SF2-EH SERIES

Robust Light Curtain Type 4









Passes global safety standards!





Conforming to OSHA / AÑSI

Global safety

The SF2-EH series complies with the IEC 61496-1/2 international standards, so that it can be used in different countries throughout the world.

- CE marking based on Machine Directive and EMC Directive has been obtained. [Type 4 based on IEC 61496-1/2, EN 61496-1, and Control Category 4 based on EN 954-1]
- C-UL US listings (UL 61496-1/2) which are required for use in the United States and Canada have been obtained.
- This series is also compatible with equipment conforming to OSHA (1910.212/217), ANSI (B11.1∼B11.20) and ANSI / RIA 15.06 regulations.

Pursuit of safety

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

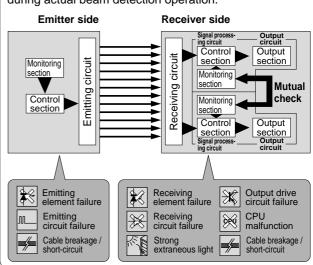
Further, in order to ensure safety, FMEA (Failure Mode & Effects Analysis) has been used to prove safe operation.



Safety design of the SF2-EH series

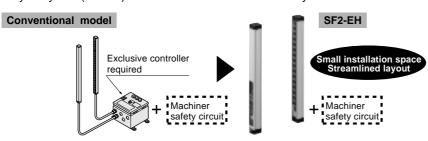
The sensor unit continually performs self-checking on its internal circuitry, its cable integrity and even checks for interference from extraneous light.

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



Exclusive controller not required

Since an exclusive controller is not required, there is no need to provide space for it. Further, the PNP output equivalent type can be combined with an optional safety relay unit (SF-AC) to create an intrusion detection system.



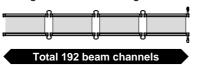
Wide area: 1,580 mm × 10 m 62.205 in × 32.808 ft

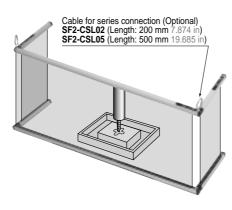
SF2-EH

It realizes a wide sensing area with a protective height of 1,580 mm 62.205 in max. (80 beam channels) and a long operating range of 10 m 32.808 ft. Just one sensor can cover an area where previously 2 sensors had to be used.

Sensors connectable in series

Using the optional cable (SF2-CSL□) for series connection, maximum 4 sets of sensors with a total of 192 beam channels can be connected in series. For example, in case of mounting the sensors on the front, as well as, both the sides of a danger region, previously separate wiring was required for 3 sets of sensors. But now, wiring equivalent to that for only 1 set is required, thus saving troublesome wiring and cost.





Wide variety

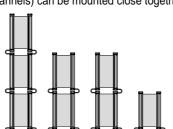
There are 13 models of sensors having a protective height ranging from 220 mm 8.661 in to 1,580 mm 62.205 in (12 to 80 beam channels). The sensors can be selected to suit the monitoring area of the used equipment.

Further, PNP output equivalent type, as well as, NPN output equivalent type are available.

No interference

· Up to 12 sets of sensors can be mounted close together

In case of series connection or parallel connection, interference can be prevented for up to 4 sets, respectively. Further, in case of series and parallel mixed connection, up to 12 sets (total 192 beam channels) can be mounted close together.



• Effective aperture angle ± 2.5 ° or less Since the effective aperture angle is narrow (± 2.5 ° or less), it reduces the effect of reflection from walls, etc., and interference from extraneous liaht.

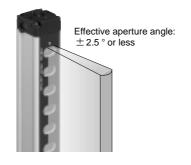
· Convenient slit mask available

By using the optional slit mask (OS-SF2-H□), the amount of beam emitted or received can be restrained to reduce the effect of extraneous light from other sensors, etc.

Easy maintenance

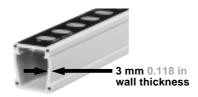
An optional front protection cover (FC-SF2-H□) is available, so that the sensing face of the sensor can be protected in an adverse environment.





Solid aluminum case

All models have a solid aluminum case with a thickness of 3 mm 0.118 in. This case is much stronger than previous cases, so that the sensors can be used with even greater confidence.





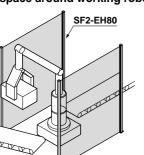
Mounting bracket enables easy beam alignment

The beam alignment is easy since angle adjustment is possible with the sensor mounting bracket (MS-SF2-1).

