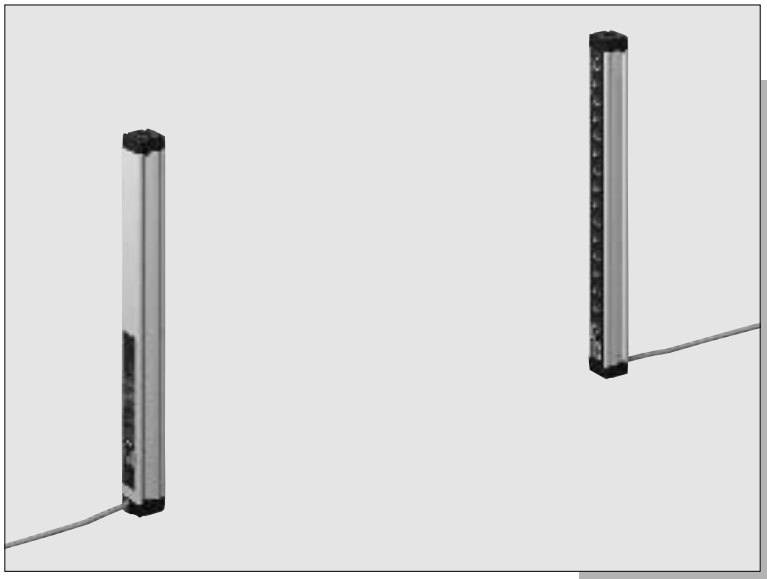
Product is discontinued -
Successor SF4B

SF2-EH SERIES

Robust Light Curtain Type 4



Passes global safety standards!

Conforming to Machine Directive & EMC Directive

Approved Listing

Conforming to OSHA / ANSI

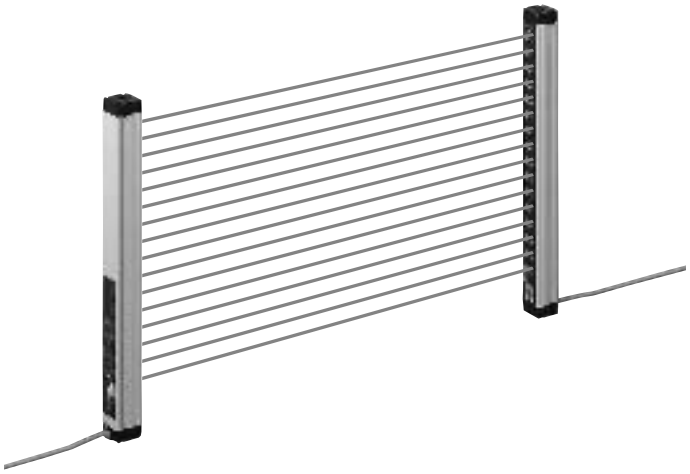
Global safety

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.

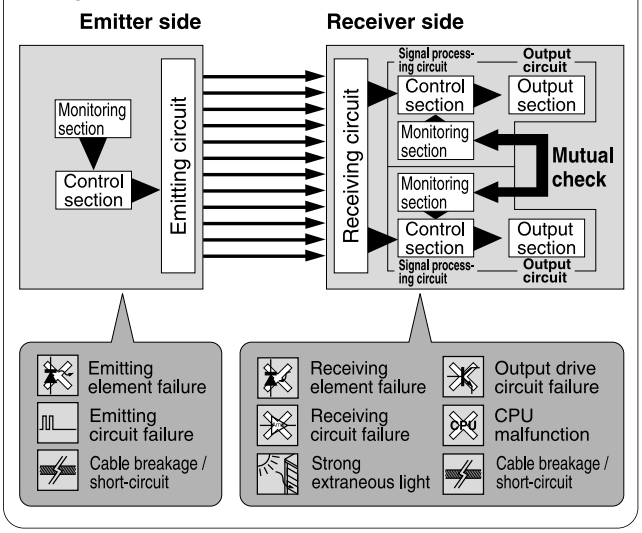
Pursuit of safety

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.



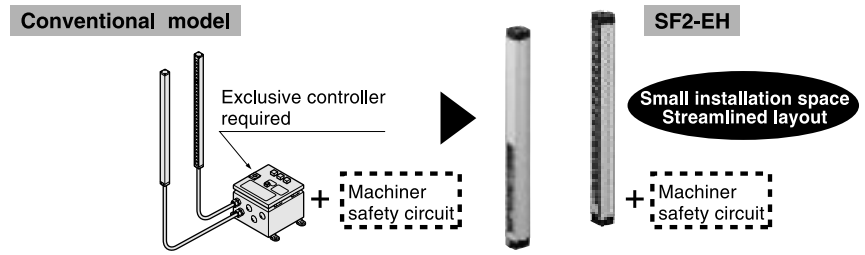
Safety design of the SF2-EH series

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.

