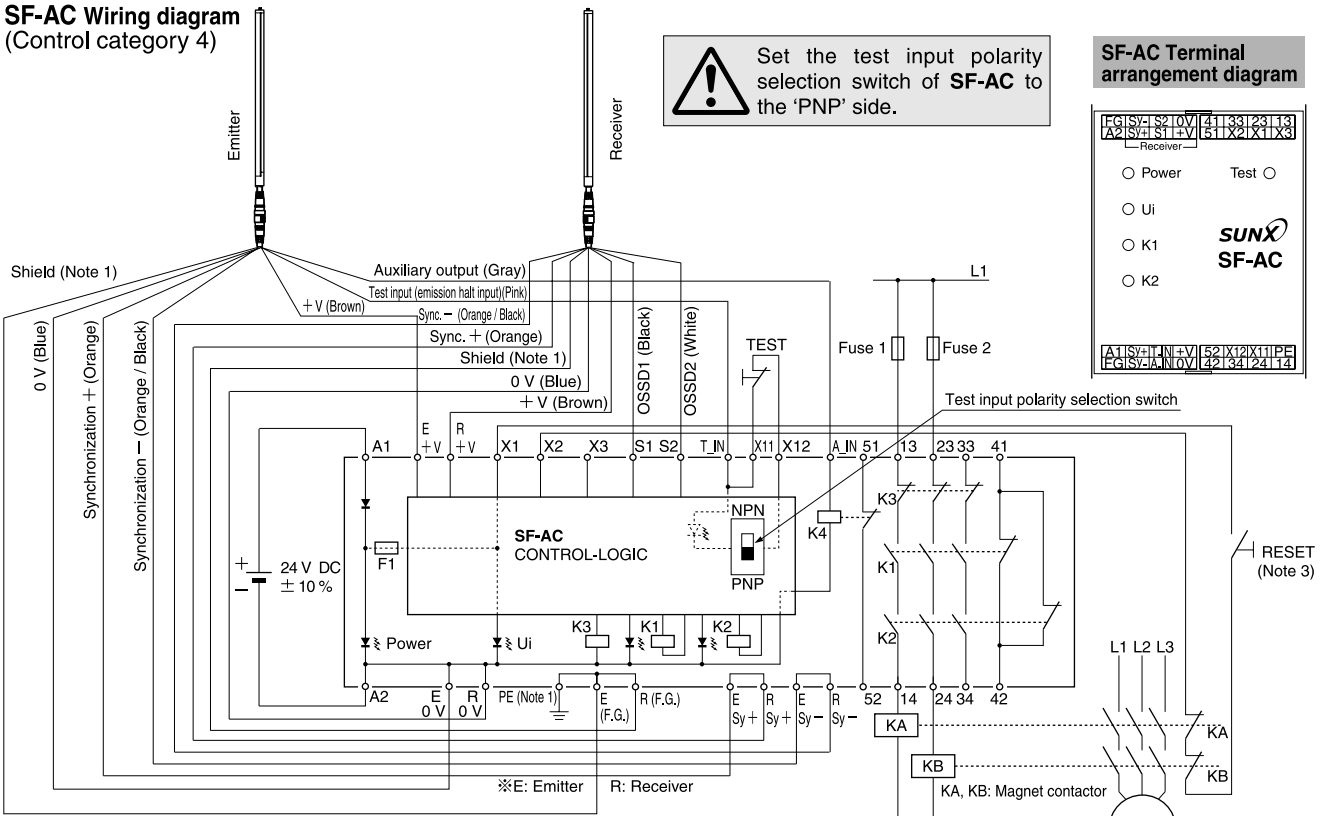
Wiring diagram



Notes: 1) Unused wires must be insulated to ensure that they do not come into contact with wires already in use.
2) Conductor cross-section area of lead wire of mating cable is 0.2 mm^2 (synchronization wire) and 0.3 mm^2 (exclude synchronization wire).
3) Be sure to connect the shield wire to the frame ground (F.G.).

SF-AC Wiring diagram (Control category 4)

Set the test input polarity selection switch of **SF-AC** to the 'PNP' side.

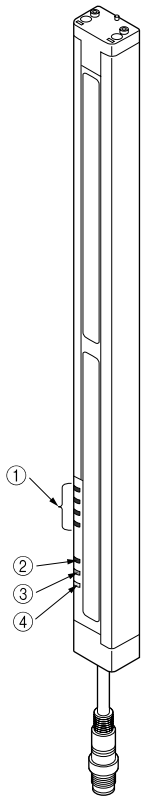


SF-AC Terminal arrangement diagram

Notes: 1) Connect the light curtain's shield wire to the frame ground (F.G.), and ground the **SF-AC**'s PE terminal.
2) If using the equipment with the manual reset, wire X1 to X2 as per the illustration above.
If using with the automatic reset, disconnect X2 wire and connect it to X3. In this case, reset button is not required.
3) Use a momentary-type switch for the reset button.

PRECAUTIONS FOR PROPER USE

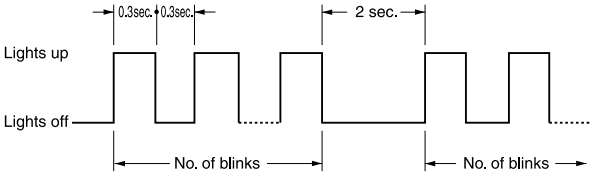
Part description and function



		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 the control outputs are OFF, lights up in green when the control outputs are ON.
	③	Emission halt / Emission amount control indicator [CTRL] (Orange LED)	Emission in normal mode: Lights off Emission in short mode: Lights on (Note 2) Emission halt: Blinks
	④	Fault indicator [FAULT] (Yellow LED)	Lights up or blinks when a fault occurs in the sensor. (Note 3) Lights up: Setting data of the sensor is in error (Noise is present around the sensor) 1 blink: Beam channel No. error (The end cap is not connected correctly.) 2 blinks: Series connection error (The cable for series connection is not connected correctly.) 3 blinks: Total unit No. / total beam channel No. error (When more than 3 sets of sensors are serially connected or when a total of 192 beam channels are exceeded) 6 blinks: Effect from noise / power supply or failure 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] (Note 1) (Red / Green LED)	Lights up in red when the control outputs are OFF, lights up in green when the control outputs are ON.
	③	Blanking indicator [BLANK] (Orange LED)	Lights up when the blanking function is used (Note 2), blinks when connecting the Handy-controller.
	④	Fault indicator [FAULT] (Yellow LED)	Lights up or blinks when a fault occurs in the sensor. (Note 3) Lights up: Setting data of the sensor is in error (Noise is present around the sensor) 1 blink: Beam channel No. error (The end cap is not connected correctly.) 2 blinks: Series connection error (The cable for series connection is not connected correctly.) 3 blinks: Total unit No. / total beam channel No. error (When more than 3 sets of sensors are serially connected or when a total of 192 beam channels are exceeded) 4 blinks: Received extraneous light error 5 blinks: Control output (OSSD1, OSSD2) error (The control output lines are not connected correctly.) 6 blinks: Effect from noise / power supply or failure of internal circuit

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) Emitting light amount control function and blanking function must both be set using the Handy-controller, **SF-HC** (optional).
3) The blinking cycle of the fault indicator is illustrated below. The number of blinks indicate what kind of fault has occurred. There is an interval of approx. 2 sec. between blinking.

Blinking cycle of fault indicator



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 that the power supply is off while wiring.
- 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.

SF4-AH

PRECAUTIONS FOR PROPER USE

- Do not utilize this sensor in 'PSDI Mode', in which the sensor is utilized as an activator for machinery.
- 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.

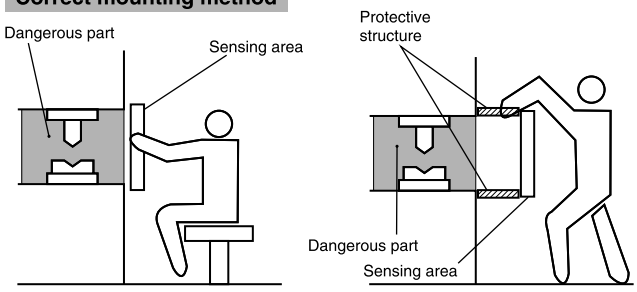
- This catalog is a guide to select a suitable product. Be sure to read the instruction manual attached to the product prior to its use.

- 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.