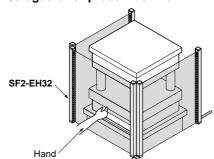


APPLICATIONS

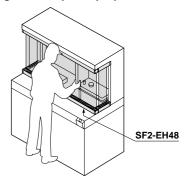
Guarding space around working robot



Safeguard for press machine



Safeguard for special purpose machine



ORDER GUIDE

SF2-EH80

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

Annagrance	Operating	Mode	el No.	Number of	Protective
Appearance	range	PNP output equivalent type	NPN output equivalent type	beam channels	height (mm in)
		SF2-EH12	SF2-EH12-N	12	220 8.661
Beam channel No.		SF2-EH16	SF2-EH16-N	16	300 11.811
Beam channel No.		SF2-EH20	SF2-EH20-N	20	380 14.961
	0.3 to 10 m 0.984 to 32.808 ft	SF2-EH24	SF2-EH24-N	24	460 18.110
Protective height		SF2-EH28	SF2-EH28-N	28	540 21.260
		SF2-EH32	SF2-EH32-N	32	620 24.409
		SF2-EH36	SF2-EH36-N	36	700 27.559
2 Beam pitch		SF2-EH40	SF2-EH40-N	40	780 30.709
0.5 m 20 mm 0.787 in		SF2-EH48	SF2-EH48-N	48	940 37.008
		SF2-EH56	SF2-EH56-N	56	1,100 43.307
₩		SF2-EH64	SF2-EH64-N	64	1,260 49.606
Optional mating cable		SF2-EH72	SF2-EH72-N	72	1,420 55.905
		SF2-EH80	SF2-EH80-N	80	1,580 62.205

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

mating cables	mating cables mating cable is not supplied with the sensor. Flease order it separately.									
Туре	Appearance	Model No.	Description							
		SF2-CC3	Length: 3 m 9.843 ft Weight: 410 g approx. (two cables)	8-core shielded cable, with connector on one end, two cables per set						
Cable with connector on one end		SF2-CC7	Length: 7 m 22.966 ft Weight: 890 g approx. (two cables)	Cable outer diameter: \$6 \text{ mm} \phi 0.236 \text{ in} Connector outer diameter: \$14 \text{ mm} \phi 0.551 \text{ in max.} Cable color: Gray (for emitter) Gray with black line (for receiver)						
		SF2-CC10	Length: 10 m 32.808 ft Weight: 1.2 kg approx. (two cables)	Connecter color: Gray (for emitter) Black (for receiver)						
Cable with connector on both ends		SF2-CCJ10	Length: 10 m 32.808 ft Weight: 1.2 kg approx. (two cables)	B-core shielded cable, with connector on both ends, two cables per set • Cable outer diameter: \$\phi 6\$ mm \$\phi 0.236\$ in • Connector outer diameter: \$\phi 14\$ mm \$\phi 0.551\$ in max. • Cable color: Gray (for emitter) Gray with black line (for receiver) • Connecter color: Gray (for emitter) Black (for receiver)						
Cable for series connection		SF2-CSL02	Length: 200 mm 7.874 in Weight: 150 g approx. (two cables)	It can connect two sensors in series. 8-core shielded cable, two cables per set						
		SF2-CSL05	Length: 500 mm 19.685 in Weight: 170 g approx. (two cables)	Cable outer diameter:						

ORDER GUIDE

Safety relay unit

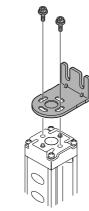
Туре	Appearance	Model No.	Description
Safety relay unit For PNP output type light curtain		SF-AC (Note)	Safety relay unit for PNP output type • Complies with Control Categories up to 4 based on EN 954-1

Note: Refer to p.500~ for further details.

Spare parts (Accessories for sensor)

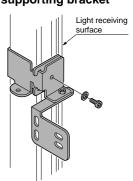
Designation	Model No.	Description
Sensor mounting bracket	MS-SF2-1	One set of two brackets for both the emitter and the receiver
Intermediate supporting bracket	MS-SF2-2	One set of two brackets for both the emitter and the receiver
Test rod	SF2-EH-TR	Sensing object (ϕ 30 mm ϕ 1.181 in) for daily check

Sensor mounting bracket



Four bracket set Eight M4 (length 10 mm 0.394 in) hexagon-socket-head bolts with

Intermediate supporting bracket



Set of 2 pcs. each of U-shaped intermediate supporting bracket and L-shaped intermediate supporting bracket

Two M4 (length 6 mm 0.236 in) hexagon-sock-et-head bolts, two M4 (length 10 mm 0.394 in) hexagon-socket-head bolts with washers, two nuts and two plain washers are attached.

OPTIONS

App	plicable beam channels ation	For 12 beam channels	For 16 beam channels	For 20 beam channels	For 24 beam channels	For 28 beam channels	For 32 beam channels	For 36 beam channels	For 40 beam channels	For 48 beam channels	For 56 beam channels	For 64 beam channels	For 72 beam channels	For 80 beam channels
Front protection cover	Model No.	FC-SF2-H12	FC-SF2-H16	FC-SF2-H20	FC-SF2-H24	FC-SF2-H28	FC-SF2-H32	FC-SF2-H36	FC-SF2-H40	FC-SF2-H48	FC-SF2-H56	FC-SF2-H64	FC-SF2-H72	FC-SF2-H80
Slit mask	Model No.	OS-SF2-H12	OS-SF2-H16	OS-SF2-H20	OS-SF2-H24	OS-SF2-H28	OS-SF2-H32	OS-SF2-H36	OS-SF2-H40	OS-SF2-H48	OS-SF2-H56	OS-SF2-H64	OS-SF2-H72	OS-SF2-H80
Front protection bracket	Model No.	MC-SF2EH-12	MC-SF2EH-16	MC-SF2EH-20	MC-SF2EH-24	MC-SF2EH-28	MC-SF2EH-32	MC-SF2EH-36	MC-SF2EH-40	MC-SF2EH-48	MC-SF2EH-56	MC-SF2EH-64	MC-SF2EH-72	MC-SF2EH-80

Note: The model Nos. given above denote a single unit, not a pair of units.