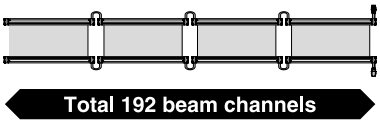


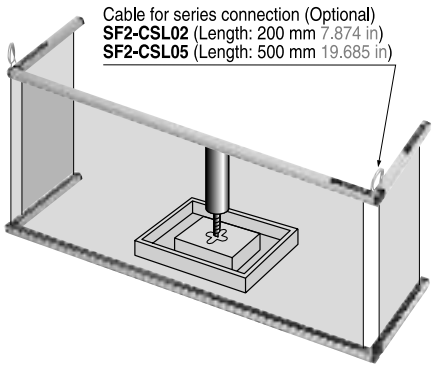
Wide area: 1,580 mm X 10 m 62.205 in X 32.808 ft

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.





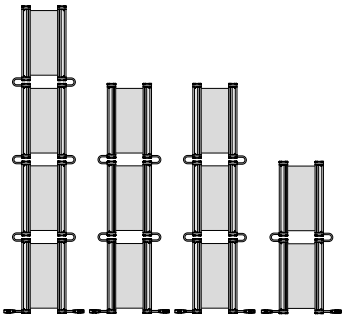
Wide variety

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

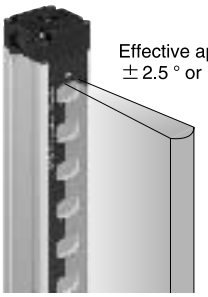
- **Up to 12 sets of sensors can be mounted close together**

  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.



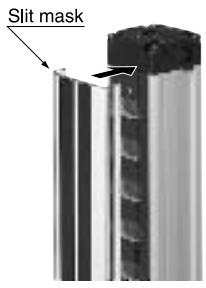
- **Effective aperture angle ±2.5 ° or less**

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



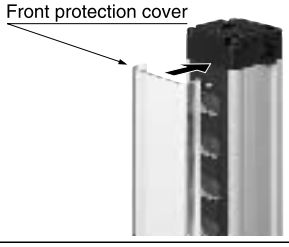
- **Convenient slit mask available**

  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.



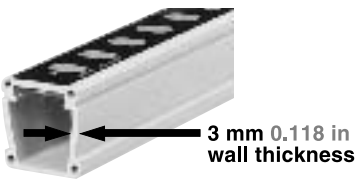
Easy maintenance

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.



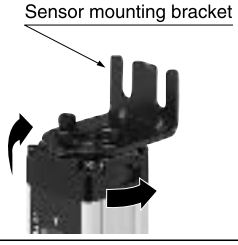
Solid aluminum case

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

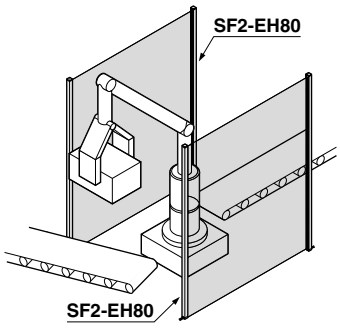
The beam alignment is easy since angle adjustment is possible with the sensor mounting bracket (**MS-SF2-1**).



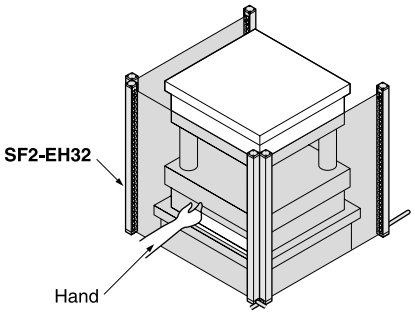
SF2-EH

APPLICATIONS

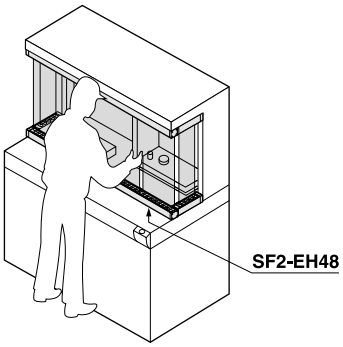
Guarding space around working robot



Safeguard for press machine

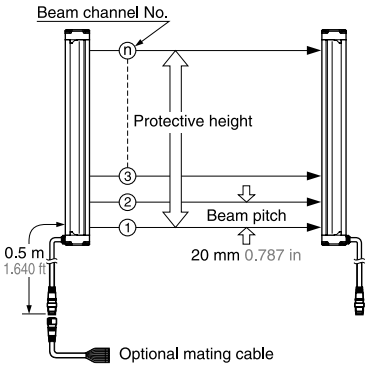


Safeguard for special purpose machine

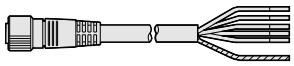
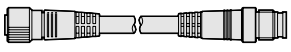
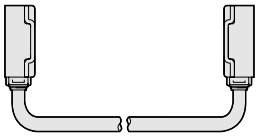


ORDER GUIDE

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

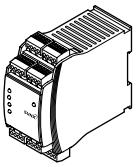
Appearance	Operating range	Model No.		Number of beam channels	Protective height (mm in)
		PNP output equivalent type	NPN output equivalent type		
	0.3 to 10 m 0.984 to 32.808 ft	**SF2-EH12**	**SF2-EH12-N**	12	220 8.661
		SF2-EH16	**SF2-EH16-N**	16	300 11.811
		SF2-EH20	**SF2-EH20-N**	20	380 14.961
		SF2-EH24	**SF2-EH24-N**	24	460 18.110
		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
		SF2-EH40	**SF2-EH40-N**	40	780 30.709
		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
		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.**