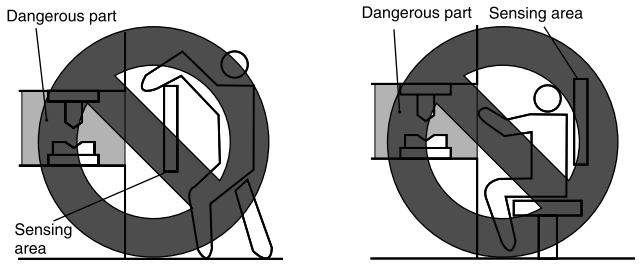
Sensing area

- Make sure to install this product such that any part of the human body that passes through the sensing area is detected before it reaches dangerous machine parts. 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

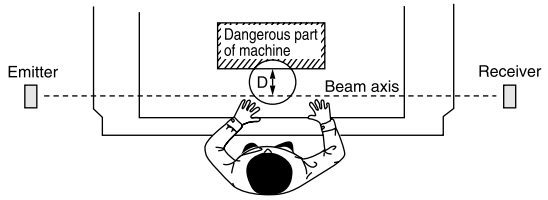


Wrong mounting method



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 or objects (mm/sec.)
Normally, taken as 2,000 (mm/sec.) for calculation.
[When the floating blanking function is being utilized, a speed of 1,600 (mm/sec.) should be used.]

T: Response time of total equipment (sec.)
$T = T_m + T_{SF4}$
T_m: Maximum halt time of device (sec.)
T_{SF4}: Response time of the **SF4-AH** series 0.011 (sec.)
[0.015 (sec.) if the blanking function has been selected and 0.02 (sec.) for series connections]

C: Additional distance calculated from the size of the minimum sensing object of the sensor (mm)
Note that the value of C is not less than or equal to 0.
$C = 8 \times (d - 14)$
d: Minimum sensing object diameter
30 (mm) 1.181 (in)
When using the floating blanking function C = 850 (mm) 33.465 (in) (constant)

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

- Equation ② $D = K \times (T_s + T_c + T_{SF4} + T_{bm}) + D_{pf}$

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 the brake to function. (sec.)

T_{SF4}: Response time of the **SF4-AH** series 0.011 (sec.)
[0.015 (sec.) if the blanking function has been selected and 0.02 (sec.) for series connections]

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 break 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)
D_{pf} = 78.2 mm 3.079 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)
(When the floating blanking function is being utilized, the minimum detectable sizes of objects will vary. (ϕ50 ϕ1.969 /ϕ70 ϕ2.756 /ϕ90 ϕ3.543 mm in))
Note that the value of D_{pf} is not less than or equal to 0.

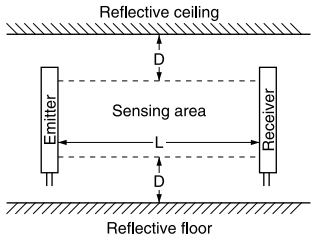
PRECAUTIONS FOR PROPER USE

Influence of reflective surface

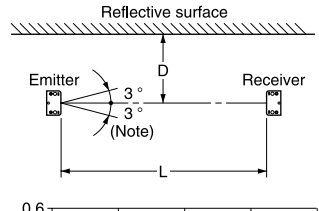
Install the sensor by considering the effect of nearby reflective surfaces and take suitable countermeasures. Failure to do so may cause the sensor not to detect, resulting in serious injury or death.

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

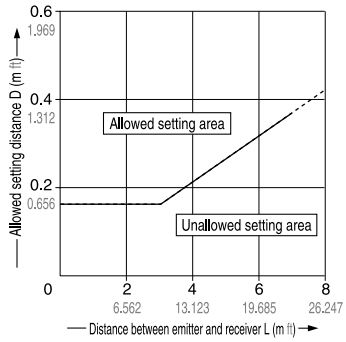
Side view



Top view



Distance between emitter and receiver, L	Allowed setting distance, D
0.3 to 3 m 0.984 to 9.843 ft	0.16 m 0.525 ft
3 to 7 m 9.843 to 22.966 ft	L × tan θ θ = 3 ° = L × 0.052 (m) 0.171 (ft)



Note: The effective aperture angle for this sensor is ±2.5 ° (with L > 3 m 9.843 ft) as required by IEC 61496-2 / UL 61496-2. However, install this sensor away from the reflective surfaces, assuming an effective aperture angle of ±3 ° to provide for misalignment, etc., during installation.

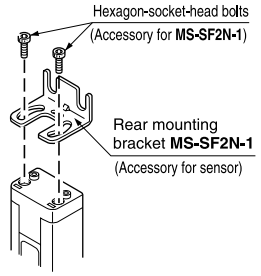
Mounting

• The minimum bending radius of the cable is R30 mm R1.181 in. Mount the sensor considering the cable bending radius.

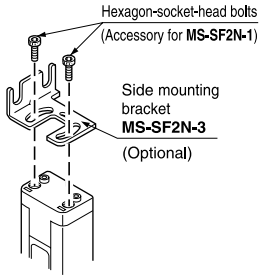
Mounting of sensor mounting bracket (MS-SF2-1/3/5)

• 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.

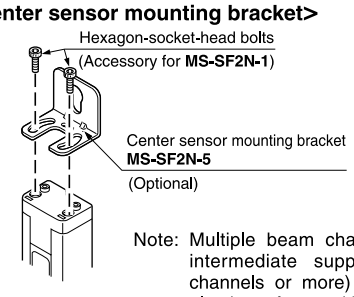
<Back mounting>



<Side mounting>



<Center sensor mounting bracket>



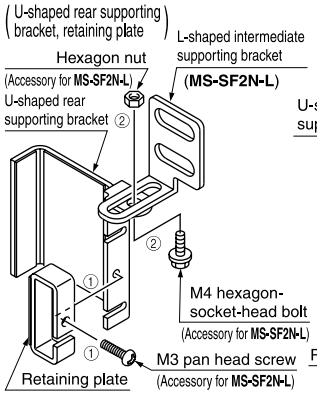
Note: Multiple beam channel sensors requiring the intermediate supporting bracket (36 beam channels or more) cannot be mounted on an aluminum frame with the center sensor mounting bracket (**MS-SF2N-5**).

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

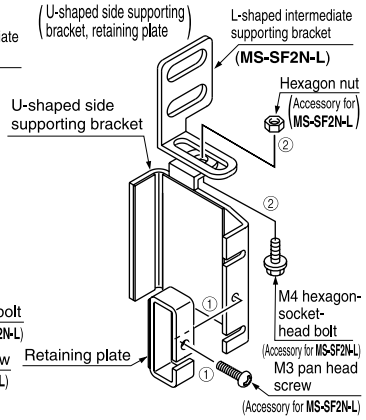
①Place the retaining plate on the U-shaped rear / side supporting bracket and temporarily tighten them with an M3 (length 10 mm 0.394 in) pan head screw.

②Temporarily tighten the L-shaped intermediate supporting bracket to the U-shaped rear / side supporting bracket with an M4 (length 10 mm 0.394 in) hexagon-socket-head bolt.

<Back mounting>
MS-SF2N-2 / MS-SF4A-H2



<Side mounting>
MS-SF2N-4 / MS-SF4A-H4

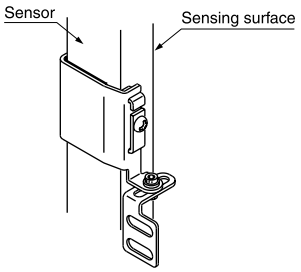


Note: The above figures are only applicable to the **MS-SF2N-2/4**. The **MS-SF4A-H2/H4** have different shapes.

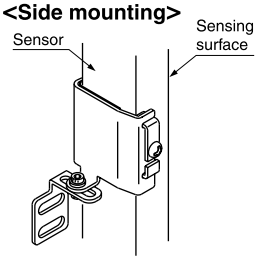
③Clamp the sensor main body with the U-shaped rear / side supporting bracket and completely tighten the M3 pan head screw that secures the retaining plate.
(Tightening torque: 0.4 N·m or less)

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 figures 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.