Front protection cover

It protects front lens.

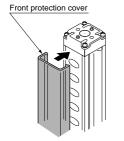
Slit mask

The slit mask restrains the amount of beam emitted or received and hence reduces the interference between neighbouring sensors.

It is also used in cases when the beam intensity is too strong penetrating through the sensing object.

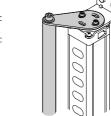
However, the operating range reduces when the

slit mask is used.



Operating range

- · Slit on the emitter side:
- Slit on the receiver side: 5 m 16.404 f
- · Slit on both sides: 2 m 6.562 ft



Front protection bracket

It protects front face from damage due to striking of an object.

Laser alignment tool

• SF-LAT-2E

Easy to align the beam axis with the visible laser beam.



SPECIFICATIONS

1		Number of beam channels	12	16	20	24	28	32	36	40	48	56	64	72	80
	Model	PNP output equivalent type	SF2-EH12	SF2-EH16	SF2-EH20	SF2-EH24	SF2-EH28	SF2-EH32	SF2-EH36	SF2-EH40	SF2-EH48	SF2-EH56	SF2-EH64	SF2-EH72	SF2-EH80
Item	\ NIO	NPN output equivalent type	SF2-EH12-N	SF2-EH16-N	SF2-EH20-N	SF2-EH24-N	SF2-EH28-N	SF2-EH32-N	SF2-EH36-N	SF2-EH40-N	SF2-EH48-N	SF2-EH56-N	SF2-EH64-N	SF2-EH72-N	SF2-EH80-N
Protective height			220 mm 8.661 in	300 mm 11.811 in	380 mm 14.961 in	460 mm 18.110 in		620 mm 24.409 in	700 mm 27.559 in						1,580 mm 62.205 in
Оре	rating ran	ng range 0.3 to 10 m 0.984 to 32.808 ft													
Bear	m pitch			20 mm 0.787 in											
Dete	ection cap	ability		ø30 mm ø1.181 in or more opaque object											
Effec	ctive aper	ture angle	\pm 2.5 ° or less [for operating range exceeding 3 m 9.843 ft (conforming to IEC 61496-2 / UL 61496-2)]												
Supp	ply voltag	е						24	V DC ± 1	5 %					
Curr	rent consu	umption						20	0 mA or le	ess					
Contr (Note		(OSSD 1, OSSD 2)	Semico • Maxi • Applie	inductor o imum sou ed voltage: S	rce curren	P output e t: 300 mA ply voltage (between con	2 outputs trol output and cource curr	Se d + V) •	emiconduc Maximum Applied volta	n sink curr age: Same a	(NPN out ent: 300 n s supply volt	nA age (betweer	alent) 2 ou n control outp A sink cur	out and 0 V)
	Utilization	n category						DC	-12 or DC	-13					
	Operation	n mode						eceived / (ion in the					are interru	ıpted	
	Protection	n circuit						Ir	ncorporate	d					
Res	ponse tim	е				OFF	response	: 15 ms o	r less, ON	response	: 20 ms or	less			
	Emitter				Test i	input (emi	ssion halt	LED (ligh) indicator: ED (lights i	Orange L	.ED (lights	up when		halts)		
Indicators	Receiver		OSSD Of Incident I	FF indicat beam indi	or: Red Ll cator: Gre prop	ED (lights en / Red portional to	up when on LED [light on the incide the inci	control out control out its up in o ent light in fault occu	puts are C green whe stensity for	OFF) en all bea reference					
Test	input (emi	ssion halt) function						lr	ncorporate	d					
Inter		prevention		Incorpora	ted Par	allel conne	ection: 4 s	ets max., h ets max., ed connec	however to	otal 192 b	eam chan	nels max.	eam chanr	nels max.	
	Pollution	degree						3 (Indus	strial envir	onment)					
Φ.	Degree o	f protection							IP65 (IEC)					
resistance	Ambient	temperature	— 10	to + 55 °	C + 14 to	+ 131 °F	(No dew	condensat	tion or icin	g allowed)	, Storage	- 25 to -	-70 °C −	13 to + 1	58 °F
resis	Ambient	humidity					30 to	85 % RH	, Storage:	30 to 95 %	% RH				
ental	Ambient	illuminance		Sunlig	ht: 20,000	ℓx at the	e light-rece	eiving face	, Incandes	scent light	3,500 ℓ>	at the lig	nt-receivir	ng face	
Environmenta	Dielectric	strength voltage			1,000 V A	C for one	min. betv	veen all su	ipply termi	nals conn	ected toge	ether and	enclosure		
nvir	Insulation	resistance		20 MΩ,	or more,	with 500 \	/ DC meg	ger betwe	en all supp	oly termina	als connec	ted togeth	ner and er	closure	
	Vibration	resistance		10	to 55 Hz	frequency	, 0.75 mm	0.030 in a	amplitude	in X, Y and	d Z directi	ons for tw	o hours ea	ach	
	Shock re	sistance			300 m	/s² accele	eration (30	G approx	.) in X, Y a	ınd Z dired	ctions for t	hree time	s each		
Emit	tting elem	ent				Infrar	ed LED (F	Peak emis	sion wave	length: 87	0 nm 0.03	4 mil)			
Mate	erial		Enclosure: Aluminum, Cap: ABS												
Cabl	le				3 mm ² × ² gether with			-core) shie g cable	elded cabl	e, 0.5 m 1	.640 ft lon	g, with a o	connector	at the end	l
Cabl	le extensi	on		Extension	on up to to	tal 27 m 8	88.583 ft is	possible,	for both e	mitter and	receiver,	with optio	nal mating	g cables.	
Weig	tht (Total of	emitter and receiver)	1.1 kg approx.	1.3 kg approx.	1.5 kg approx.	1.7 kg approx.	1.9 kg approx.	2.2 kg approx.	2.4 kg approx.	2.6 kg approx.	3.1 kg approx.	3.5 kg approx.	4.0 kg approx.	4.4 kg approx.	4.9 kg approx.
	Weight (Total of emitter and receiver) 1.1 kg approx 1.3 kg approx 1.5 kg approx 1.5 kg approx 1.7 kg approx 1.9 kg approx 2.2 kg approx 2.4 kg approx 2.4 kg approx 3.1 kg approx 3.5 kg approx 4.0 kg approx 4.4 kg approx 4.9 kg approx 4.0 kg approx 4.9 kg approx 4.0 kg approx 4.0 kg approx 4.4 kg approx 4.9 kg approx 4.0 k														