Type	Appearance	Model No.	Description	
Cable with connector on one end		**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 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) • Connecter color: Gray (for emitter) Black (for receiver)
		SF2-CC7	Length: 7 m 22.966 ft Weight : 890 g approx. (two cables)	
		SF2-CC10	Length : 10 m 32.808 ft Weight: 1.2 kg approx. (two cables)	
Cable with connector on both ends		**SF2-CCJ10**	Length: 10 m 32.808 ft Weight: 1.2 kg approx. (two cables)	8-core 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) • 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 • Cable outer diameter: ϕ6 mm ϕ0.236 in • Connector outer dimensions: □35 mm □1.378 in max. • Cable color: Gray (for emitter and receiver)
		SF2-CSL05	Length: 500 mm 19.685 in Weight: 170 g approx. (two cables)	

ORDER GUIDE

Safety relay unit

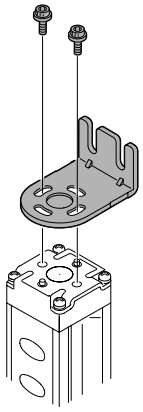
Type	Appearance	Model No.	Description
Safety relay unit (For PNP output type light curtain)		**SF-AC** (Note)	Safety relay unit for PNP output type • Complies with Control Categories up to 4 based on EN 954-1

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

Spare parts (Accessories for sensor)

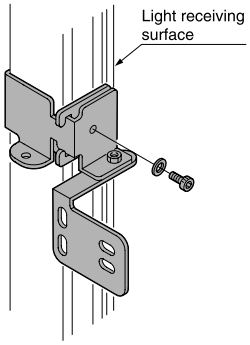
Designation	Model No.	Description
Sensor mounting bracket	**MS-SF2-1**	One set of two brackets for both the emitter and the receiver
Intermediate supporting bracket	**MS-SF2-2**	One set of two brackets for both the emitter and the receiver
Test rod	**SF2-EH-TR**	Sensing object (ϕ30 mm ϕ1.181 in) for daily check

Sensor mounting bracket



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

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-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.)

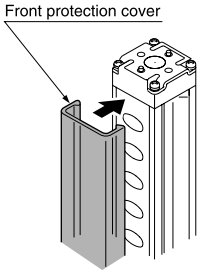
OPTIONS

Designation \ Applicable beam channels		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.

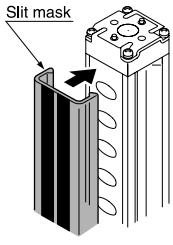
Front protection cover

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.

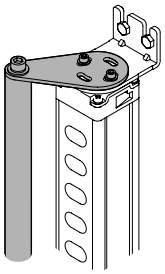


Operating range

- Slit on the emitter side: 4 m 13.123 ft
- Slit on the receiver side: 5 m 16.404 ft
- Slit on both sides: 2 m 6.562 ft

Front protection bracket

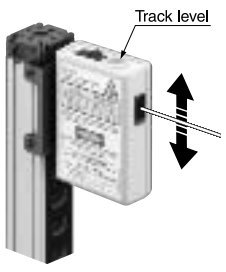
It protects front face from damage due to striking of an object.