SF4-AH

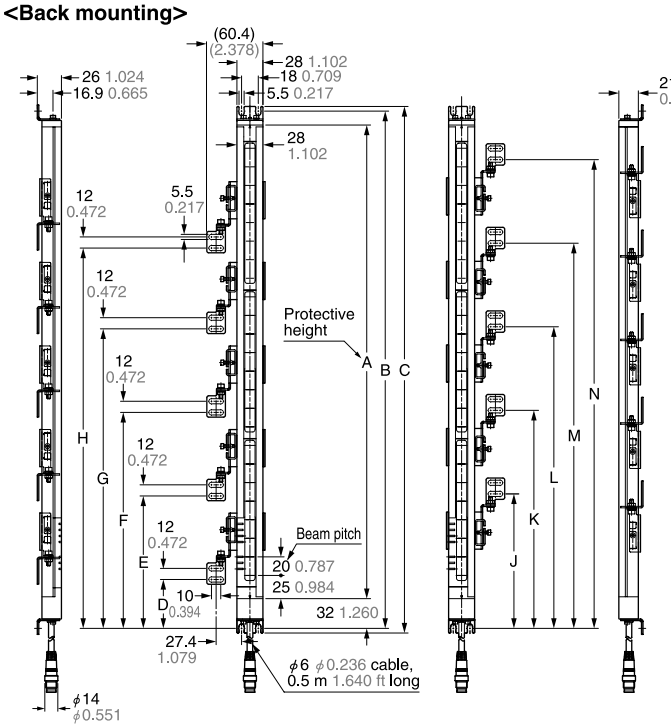
DIMENSIONS (Unit: mm in)

SF4-AH□(-N) Sensor

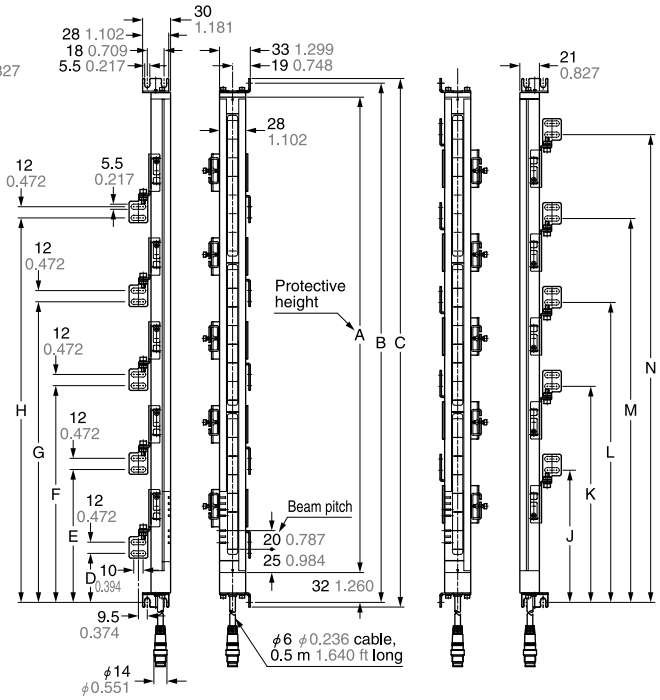
Assembly dimensions

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
SF4-AH8(-N)	190 7.480	237 9.331	247 9.724	–	–	–	–	–	–	–	–	–	–
SF4-AH12(-N)	270 10.630	317 12.480	327 12.874	–	–	–	–	–	–	–	–	–	–
SF4-AH16(-N)	350 13.780	397 15.630	407 16.024	–	–	–	–	–	–	–	–	–	–
SF4-AH20(-N)	430 16.929	477 18.779	487 19.173	–	–	–	–	–	–	–	–	–	–
SF4-AH24(-N)	510 20.079	557 21.929	567 22.323	–	–	–	–	–	–	–	–	–	–
SF4-AH28(-N)	590 23.228	637 25.079	647 25.472	–	–	–	–	–	–	–	–	–	–
SF4-AH32(-N)	670 26.378	717 28.228	727 28.622	–	–	–	–	–	–	–	–	–	–
SF4-AH36(-N)	750 29.528	797 31.378	807 31.772	350 13.780	–	–	–	–	440 17.323	–	–	–	–
SF4-AH40(-N)	830 32.677	877 34.527	887 34.921	390 15.354	–	–	–	–	480 18.898	–	–	–	–
SF4-AH48(-N)	990 38.976	1,037 40.827	1,047 41.220	390 15.354	550 21.654	–	–	–	480 18.898	640 25.197	–	–	–
SF4-AH56(-N)	1,150 45.276	1,197 47.126	1,207 47.520	390 15.354	550 21.654	710 27.953	–	–	480 18.898	640 25.197	800 31.496	–	–
SF4-AH64(-N)	1,310 51.575	1,357 53.425	1,367 53.819	470 18.504	630 24.803	790 31.102	–	–	560 22.047	720 28.346	880 34.646	–	–
SF4-AH72(-N)	1,470 57.874	1,517 59.724	1,527 60.118	550 21.654	710 27.953	870 34.252	–	–	640 25.197	800 31.496	960 37.795	–	–
SF4-AH80(-N)	1,630 64.173	1,677 66.023	1,687 66.417	550 21.654	710 27.953	870 34.252	1,030 40.551	–	640 25.197	800 31.496	960 37.795	1,120 44.094	–
SF4-AH88(-N)	1,790 70.472	1,837 72.323	1,847 72.716	550 21.654	710 27.953	870 34.252	1,030 40.551	1,190 46.850	640 25.197	800 31.496	960 37.795	1,120 44.094	1,280 50.394
SF4-AH96(-N)	1,950 76.772	1,997 78.622	2,007 79.016	630 24.803	790 31.102	950 37.402	1,110 43.701	1,270 50.000	720 28.346	880 34.646	1,040 40.945	1,200 47.244	1,360 53.543

SF4-AH

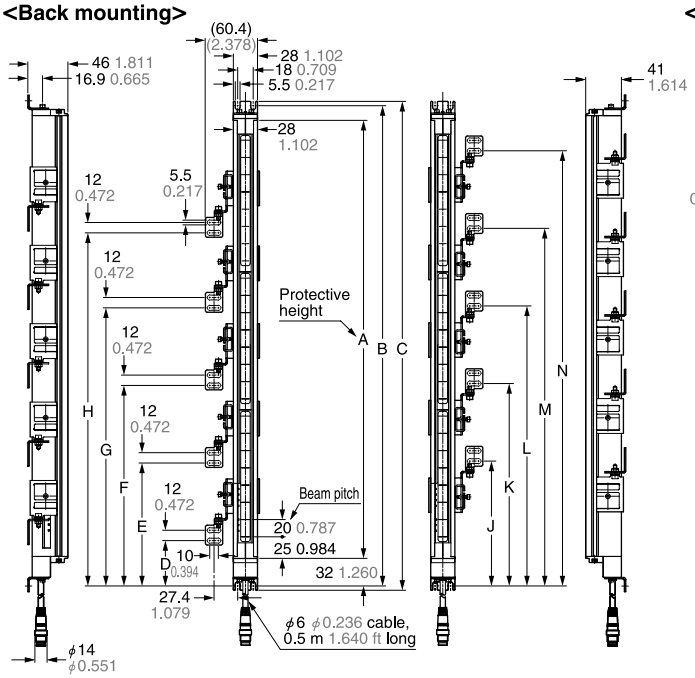
DIMENSIONS (Unit: mm in)

SF4-AH□-H Sensor

Assembly dimensions

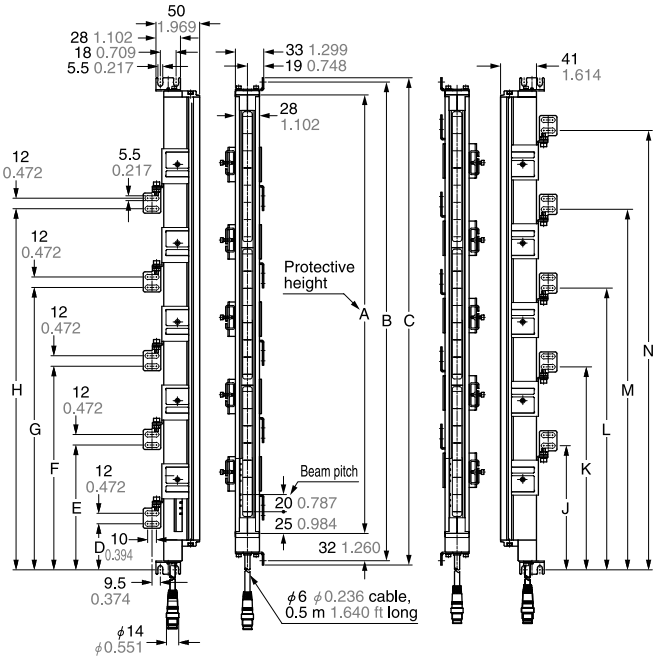
Mounting drawing for the sensor on which the sensor mounting brackets and the intermediate supporting brackets are mounted.