Notes: 1) OSSD stands for 'Output Signal Switching Device'.

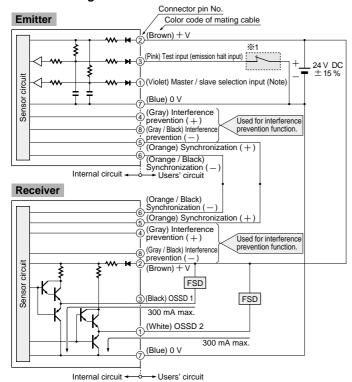
2) MS-SF2-2 (intermediate supporting bracket) is attached with sensors having 24, or more, beam channels. The number of attached intermediate supporting brackets is different depending on the sensor as follows.

SF2-EH24(-N), SF2-EH28(-N), SF2-EH32(-N), SF2-EH36(-N), SF2-EH40(-N), SF2-EH48(-N), SF2-EH56(-N): 1 set SF2-EH64(-N), SF2-EH72(-N), SF2-EH80(-N): 2 sets

I/O CIRCUIT AND WIRING DIAGRAMS

NPN output equivalent type

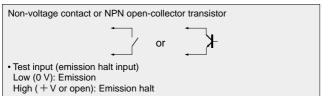
I/O circuit diagram



Note: Refer to p.496 for master / slave selection input.

CAUTION

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



Output waveform (when output is ON)

• When the sensor is in the light received condition (ON state), the receiver self-diagnoses the output circuit. For this purpose, the output transistor goes to the OFF state periodically. (Refer to the figure of output condition given at the right.)

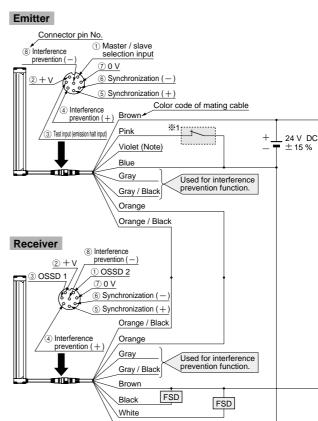
If the OFF signal is fed back, the receiver judges the output circuit as normal. If the OFF signal is not fed back, the receiver judges that the output circuit or the wiring is abnormal, and the output is maintained in the OFF state.

The frequency or the period for which the output transistor turns OFF does not change even for the maximum connected set No. of 4 sets connected in series.



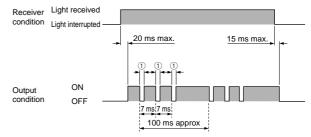
Take care of the input response time of the equipment connected to the sensor, since there is a possibility of the equipment malfunctioning due to the sensor OFF signal.

Wiring diagram



Note: Refer to p.496 for master / slave selection input.