Laser alignment tool

- **SF-LAT-2E**

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



SF2-EH

SPECIFICATIONS

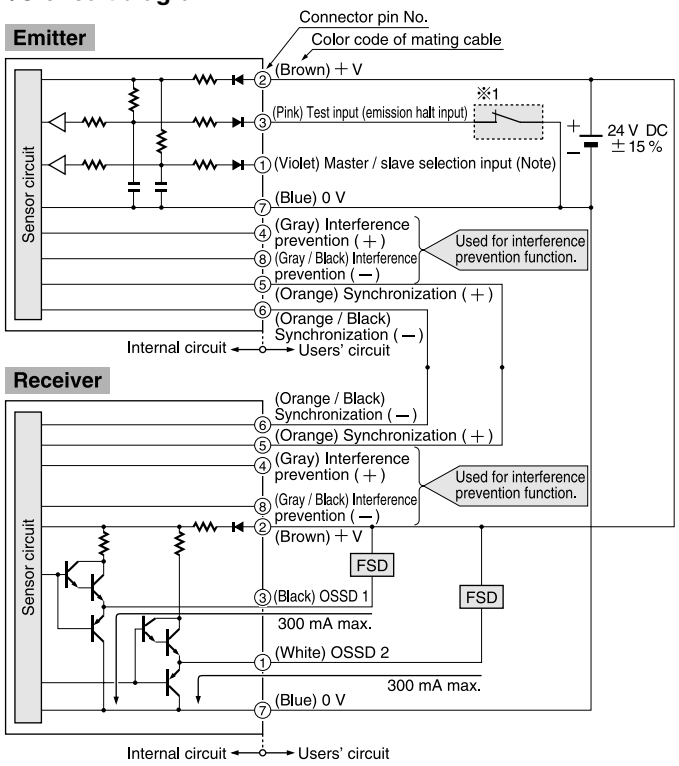
Item	Model No.	Number of beam channels	12	16	20	24	28	32	36	40	48	56	64	72	80
		PNP output equivalent type	**SF2-EH12**	**SF2-EH16**	**SF2-EH20**	**SF2-EH24**	**SF2-EH28**	**SF2-EH32**	**SF2-EH36**	**SF2-EH40**	**SF2-EH48**	**SF2-EH56**	**SF2-EH64**	**SF2-EH72**	**SF2-EH80**
		NPN output equivalent type	**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	540 mm 21.260 in	620 mm 24.409 in	700 mm 27.559 in	780 mm 30.704 in	940 mm 37.008 in	1,100 mm 43.307 in	1,260 mm 49.606 in	1,420 mm 55.905 in	1,580 mm 62.205 in
Operating range			0.3 to 10 m 0.984 to 32.808 ft												
Beam pitch			20 mm 0.787 in												
Detection capability			ϕ30 mm ϕ1.181 in or more opaque object												
Effective aperture angle			± 2.5 ° or less [for operating range exceeding 3 m 9.843 ft (conforming to IEC 61496-2 / UL 61496-2)]												
Supply voltage			24 V DC ± 15 %												
Current consumption			200 mA or less												
Control outputs (OSSD 1, OSSD 2) (Note 1)			<PNP output equivalent type> Semiconductor output (PNP output equivalent) 2 outputs • Maximum source current: 300 mA • Applied voltage: Same as supply voltage (between control output and + V) • Residual voltage: 2.5 V or less (at 300 mA source current)							<NPN output equivalent type> Semiconductor output (NPN output equivalent) 2 outputs • Maximum sink current: 300 mA • Applied voltage: Same as supply voltage (between control output and 0 V) • Residual voltage: 2 V or less (at 300 mA sink current)					
	Utilization category		DC-12 or DC-13												
	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			OFF response: 15 ms or less, ON response: 20 ms or less												
Indicators	Emitter		Emitting indicator: Green LED (lights up under normal emission) Test input (emission halt) indicator: Orange LED (lights up when emission halts) Fault indicator: Yellow LED (lights up or blinks in fault occurs in sensor)												
	Receiver		OSSD ON indicator: Green LED (lights up when control outputs are ON) OSSD OFF indicator: Red LED (lights up when control outputs are OFF) Incident beam indicator: Green / Red LED [lights up in green when all beams are received, lights up in red with intensity proportional to the incident light intensity for reference channel (second channel from cable side)] Fault indicator: Yellow LED (lights up or blinks in fault occurs in sensor)											
Test input (emission halt) function			Incorporated												
Interference prevention function			Incorporated (Series connection: 4 sets max., however total 192 beam channels max. Parallel connection: 4 sets max., however total 192 beam channels max. Series and parallel mixed connection: 12 sets max., however total 192 beam channels max.)												
Environmental resistance	Pollution degree		3 (Industrial environment)												
	Degree of protection		IP65 (IEC)												
	Ambient temperature		− 10 to + 55 °C + 14 to + 131 °F (No dew condensation or icing allowed), Storage: − 25 to + 70 °C − 13 to + 158 °F												
	Ambient humidity		30 to 85 % RH, Storage: 30 to 95 % RH												
	Ambient illuminance		Sunlight: 20,000 ℓx at the light-receiving face, Incandescent light: 3,500 ℓx at the light-receiving face												
	Dielectric strength voltage		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												
	Vibration resistance		10 to 55 Hz frequency, 0.75 mm 0.030 in amplitude in X, Y and Z directions for two hours each												
	Shock resistance		300 m/s^2 acceleration (30 G approx.) in X, Y and Z directions for three times each												
Emitting element			Infrared LED (Peak emission wavelength: 870 nm 0.034 mil)												
Material			Enclosure: Aluminum, Cap: ABS												
Cable			8-core (0.3 mm^2 × 4-core, 0.2 mm^2 × 4-core) shielded cable, 0.5 m 1.640 ft long, with a connector at the end ※ Use together with the optional mating cable												
Cable extension			Extension up to total 27 m 88.583 ft is possible, for both emitter and receiver, with optional mating cables.												
Weight (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.
Accessories			**MS-SF2-1** (Sensor mounting bracket): 1 set for emitter and receiver, **MS-SF2-2** (Intermediate supporting bracket): (Note 2), **SF2-EH-TR** (Test rod): 1 pc.												