<Back mounting>



Emitter **Receiver**

<Side mounting>



Emitter **Receiver**

Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N
SF4-AH8-H	190 7.480	237 9.331	247 9.724	–	–	–	–	–	–	–	–	–	–
SF4-AH12-H	270 10.630	317 12.480	327 12.874	–	–	–	–	–	–	–	–	–	–
SF4-AH16-H	350 13.780	397 15.630	407 16.024	–	–	–	–	–	–	–	–	–	–
SF4-AH20-H	430 16.929	477 18.779	487 19.173	–	–	–	–	–	–	–	–	–	–
SF4-AH24-H	510 20.079	557 21.929	567 22.323	–	–	–	–	–	–	–	–	–	–
SF4-AH28-H	590 23.228	637 25.079	647 25.472	–	–	–	–	–	–	–	–	–	–
SF4-AH32-H	670 26.378	717 28.228	727 28.622	–	–	–	–	–	–	–	–	–	–
SF4-AH36-H	750 29.528	797 31.378	807 31.772	350 13.780	–	–	–	–	440 17.323	–	–	–	–
SF4-AH40-H	830 32.677	877 34.527	887 34.921	390 15.354	–	–	–	–	480 18.898	–	–	–	–
SF4-AH48-H	990 38.976	1,037 40.827	1,047 41.220	390 15.354	550 21.654	–	–	–	480 18.898	640 25.197	–	–	–
SF4-AH56-H	1,150 45.276	1,197 47.126	1,207 47.520	390 15.354	550 21.654	710 27.953	–	–	480 18.898	640 25.197	800 31.496	–	–
SF4-AH64-H	1,310 51.575	1,357 53.425	1,367 53.819	470 18.504	630 24.803	790 31.102	–	–	560 22.047	720 28.346	880 34.646	–	–
SF4-AH72-H	1,470 57.874	1,517 59.724	1,527 60.118	550 21.654	710 27.953	870 34.252	–	–	640 25.197	800 31.496	960 37.795	–	–
SF4-AH80-H	1,630 64.173	1,677 66.023	1,687 66.417	550 21.654	710 27.953	870 34.252	1,030 40.551	–	640 25.197	800 31.496	960 37.795	1,120 44.094	–
SF4-AH88-H	1,790 70.472	1,837 72.323	1,847 72.716	550 21.654	710 27.953	870 34.252	1,030 40.551	1,190 46.850	640 25.197	800 31.496	960 37.795	1,120 44.094	1,280 50.394
SF4-AH96-H	1,950 76.772	1,997 78.622	2,007 79.016	630 24.803	790 31.102	950 37.402	1,110 43.701	1,270 50.000	720 28.346	880 34.646	1,040 40.945	1,200 47.244	1,360 53.543

SF4-AH

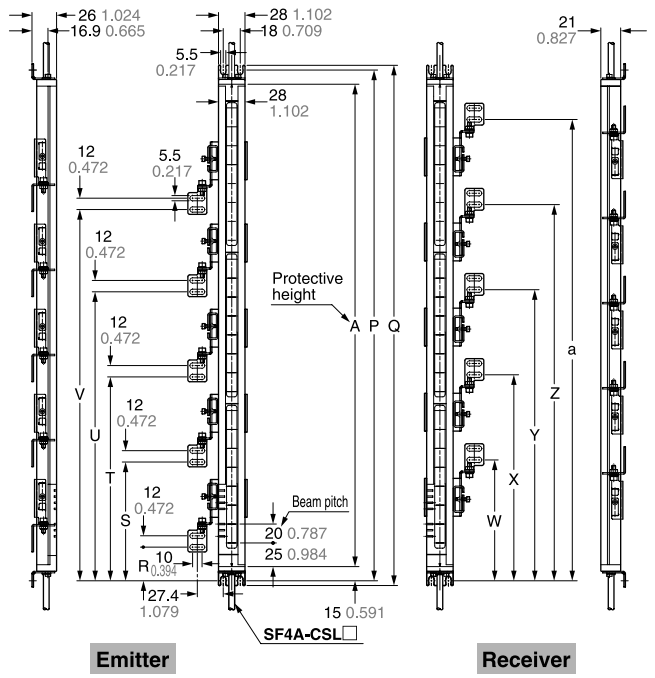
DIMENSIONS (Unit: mm in)

SF4-AH□(-N)
SF4-AH□-H Sensor

When using cable for series connection

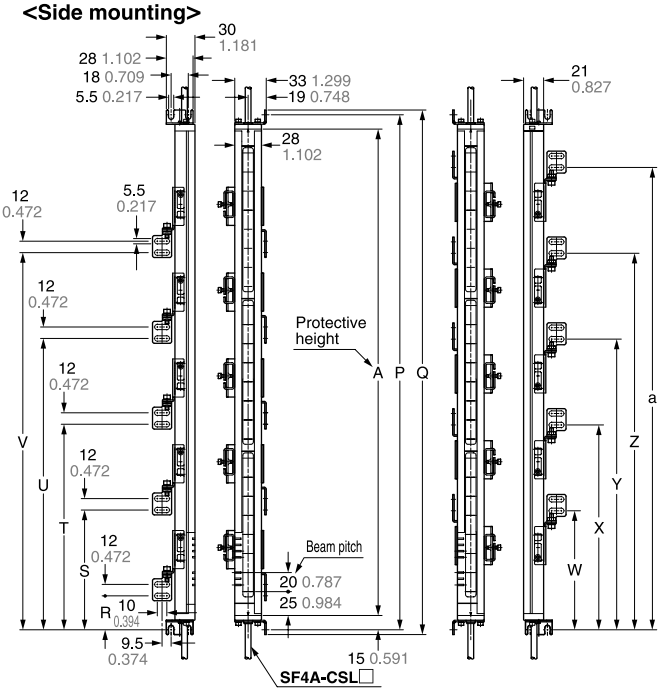
Mounting drawing for **SF4-AH□(-N)** on which the cables for series connection, the mounting brackets and the intermediate supporting brackets are mounted. When utilizing **SF4-AH□-H**, although the shape is different, all dimensions listed in the table below are exactly the same as those of **SF4-AH□(-N)**.

<Back mounting>



Emitter Receiver

<Side mounting>



Emitter Receiver

Model No.	A	P	Q	R	S	T	U	V	W	X	Y	Z	a
SF4-AH8(-N/H)	190 7.480	220 8.661	230 9.055	–	–	–	–	–	–	–	–	–	–
SF4-AH12(-N/H)	270 10.630	300 11.811	310 12.205	–	–	–	–	–	–	–	–	–	–
SF4-AH16(-N/H)	350 13.780	380 14.961	390 15.354	–	–	–	–	–	–	–	–	–	–
SF4-AH20(-N/H)	430 16.929	460 18.110	470 18.504	–	–	–	–	–	–	–	–	–	–
SF4-AH24(-N/H)	510 20.079	540 21.260	550 21.654	–	–	–	–	–	–	–	–	–	–
SF4-AH28(-N/H)	590 23.228	620 24.409	630 24.803	–	–	–	–	–	–	–	–	–	–
SF4-AH32(-N/H)	670 26.378	700 27.559	710 27.953	–	–	–	–	–	–	–	–	–	–
SF4-AH36(-N/H)	750 29.528	780 30.709	790 31.102	340 13.386	–	–	–	–	430 16.929	–	–	–	–
SF4-AH40(-N/H)	830 32.677	860 33.858	870 34.252	380 14.961	–	–	–	–	470 18.504	–	–	–	–
SF4-AH48(-N/H)	990 38.976	1,020 40.157	1,030 40.551	380 14.961	540 21.260	–	–	–	470 18.504	630 24.803	–	–	–
SF4-AH56(-N/H)	1,150 45.276	1,180 46.457	1,190 46.850	380 14.961	540 21.260	700 27.559	–	–	470 18.504	630 24.803	790 31.102	–	–
SF4-AH64(-N/H)	1,310 51.575	1,340 52.756	1,350 53.150	460 18.110	620 24.409	780 30.709	–	–	550 21.654	710 27.953	870 34.252	–	–
SF4-AH72(-N/H)	1,470 57.874	1,500 59.055	1,510 59.449	540 21.260	700 27.559	860 33.858	–	–	630 24.803	790 31.102	950 37.402	–	–
SF4-AH80(-N/H)	1,630 64.173	1,660 65.354	1,670 65.748	540 21.260	700 27.559	860 33.858	1,020 40.157	–	630 24.803	790 31.102	950 37.402	1,110 43.701	–
SF4-AH88(-N/H)	1,790 70.472	1,820 71.653	1,830 72.047	540 21.260	700 27.559	860 33.858	1,020 40.157	1,180 46.457	630 24.803	790 31.102	950 37.402	1,110 43.701	1,270 50.000
SF4-AH96(-N/H)	1,950 76.772	1,980 77.953	1,990 78.346	620 24.409	780 30.709	940 37.008	1,100 43.307	1,260 49.606	710 27.953	870 34.252	1,030 40.551	1,190 46.850	1,350 53.150