Blue



Pulse width (width of 1 in the figure): 200 μ s

I/O CIRCUIT AND WIRING DIAGRAMS

PNP output equivalent type

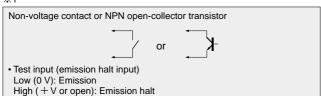
I/O circuit diagram Connector pin No. Emitter Color code of mating cable (Brown) + \ _24 V DC ±15% circuit (Violet) Master / slave selection input (Note) Sensor (Blue) 0 V (Gray) Interference prevention (+) (Gray / Black) Interference Used for interference prevention function. prevention (-) (Orange) Synchronization (+) (Orange / Black) Synchronization (Users' circuit Internal circuit -Receiver (Orange / Black) Synchronization (-(Orange) Synchronization (+) (Gray) Interference prevention (+) Used for interference (Gray / Black) Interference Sensor circuit prevention (—) (Brown) + V 300 mA max. (Black) OSSD 1 300 mA max (White) OSSD 2 FSD FSD (Blue) 0 V

Note: Refer to p.496 for master / slave selection input.

CAUTION

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

※1



Output waveform (when output is ON)

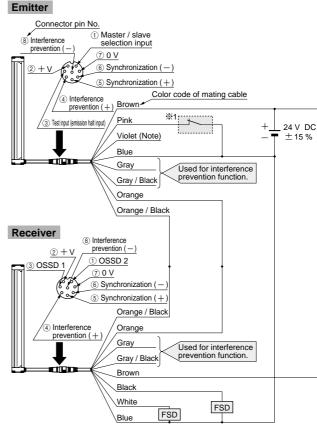
 When the sensor is in the light received condition (ON state), the receiver self-diagnoses the output circuit. For this purpose, the output transistor goes to the OFF state periodically. (Refer to the figure of output condition given at the right.)

If the OFF signal is fed back, the receiver judges the output circuit as normal. If the OFF signal is not fed back, the receiver judges that the output circuit or the wiring is abnormal, and the output is maintained in the OFF state. The frequency or the period for which the output transistor turns OFF does not change even for the maximum connected set No. of 4 sets connected in series.

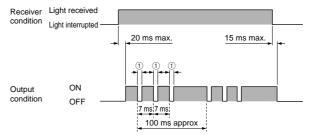


Take care of the input response time of the equipment connected to the sensor, since there is a possibility of the equipment malfunctioning due to the sensor OFF signal.

Wiring diagram



Note: Refer to p.496 for master / slave selection input.

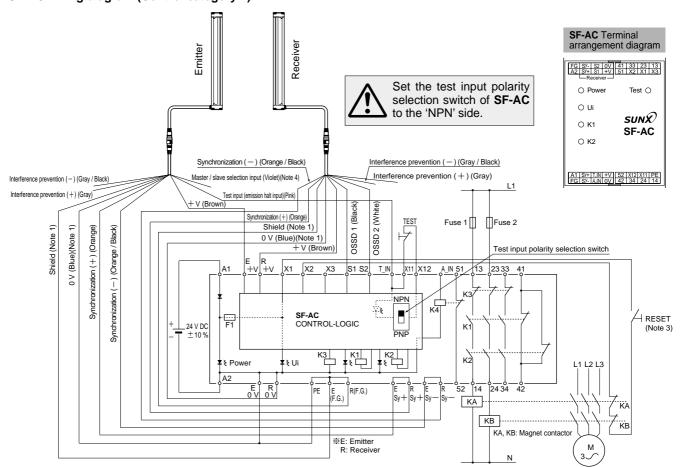


Pulse width (width of 1 in the figure): 200 μ s

I/O CIRCUIT AND WIRING DIAGRAMS

PNP output equivalent type

SF-AC wiring diagram (Control category 4)



Notes: 1) The shielding wire and 0 V (blue) of the SF2-EH series are connected in the their bodies.

- 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.
- 4) Refer to p.496 for master / slave selection input.

PRECAUTIONS FOR PROPER USE

Refer to p.1135~ for general precautions.



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.

Wiring

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

PRECAUTIONS FOR PROPER USE

Refer to p.1135~ for general precautions.



 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

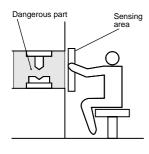


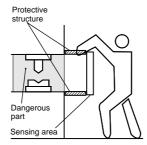
 Make sure to install this product such that any part of the human body that passes through the sensing area is detected before it reaches dangerous machine parts.

If the human body is not detected, there is a danger of serious injury or death.

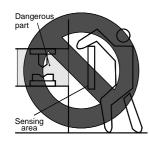
 Do not use any reflective type or retroreflective type arrangement.

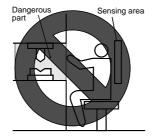
Correct mounting method





Wrong mounting method

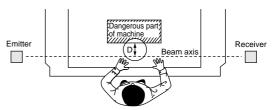




Safety distance



- 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.
- T: Response time of total equipment (sec.)

 $T = T_m + T_{SF2}$

T_m: Maximum halt time of device (sec.)

TsF2: Response time of the SF2-EH series 0.015 (sec.)