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

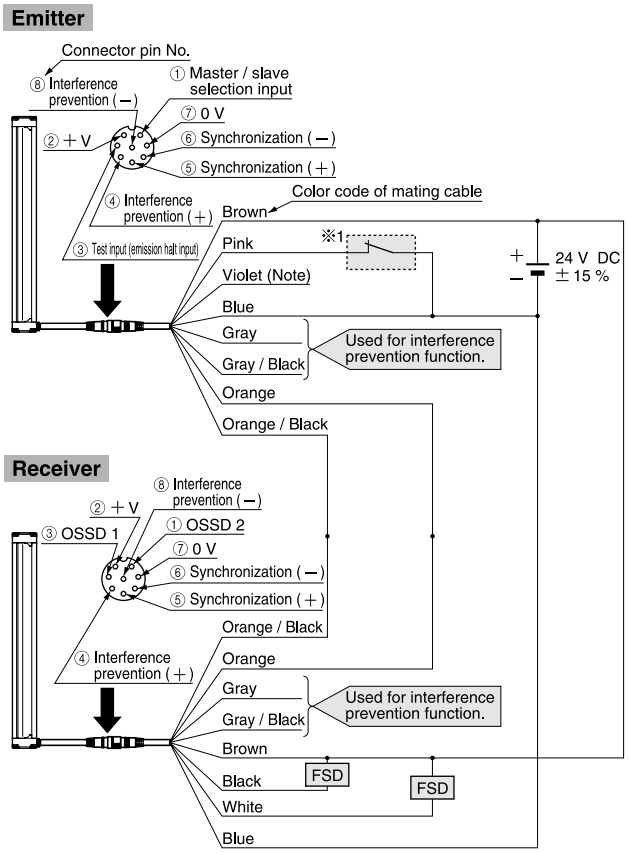
I/O CIRCUIT AND WIRING DIAGRAMS

NPN output equivalent type

I/O circuit diagram



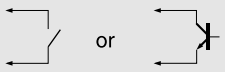
Wiring diagram



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

※1

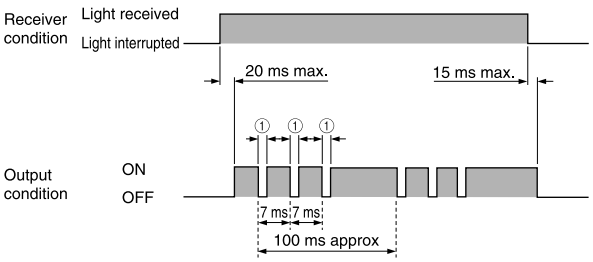
Non-voltage contact or NPN open-collector transistor



- Test input (emission halt input)
  Low (0 V): Emission
  High (+ V or open): Emission halt

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.



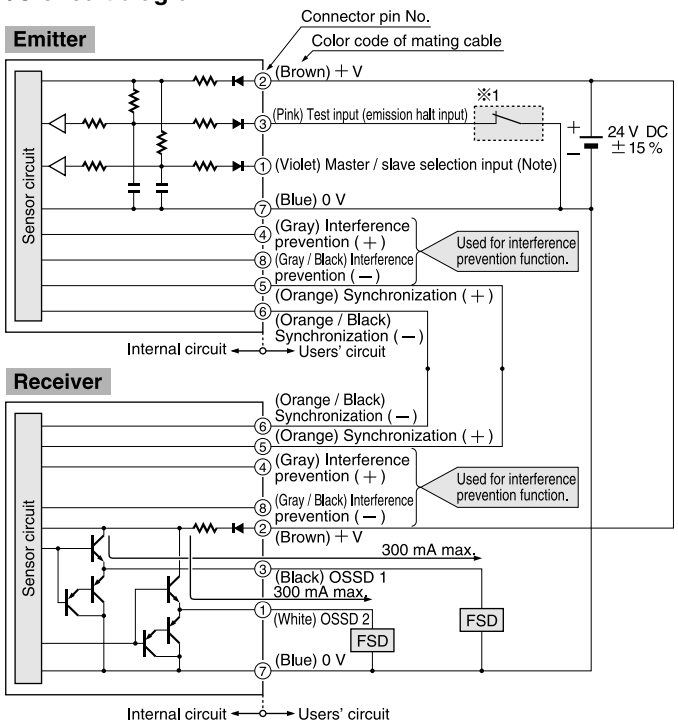
Pulse width (width of ① in the figure): 200 μs

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.