SF4-AH

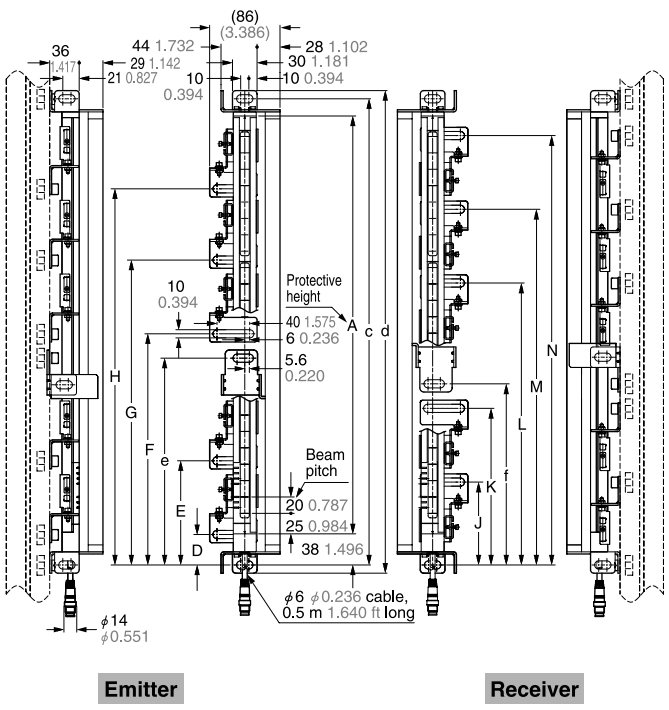
DIMENSIONS (Unit: mm in)

SF4-AH□(-N) Sensor

When mounting front protection unit

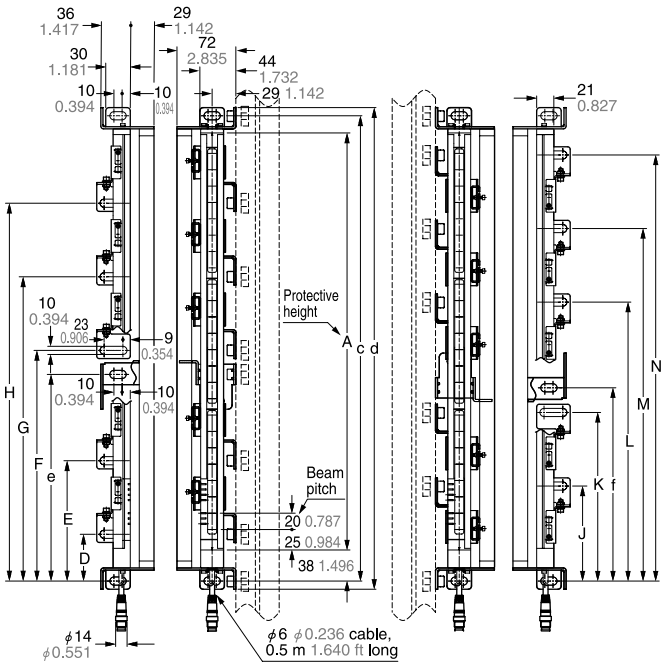
Mounting drawing for the sensor on which the U-shaped intermediate supporting brackets and the front protection unit are mounted.

<Back mounting>



Emitter Receiver

<Side mounting>



Emitter Receiver

Model No.	A	c	d	D	E	F	G	H	J	K	L	M	N	e	f
SF4-AH8(-N)	190 7.480	249 9.803	269 10.591	–	–	–	–	–	–	–	–	–	–	–	–
SF4-AH12(-N)	270 10.630	329 12.953	349 13.740	–	–	–	–	–	–	–	–	–	–	–	–
SF4-AH16(-N)	350 13.780	409 16.102	429 16.890	–	–	–	–	–	–	–	–	–	–	–	–
SF4-AH20(-N)	430 16.929	489 19.252	509 20.039	–	–	–	–	–	–	–	–	–	–	–	–
SF4-AH24(-N)	510 20.079	569 22.402	589 23.189	–	–	–	–	–	–	–	–	–	–	–	–
SF4-AH28(-N)	590 23.228	649 25.551	669 26.339	–	–	–	–	–	–	–	–	–	–	–	–
SF4-AH32(-N)	670 26.378	729 28.701	749 29.488	–	–	–	–	–	–	–	–	–	–	–	–
SF4-AH36(-N)	750 29.528	809 31.850	829 32.638	350 13.780	–	–	–	–	440 17.323	–	–	–	–	–	–
SF4-AH40(-N)	830 32.677	889 35.000	909 35.787	390 15.354	–	–	–	–	480 18.898	–	–	–	–	520 20.472	510 20.079
SF4-AH48(-N)	990 38.976	1,049 41.299	1,069 42.087	390 15.354	550 21.654	–	–	–	480 18.898	640 25.197	–	–	–	520 20.472	510 20.079
SF4-AH56(-N)	1,150 45.276	1,209 47.598	1,229 48.386	390 15.354	550 21.654	710 27.953	–	–	480 18.898	640 25.197	800 31.496	–	–	680 26.772	670 26.378
SF4-AH64(-N)	1,310 51.575	1,369 53.898	1,389 54.685	470 18.504	630 24.803	790 31.102	–	–	560 22.047	720 28.346	880 34.646	–	–	760 29.921	750 29.528
SF4-AH72(-N)	1,470 57.874	1,529 60.197	1,549 60.984	550 21.654	710 27.953	870 34.252	–	–	640 25.197	800 31.496	960 37.795	–	–	840 33.071	830 32.677
SF4-AH80(-N)	1,630 64.173	1,689 66.496	1,709 67.283	550 21.654	710 27.953	870 34.252	1,030 40.551	–	640 25.197	800 31.496	960 37.795	1,120 44.094	–	840 33.071	830 32.677
SF4-AH88(-N)	1,790 70.472	1,849 72.795	1,869 73.583	550 21.654	710 27.953	870 34.252	1,030 40.551	1,190 46.850	640 25.197	800 31.496	960 37.795	1,120 44.094	1,280 50.394	1,000 39.370	990 38.976
SF4-AH96(-N)	1,950 76.772	2,009 79.094	2,029 79.882	630 24.803	790 31.102	950 37.402	1,110 43.701	1,270 50.000	720 28.346	880 34.646	1,040 40.945	1,200 47.244	1,360 53.543	1,080 42.520	1,070 42.126

SF4-AH

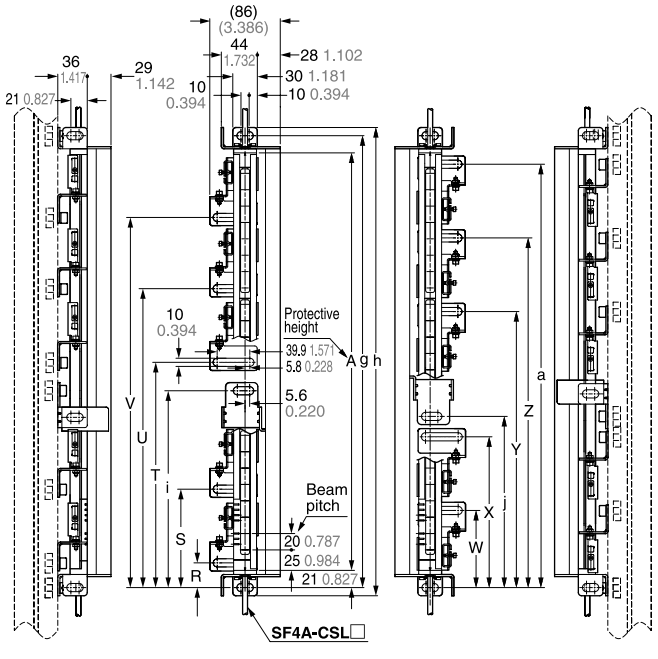
DIMENSIONS (Unit: mm in)

SF4-AH□(-N) Sensor

When mounting front protection unit and using cable for series connection

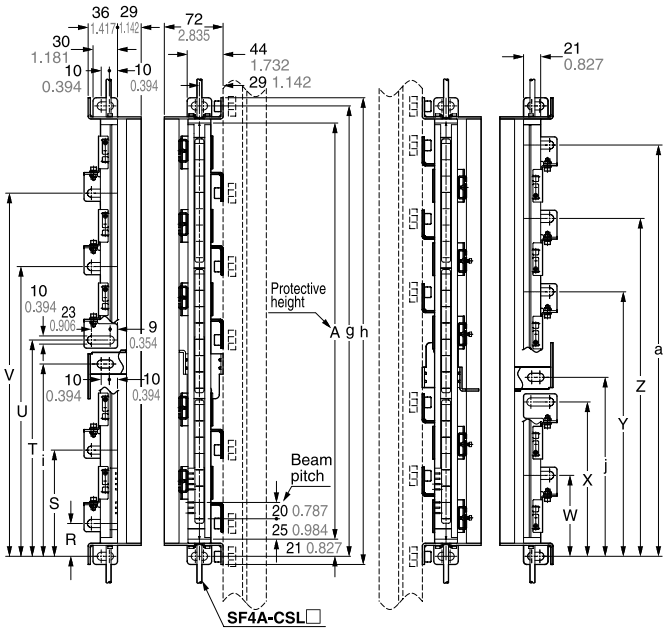
Mounting drawing for the sensor on which the U-shaped intermadiate supporting brackets, the front protection unit and the cables for series connection are mounted.