C: Additional distance calculated from the size of the minimum sensing object of the sensor (mm)

Note that the value of C is not less than or equal to 0. $C = 8 \times (d - 14)$

d: Minimum sensing object diameter 30 (mm) 1.181 (in)

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

• Equation (2) $D = K \times (T_s + T_c + T_{SF2} + T_{bm}) + D_{pf}$

D: Safety distance (mm)

Minimum required distance between the surface of the sensing area and dangerous part of machine.

K: Intrusion speed {Recommended value in OSHA is 63 (inch/sec.) [≒1,600 (mm/sec.)]}

ANSI B11.19 does not define the intrusion speed (K). When determining K, consider possible factors including physical ability of operators.

- Ts: 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.)

TsF2: Response time of the SF2-EH series 0.015 (sec.)

T_{bm}: Additional halt time tolerance for the brake monitor (sec.)

 $T_{bm} = T_a - (T_s + T_c)$

Ta: 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.

Dpf: Additional distance calculated from the size of the minimum sensing object of the sensor (mm)

 $D_{pf} = 78.2 \text{ mm } 3.079 \text{ in}$ $D_{pf} = 3.4 \times (d - 0.276) \text{ (inch)}$

 $J_{pf} = 3.4 \times (d - 0.276)$ (Inc = 3.4 × (d - 7) (mm)

d: Minimum sensing object diameter 1.2 (inch) = 30 (mm) Note that the value of D_P is not less than or equal to 0.

PRECAUTIONS FOR PROPER USE

Refer to p.1135~ for general precautions.

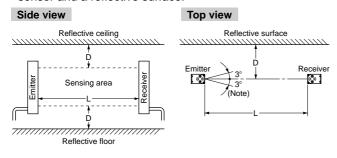
SF2-EH

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.



Distance between emitter and receiver, L	Allowable setting distance, D	0.8 7 \$\int 2.265\$ \$\begin{align*} 2.265 \\ \text{\$\exiting{\$\text{\$\text{\$\text{\$\text{\$\text{\$\text{\$\text{\$\text{\$\text{\$\text{\$\text{\$\text{\$\text{\$\text{\$\text{\$\text{\$\text{\$\}\$}}}}}}}}}}}}}}}}}}}}}}}}}}}}}} \endthend\text{\$\te	Allowed setting area
0.3 to 3 m 0.984 to 9.843 ft	0.16 m 0.525 ft	ettin 0.4 - 1.312	
3 to 10 m 9.843 to 32.808 ft	$L \times \tan \theta \ \theta = 3^{\circ}$ = $L \times 0.052$ (m) 0.171 (ft)	☐ 9.1309 ☐ 0.4 - ☐ 0.2 - ☐ 0.656	Unallowed setting area
		0 4	2 4 6 8 10 6.562 13.123 19.685 26.247 32.80 — Distance between emitter and receiver L (m 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

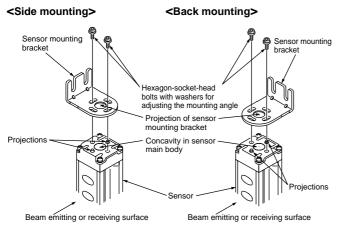
Mounting

• The minimum bending radius of the cable is R35 mm

Mount the sensor considering cable bending radius.

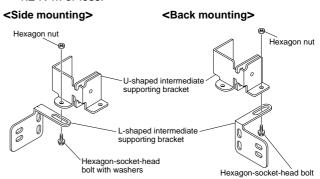
Mounting of sensor mounting bracket (MS-SF2-1)

· Choose the mounting direction for the sensor mounting bracket based on the mounting direction (side or back), and temporarily tighten the brackets with the two hexagonsocket-head bolts with washers for adjusting the mounting angle (M4, length 10 mm 0.394 in). Tighten it securely, after beam alignment. The tightening torque should be 1.2 N·m or less.



Mounting of intermediate supporting bracket (MS-SF2-2)

1) Choose the mounting direction for the L- and U-shaped intermediate supporting brackets based on the mounting direction (side or back), and temporarily tighten the mounting brackets with the hexagon-socket-head bolt (M4, length 10 mm 0.394 in). Tighten it securely, after beam alignment. The tightening torque should be 1.2 N·m or less.



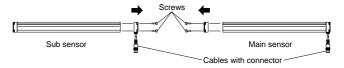
2 Clasp the body of the sensor with the U-shaped intermediate supporting bracket, and temporarily tighten with the hexagon-socket-head bolt (M4, length 6 mm 0.236 in) for position adjustment. Tighten it securely, after beam alignment. The tightening torque should be 1.2 N·m or less.

<Side mounting> <Back mounting> Beam emitting or Beam emitting or receiving surface receiving surface U-shaped intermediate supporting bracket Hexagon-socket-head Hexagon-socket-head holt for position adjustme

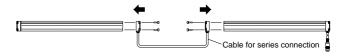
Note: The above drawing shows the intermediate supporting bracket mounted on the emitter. In case of mounting on the receiver, note that the intermediate supporting bracket is upside down.