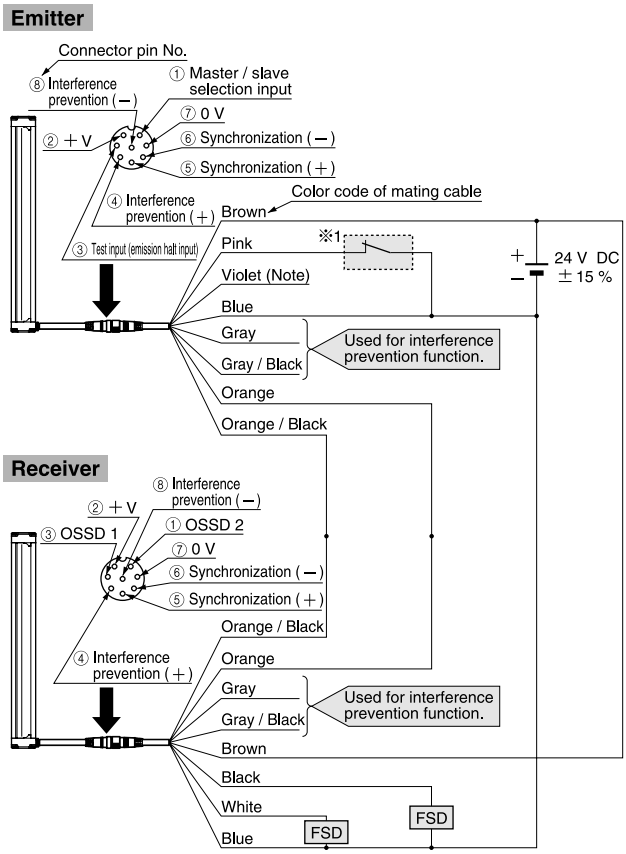
I/O CIRCUIT AND WIRING DIAGRAMS

PNP output equivalent type

I/O circuit diagram



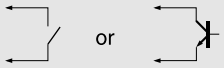
Wiring diagram



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

※1

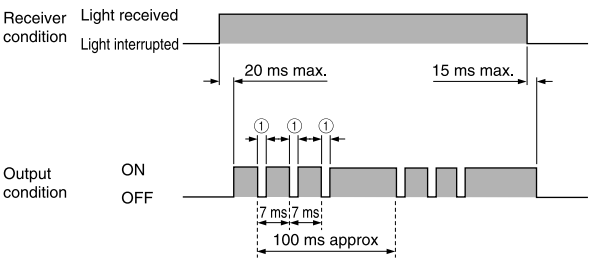
Non-voltage contact or NPN open-collector transistor



- Test input (emission halt input)
  Low (0 V): Emission
  High (+ V or open): Emission halt

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.



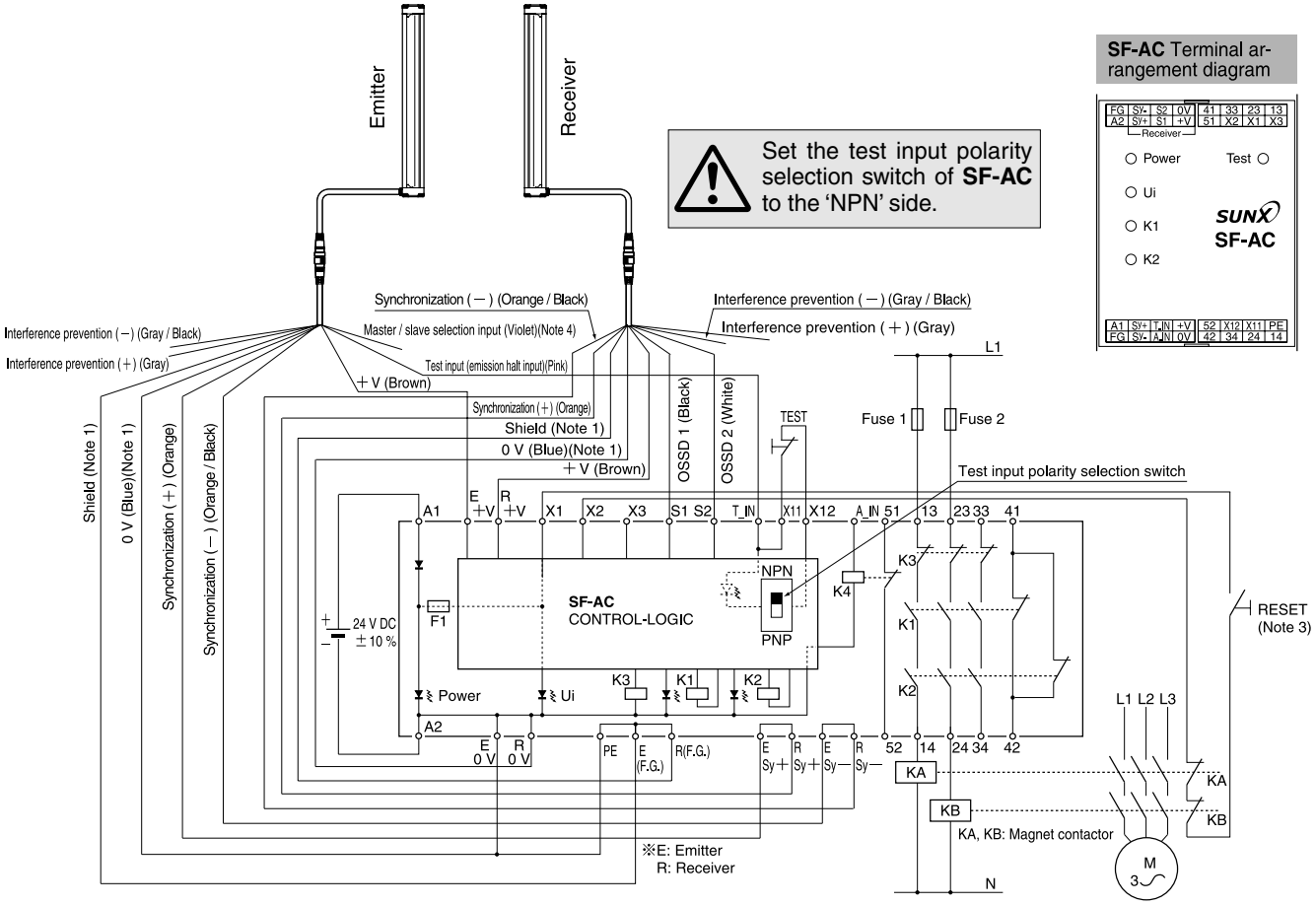
Pulse width (width of ① in the figure): 200 μs

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.