<Back mounting>



Emitter Receiver

<Side mounting>



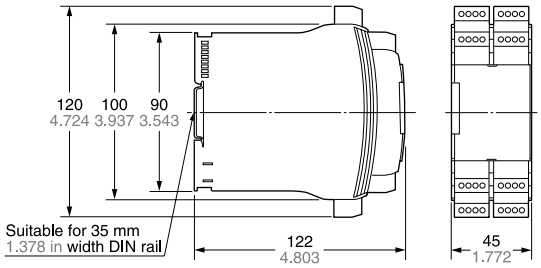
Emitter Receiver

Model No.	A	g	h	R	S	T	U	V	W	X	Y	Z	a	i	j
SF4-AH8(-N)	190 7.480	232 9.134	252 9.921	—	—	—	—	—	—	—	—	—	—	—	—
SF4-AH12(-N)	270 10.630	312 12.283	332 13.071	—	—	—	—	—	—	—	—	—	—	—	—
SF4-AH16(-N)	350 13.780	392 15.433	412 16.220	—	—	—	—	—	—	—	—	—	—	—	—
SF4-AH20(-N)	430 16.929	472 18.583	492 19.370	—	—	—	—	—	—	—	—	—	—	—	—
SF4-AH24(-N)	510 20.079	552 21.732	572 22.520	—	—	—	—	—	—	—	—	—	—	—	—
SF4-AH28(-N)	590 23.228	632 24.882	652 25.669	—	—	—	—	—	—	—	—	—	—	—	—
SF4-AH32(-N)	670 26.378	712 28.031	732 28.819	—	—	—	—	—	—	—	—	—	—	—	—
SF4-AH36(-N)	750 29.528	792 31.181	812 31.968	340 13.386	—	—	—	—	430 16.929	—	—	—	—	—	—
SF4-AH40(-N)	830 32.677	872 34.331	892 35.118	380 14.961	—	—	—	—	470 18.504	—	—	—	—	510 20.079	500 19.685
SF4-AH48(-N)	990 38.976	1,032 40.630	1,052 41.417	380 14.961	540 21.260	—	—	—	470 18.504	630 24.803	—	—	—	510 20.079	500 19.685
SF4-AH56(-N)	1,150 45.276	1,192 46.929	1,212 47.716	380 14.961	540 21.260	700 27.559	—	—	470 18.504	630 24.803	790 31.102	—	—	670 26.378	660 25.984
SF4-AH64(-N)	1,310 51.575	1,352 53.228	1,372 54.016	460 18.110	620 24.409	780 30.709	—	—	550 21.654	710 27.953	870 34.252	—	—	750 29.528	740 29.134
SF4-AH72(-N)	1,470 57.874	1,512 59.527	1,532 60.315	540 21.260	700 27.559	860 33.858	—	—	630 24.803	790 31.102	950 37.402	—	—	830 32.677	820 32.283
SF4-AH80(-N)	1,630 64.173	1,672 65.827	1,692 66.614	540 21.260	700 27.559	860 33.858	1,020 40.157	—	630 24.803	790 31.102	950 37.402	1,110 43.701	—	830 32.677	820 32.283
SF4-AH88(-N)	1,790 70.472	1,832 72.126	1,852 72.913	540 21.260	700 27.559	860 33.858	1,020 40.157	1,180 46.457	630 24.803	790 31.102	950 37.402	1,110 43.701	1,270 50.000	990 38.976	980 38.583
SF4-AH96(-N)	1,950 76.772	1,992 78.425	2,012 79.212	620 24.409	780 30.709	940 37.008	1,100 43.307	1,260 49.606	710 27.953	870 34.252	1,030 40.551	1,190 46.850	1,350 53.150	1,070 42.126	1,060 41.732

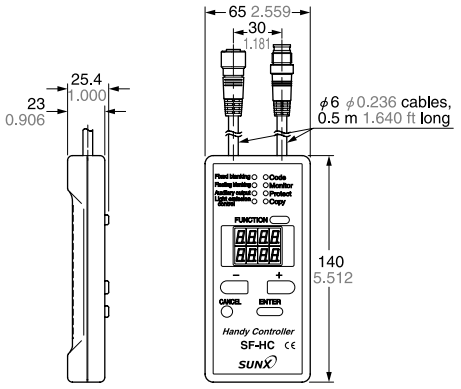
SF4-AH

DIMENSIONS (Unit: mm in)

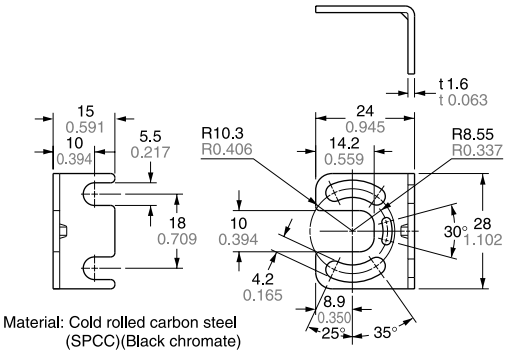
SF-AC
Safety relay unit (for PNP output type light curtain)(Optional)



SF-HC
Handy-controller (Optional)



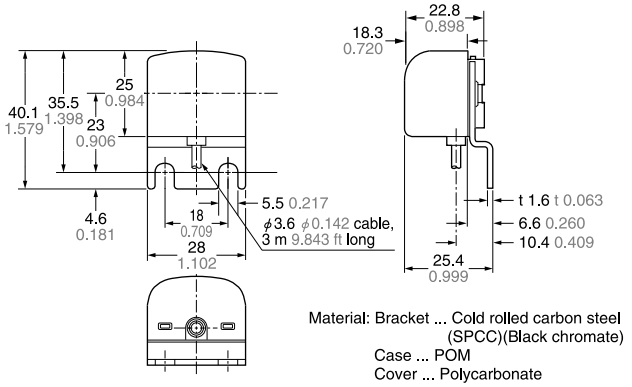
MS-SF2N-1
Rear mounting bracket (Accessory)



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

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

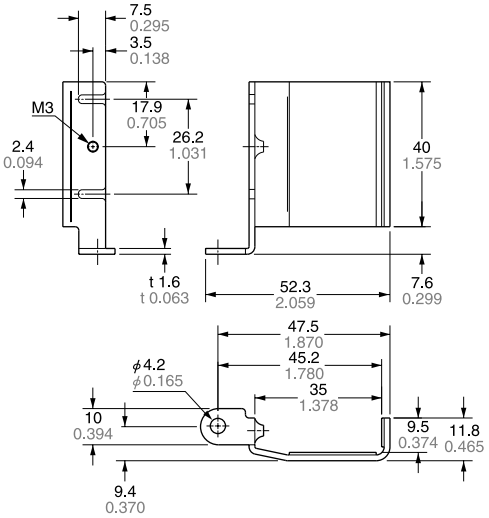
SF-IND-2
Large display unit for light curtain (Optional)



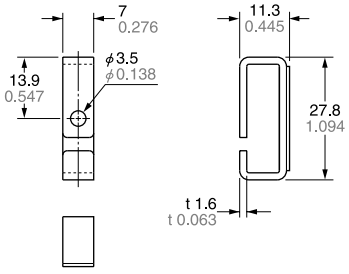
Material: Bracket ... Cold rolled carbon steel (SPCC)(Black chromate)
Case ... POM
Cover ... Polycarbonate

MS-SF2N-2
U-shaped rear mounting intermediate supporting bracket for **SF4-AH□(-N)** [Accessory for **SF4-AH□(-N)** having 36 beam channels or more]

U-shaped rear supporting bracket



Retaining plate



Material: Cold rolled carbon steel (SPCC)(Black chromate)
Set of 2 pcs. each of U-shaped rear supporting bracket and retaining plate (Note)

Note: **MS-SF2N-2** (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.