Mounting of cable for series connection (SF2-CSL□)

① Remove four M4 screws (length 10 mm 0.394 in) on the main sensor and the sub sensor as given below.



2 As shown below, mount the cable for series connection at the place on the main sensor and the sub sensor from where the screws have been removed.



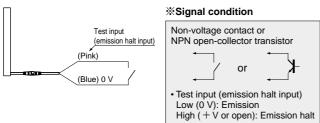
SF2-EH

PRECAUTIONS FOR PROPER USE

Refer to p.1135~ for general precautions.

Test input (emission halt) function

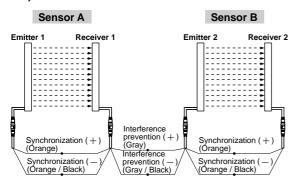
• The emission is halted when the test input (emission halt input) wire (pink) is connected to + V or kept open. The test input (emission halt input) is useful for a start-up check since the sensing output can be switched ON / OFF without the sensing object.



Note: When test input (emission halt) function is not used, make sure to connect the test input (emission halt input) wire (pink) to 0 V.

Interference prevention function

•Interference can be prevented between 4 sets max. (192 beam channels max.) for series connection, 4 sets max. (192 beam channels max.) for parallel connection, and 12 sets max. (192 beam channels max.) for series and parallel mixed connection. In this case, connect the respective interference (+) (gray) and interference (-) (gray / black) of the adjacent sensors.

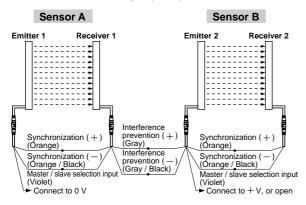


Master / slave selection input

 In case of parallel connection, or series and parallel mixed connection, before switching on the power supply, connect the master / slave selection input (violet) of Sensor A, as master, to 0 V and connect the master / slave selection input (violet) of Sensor B, as slave, to + V or open.

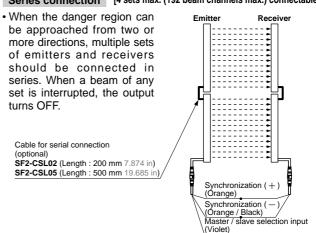
The master / slave selection is done only once at the time of switching on of the power supply. If selection is done after switching on of the power supply, it does not change. Further, if the master / slave selection input is kept open when the sensor is set as slave, ensure to insulate it.

 In case of series connection or when using 1 set, connect the master / slave selection input (violet), as master, to 0 V.



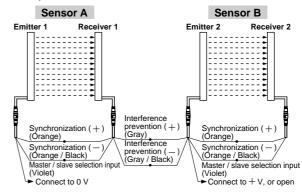
Connection

Series connection [4 sets max. (192 beam channels max.) connectable]



Parallel connection [4 sets max. (192 beam channels max.) connectable]

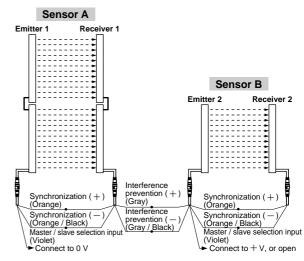
• In case there are two, or more, danger regions which can be approached from a single direction only, multiple sets of emitters and receivers can be connected in parallel by connecting their interference prevention wires to individually monitor the danger regions. Since the outputs are separate, only the output of the sensor whose beams are interrupted is turned OFF.



Serial / parallel mixed connection

[12 sets max. (192 beam channels max.) connectable]

• In case there are two, or more, danger regions which can be approached from two or more directions, multiple sets of emitters and receivers can be connected in series and parallel mixed combination. For the sensors connected in series, the output turns OFF if the beams of any of these sensors are interrupted. For the sensors connected in parallel, the output of only the sensor whose beams are interrupted turns OFF.

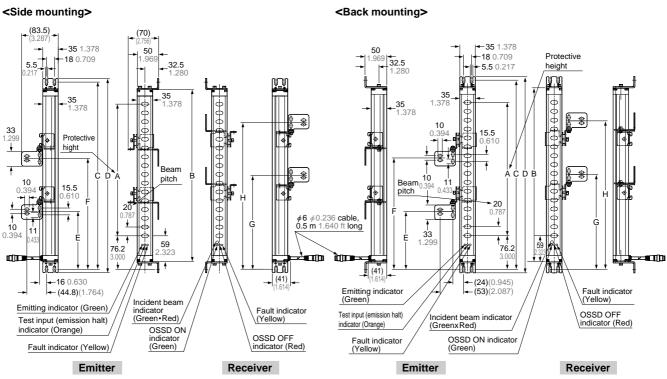


DIMENSIONS (Unit: mm in)