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. XXX for master/slave selection input.

PRECAUTIONS FOR PROPER USE

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

- 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.

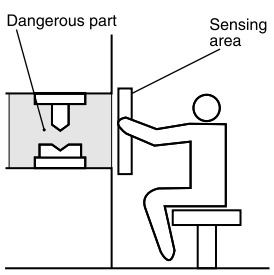
- This catalog is a guide to select a suitable product. Be sure to read the instruction manual attached to the product prior to its use.

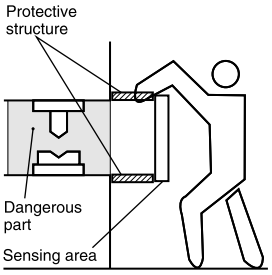
- Make sure to carry out the test run before regular operation.
- This safety system is for use only on machinery in which the dangerous parts can be stopped immediately, either by an emergency stop unit or by disconnecting the power supply. Do not use this system with machinery which cannot be stopped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

Sensing area

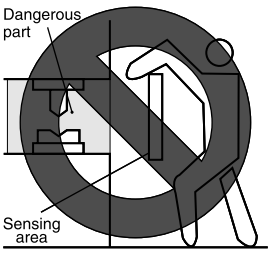
- Make sure to install this product such that any part of the human body that passes through the sensing area is detected before it reaches dangerous machine parts.
  If the human body is not detected, there is a danger of serious injury or death.
- Do not use any reflective type or retroreflective type arrangement.

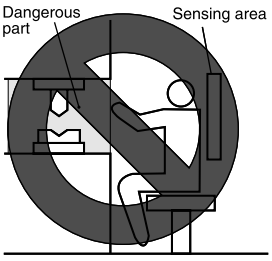
Correct mounting method





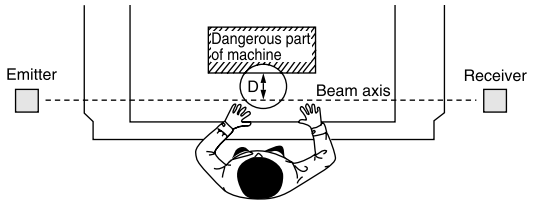
Wrong mounting method





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.)
T_{SF2}: 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.

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_{SF2}: Response time of the **SF2-EH** series 0.015 (sec.)

T_{bm}: Additional halt time tolerance for the brake monitor (sec.)
$T_{bm} = T_a - (T_s + T_c)$
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)
$= 3.4 \times (d - 7)$ (mm)
d: Minimum sensing object diameter 1.2 (inch)≒30 (mm)
Note that the value of D_{pf} is not less than or equal to 0.

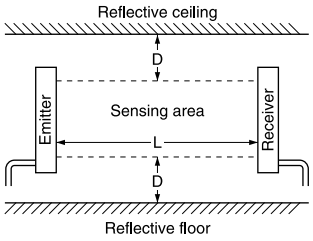
PRECAUTIONS FOR PROPER USE

Influence of reflective surface

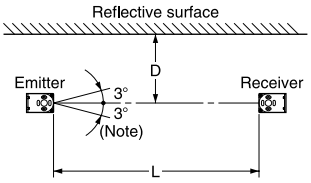
Install the sensor by considering the effect of nearby reflective surfaces and take suitable countermeasures. Failure to do so may cause the sensor not to detect, resulting in serious injury or

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

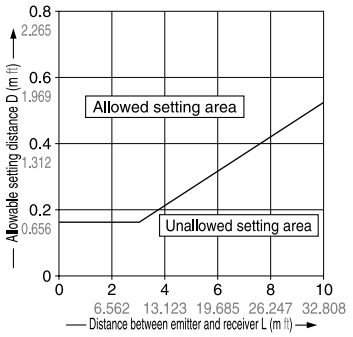
Side view



Top view



Distance between emitter and receiver, L	Allowable setting distance, D
0.3 to 3 m 0.984 to 9.843 ft	0.16 m 0.525 ft
3 to 10 m 9.843 to 32.808 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

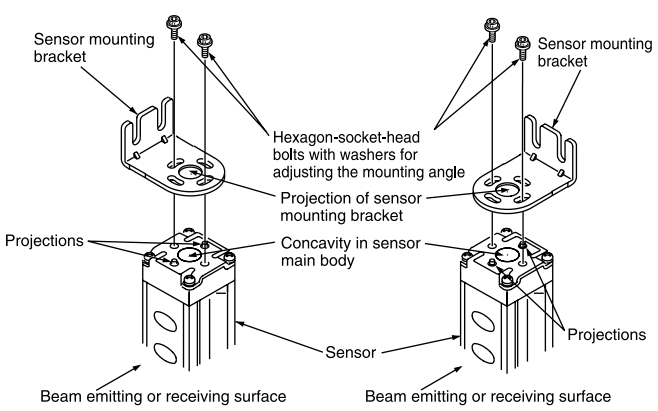
- The minimum bending radius of the cable is R35 mm R1.378 in.

  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 hexagon-socket-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.