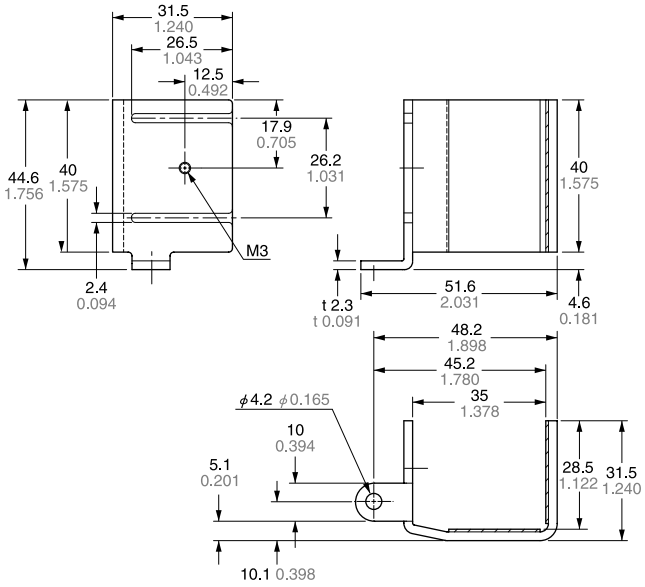
SF4-AH36(-N), **SF4-AH40(-N)**: 1 set
SF4-AH48(-N): 2 sets
SF4-AH56(-N), **SF4-AH64(-N)**, **SF4-AH72(-N)**: 3 sets
SF4-AH80(-N): 4 sets
SF4-AH88(-N), **SF4-AH96(-N)**: 5 sets

SF4-AH

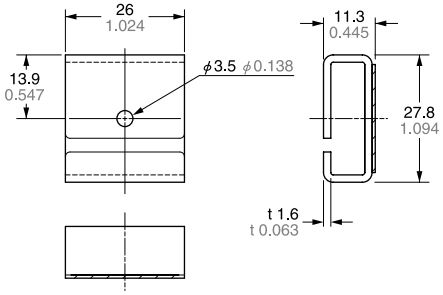
DIMENSIONS (Unit: mm in)

MS-SF4A-H2
U-shaped rear mounting intermediate supporting bracket for **SF4-AH□-H** (Accessory for **SF4-AH□-H** having 36 beam channels or more)

U-shaped rear supporting bracket



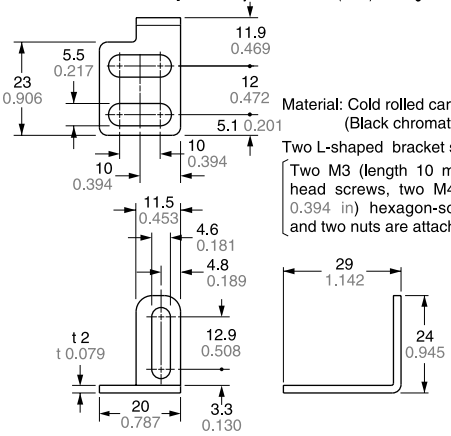
Retaining plate



Material: Cold rolled carbon steel (SPCC)(Black chromate)
Set of 2 pcs. 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.
SF4-AH36-H, **SF4-AH40-H**: 1 set
SF4-AH48-H: 2 sets
SF4-AH56-H, **SF4-AH64-H**, **SF4-AH72-H**: 3 sets
SF4-AH80-H: 4 sets
SF4-AH88-H, **SF4-AH96-H**: 5 sets

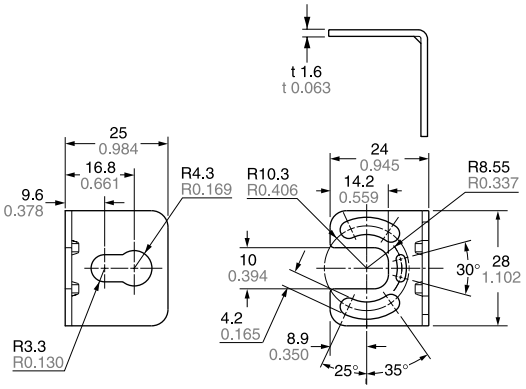
MS-SF2N-L
L-shaped intermediate supporting bracket
[Accessory for **SF4-AH□(-N/H)** having 36 beam channels or more]



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

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.
SF4-AH36(-N/H), **SF4-AH40(-N/H)**: 1 set
SF4-AH48(-N/H): 2 sets
SF4-AH56(-N/H), **SF4-AH64(-N/H)**, **SF4-AH72(-N/H)**: 3 sets
SF4-AH80(-N/H): 4 sets
SF4-AH88(-N/H), **SF4-AH96(-N/H)**: 5 sets

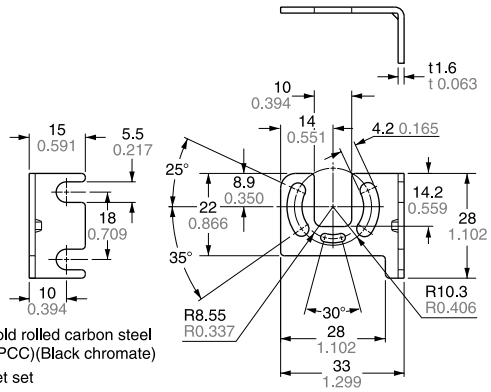
MS-SF2N-5
Center sensor mounting bracket (Optional)



Material: Cold rolled carbon steel (SPCC)(Black chromate)
Four bracket set

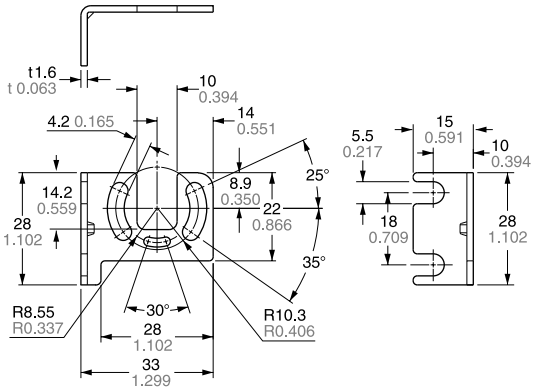
MS-SF2N-3
Side mounting bracket (Optional)

Right side-mounting of sensors



Material: Cold rolled carbon steel
(SPCC)(Black chromate)
Four bracket set

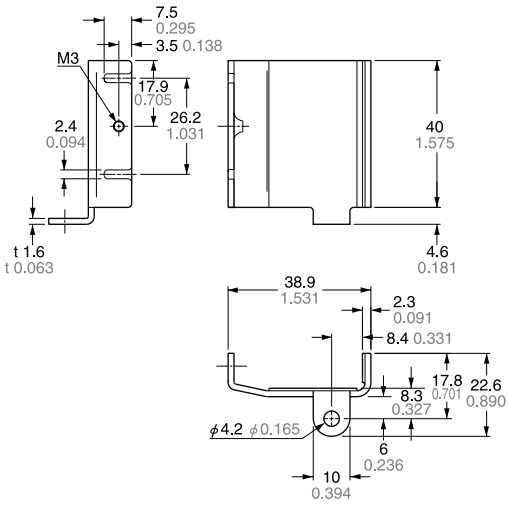
Left side-mounting of sensors



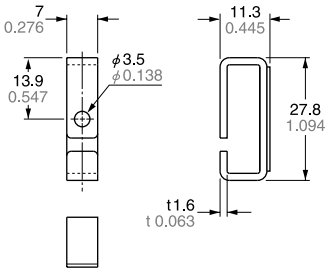
DIMENSIONS (Unit: mm in)

MS-SF2N-4 U-shaped side mounting intermediate supporting bracket for SF4-AH□(-N)(Optional)

U-shaped side supporting bracket



Retaining plate



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

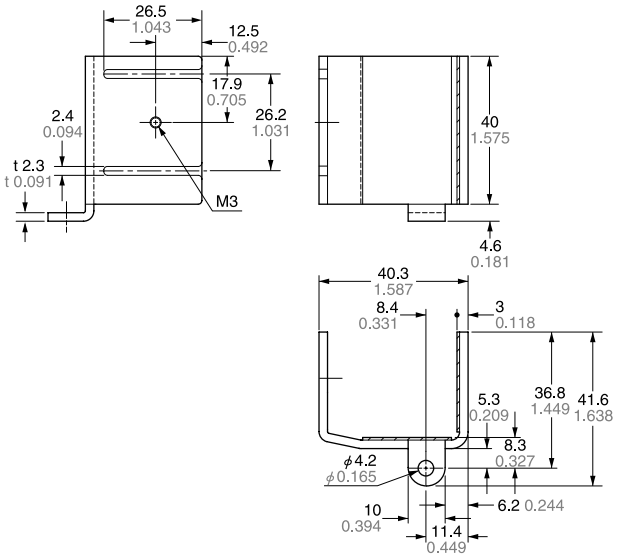
Set of 2 pcs. each of U-shaped side supporting bracket and retaining plate (Note)

Note: **MS-SF2N-4** (U-shaped side mounting intermediate supporting bracket) is attached with the following sensors. The number of attached U-shaped side mounting intermediate supporting bracket is different depending on the sensor as follows.