SF2-EH□(-N) Sensor

Assembly dimensions

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



Model No.	А	В	С	D	E	F	G	Н
SF2-EH12(-N)	220 8.661	312 12.283	342 13.465	362 14.252				
SF2-EH16(-N)	300 11.811	392 15.433	422 16.614	442 17.402				
SF2-EH20(-N)	380 14.961	472 18.583	502 19.764	522 20.551				
SF2-EH24(-N)	460 18.110	552 21.732	582 22.913	602 23.701	322 12.677		280 11.024	
SF2-EH28(-N)	540 21.260	632 24.882	662 26.063	682 26.850	362 14.252		320 12.598	
SF2-EH32(-N)	620 24.409	712 28.031	742 29.213	762 30.000	402 15.827		360 14.173	
SF2-EH36(-N)	700 27.559	792 31.181	822 32.362	842 33.150	442 17.402		400 15.748	
SF2-EH40(-N)	780 30.709	872 34.331	902 35.512	922 36.299	482 18.976		440 17.323	
SF2-EH48(-N)	940 37.008	1,032 40.630	1,062 41.811	1,082 42.598	562 22.126		520 20.472	
SF2-EH56(-N)	1,100 43.307	1,192 46.929	1,222 48.110	1,242 48.898	642 25.276		600 23.622	
SF2-EH64(-N)	1,260 49.606	1,352 53.228	1,382 54.409	1,402 55.197	488 19.213	976 38.425	446 17.559	892 35.118
SF2-EH72(-N)	1,420 55.905	1,512 59.527	1,542 60.709	1,562 61.496	542 21.339	1,084 42.677	500 19.685	1,000 39.370
SF2-EH80(-N)	1,580 62.205	1,672 65.827	1,702 67.008	1,722 67.795	595 23.425	1,190 46.850	574 22.598	1,148 45.197

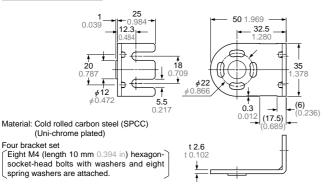
Note: MS-SF2-2 (intermediate supporting bracket) is attached with sensors having 24, or more, beam channels. The number of attached intermediate supporting brackets is different depending on the sensor as follows. SF2-EH24(-N), SF2-EH36(-N), SF2-EH36(-N), SF2-EH36(-N), SF2-EH40(-N), SF2-EH48(-N), SF2-EH56(-N): 1 set SF2-EH64(-N), SF2-EH72(-N), SF2-EH80(-N): 2 sets

aht Curtain

SF2-EH

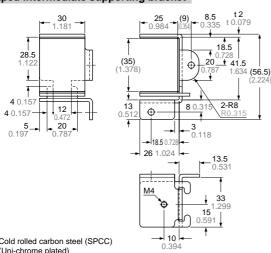
DIMENSIONS (Unit: mm in)

MS-SF2-1 Sensor mounting bracket (Accessory)



MS-SF2-2 Intermediate supporting bracket (Accessory)

U-shaped intermediate supporting bracket

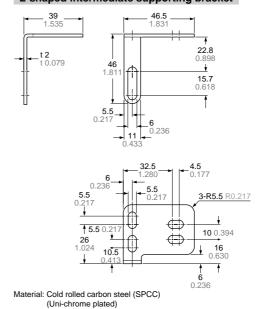


Material: Cold rolled carbon steel (SPCC) (Uni-chrome plated)

Set of 2 pcs. each of U-shaped intermediate supporting bracket and L-shaped intermediate supporting bracket

Two M4 (length 6 mm 0.236 in) hexagon-socket-head bolts,
two M4 (length 10 mm 0.394 in) hexagon-socket-head bolts
with washers, two nuts and two plain washers are attached.

L-shaped intermediate supporting bracket



Note: MS-SF2-2 (intermediate supporting bracket) is attached with sensors having 24, or more, beam channels. The number of attached intermediate supporting brackets is different depending on the sensor as follows SF2-EH24(-N), SF2-EH28(-N), SF2-EH32(-N), SF2-EH36(-N), SF2-EH40(-N), SF2-EH48(-N), SF2-EH56(-N): 1 set **SF2-EH64(-N)**, **SF2-EH72(-N)**, **SF2-EH80(-N)**: 2 sets

MC-SF2EH-☐ Front protection bracket (Optional)

Model No.	,	4	I	1
MC-SF2EH-12	220	8.661	322	12.677
MC-SF2EH-16	300	11.811	402	15.827
MC-SF2EH-20	380	14.961	482	18.976
MC-SF2EH-24	460	18.110	562	22.126
MC-SF2EH-28	540	21.260	642	25.276
MC-SF2EH-32	620	24.409	722	28.425
MC-SF2EH-36	700	27.559	802	31.575
MC-SF2EH-40	780	30.709	882	34.724
MC-SF2EH-48	940	37.008	1,042	41.024
MC-SF2EH-56	1,100	43.307	1,202	47.323
MC-SF2EH-64	1,260	49.606	1,362	53.622
MC-SF2EH-72	1,420	55.905	1,522	59.921
MC-SF2EH-80	1,580	62.205	1,682	66.220

Note: The intermediate supporting bracket for protection bar is an accessory for units with beam axis of 40 or above. Use it if there is a large amount of bending of the bar

<Side mounting> <Back mounting> Protection 57 (49) Intermediate supporting bracket for protection bar (Note) height pitch