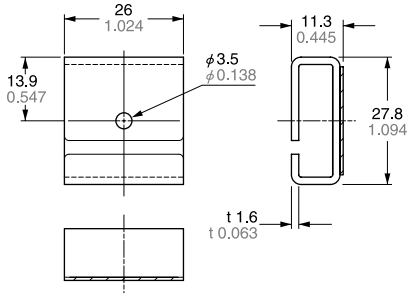
SF4-AH36(-N), **SF4-AH40(-N)**: 1 set
SF4-AH48(-N): 2 sets
SF4-AH56(-N), **SF4-AH64(-N)**, **SF4-AH72(-N)**: 3 sets
SF4-AH80(-N): 4 sets
SF4-AH88(-N), **SF4-AH96(-N)**: 5 sets

MS-SF4A-H4 U-shaped side mounting intermediate supporting bracket for SF4-AH□-H (Optional)

U-shaped side supporting bracket



Retaining plate



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

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

Note: **MS-SF4A-H4** (U-shaped side mounting intermediate supporting bracket) is attached with the following sensors. The number of attached U-shaped side mounting intermediate supporting bracket is different depending on the sensor as follows.

SF4-AH36-H, **SF4-AH40-H**: 1 set
SF4-AH48-H: 2 sets
SF4-AH56-H, **SF4-AH64-H**, **SF4-AH72-H**: 3 sets
SF4-AH80-H: 4 sets
SF4-AH88-H, **SF4-AH96-H**: 5 sets

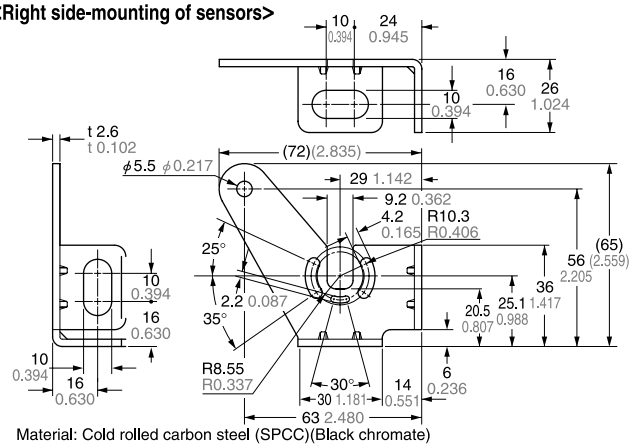
SF4-AH

DIMENSIONS (Unit: mm in)

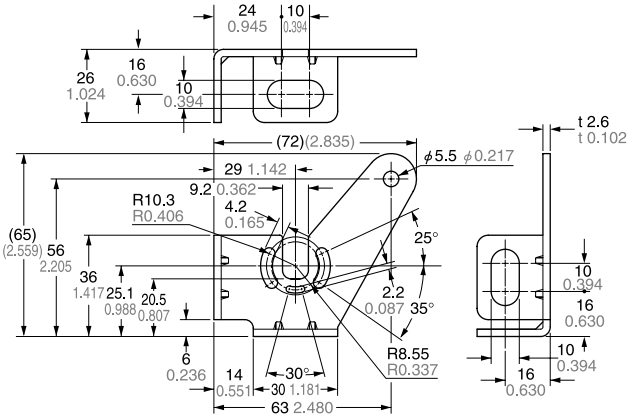
MC-SF4AH-□ Front protection unit (Optional)

Protection bar mounting bracket

<Right side-mounting of sensors>

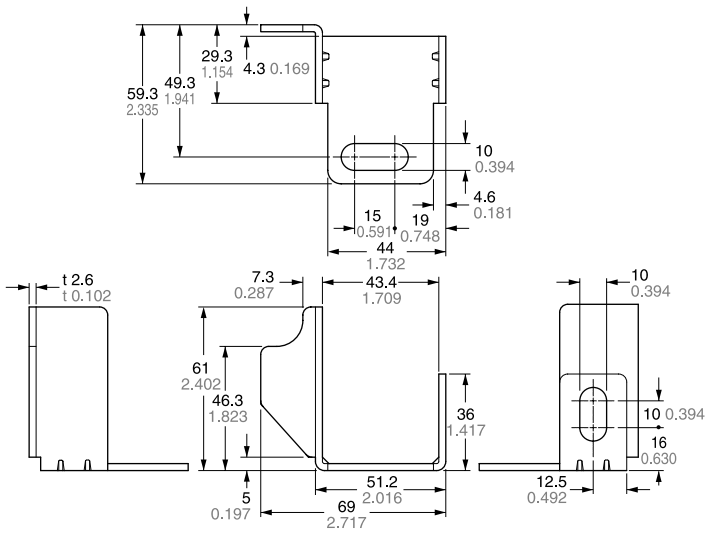


<Left side-mounting of sensors>



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

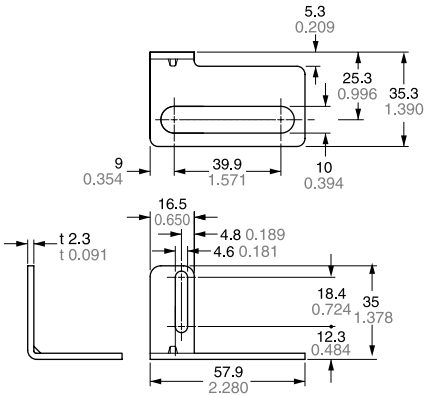
Protection bar intermediate supporting bracket



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

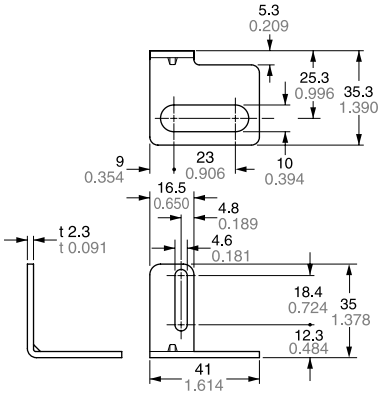
Note: 1 pc. protection bar intermediate supporting bracket is attached with the front protection bracket for 40 beam channels or more.

L-shaped rear mounting intermediate supporting bracket for front protection unit MS-SF4A-L2



Notes: 1) The number of **MS-SF4A-L2** (L-shaped rear mounting intermediate supporting bracket for front protection unit) is different depending on the product as follows.
MC-SF4AH-36, **MC-SF4AH-40**: 1 pc.
MC-SF4AH-48: 2 pcs.
MC-SF4AH-56, **MC-SF4AH-64**, **MC-SF4AH-72**: 3 pcs.
MC-SF4AH-80: 4 pcs.
MC-SF4AH-88, **MC-SF4AH-96**: 5 pcs.

L-shaped side mounting intermediate supporting bracket for front protection unit MS-SF4A-L4



Note: The number of **MS-SF4A-L4** (L-shaped side mounting intermediate supporting bracket for front protection unit) is different depending on the product as follows.
MC-SF4AH-36, **MC-SF4AH-40**: 1 pc.
MC-SF4AH-48: 2 pcs.
MC-SF4AH-56, **MC-SF4AH-64**, **MC-SF4AH-72**: 3 pcs.
MC-SF4AH-80: 4 pcs.
MC-SF4AH-88, **MC-SF4AH-96**: 5 pcs.

Two M5 (length 20 mm 0.787 in) hexagon-socket-head bolts, four M3 (length 6 mm 0.236 in) hexagon-socket-head bolts, M8 (length 16 mm 0.630 in) hexagon-headed bolt (Note 2) and two spacers are attached.

2) The number of M8 (length 16 mm 0.630 in) hexagon-socket-head bolt is different depending on the product as follows.
MC-SF4AH-8/12/16/20/24/28/32: 2 pcs.
MC-SF4AH-36: 3 pcs.
MC-SF4AH-40: 4 pcs.
MC-SF4AH-48: 5 pcs.
MC-SF4AH-56/64/72: 6 pcs.
MC-SF4AH-80: 7 pcs.
MC-SF4AH-88/96: 8 pcs.