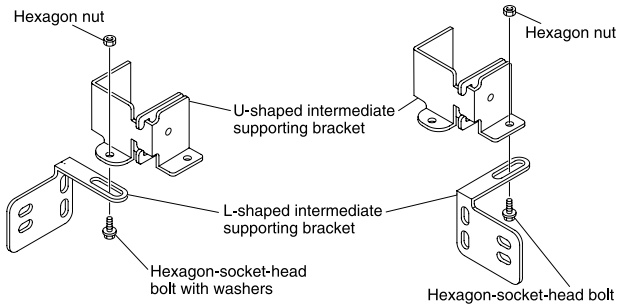
<Side mounting> **<Back mounting>**



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

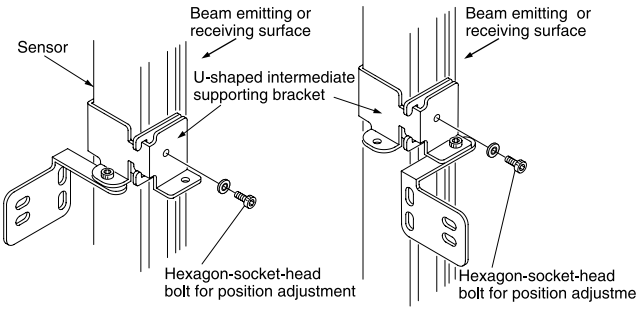
① Choose the mounting direction for the L- and U-shaped intermediate supporting brackets based on the mounting direction (side or back), and temporarily tighten the mounting brackets with the hexagon-socket-head bolt (M4, length 10 mm 0.394 in). Tighten it securely, after beam alignment. The tightening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

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



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.

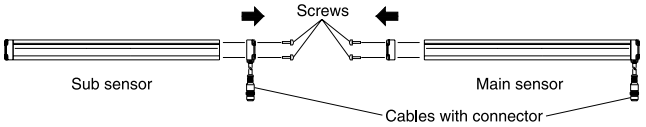
<Side mounting> **<Back mounting>**



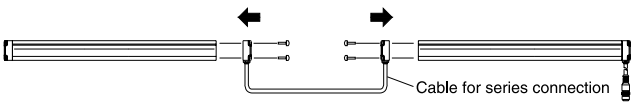
Note: The above drawing shows the intermediate supporting bracket mounted on the emitter. In case of mounting on the receiver, note that the intermediate supporting bracket is upside down.

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.

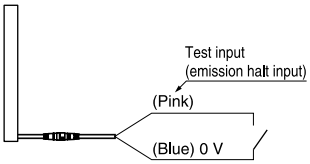


SF2-EH

PRECAUTIONS FOR PROPER USE

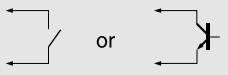
Test input (emission halt) function

- 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.



※Signal condition

Non-voltage contact or
NPN open-collector transistor

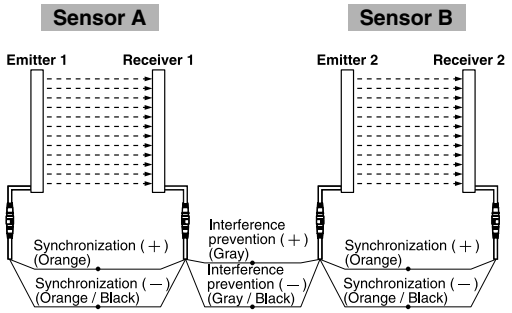


- Test input (emission halt input)
  Low (0 V): Emission
  High (+ V or open): Emission halt

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.

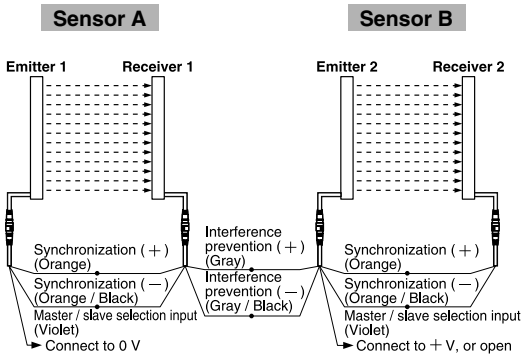
Interference prevention function

- 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

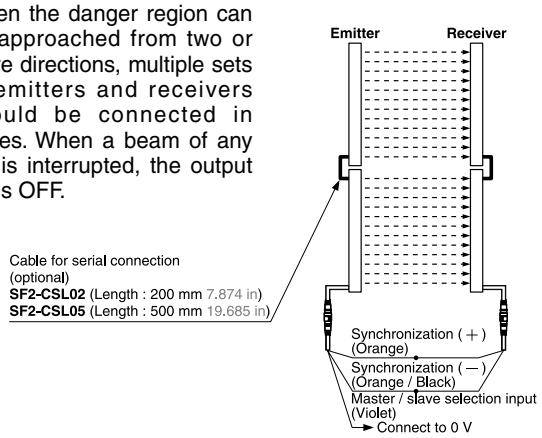
- In case of parallel connection, or series and parallel mixed connection, before switching on the power supply, connect the master / slave selection input (violet) of Sensor A, as master, to 0 V and connect the master / slave selection input (violet) of Sensor B, as slave, to + V or open.
  The master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

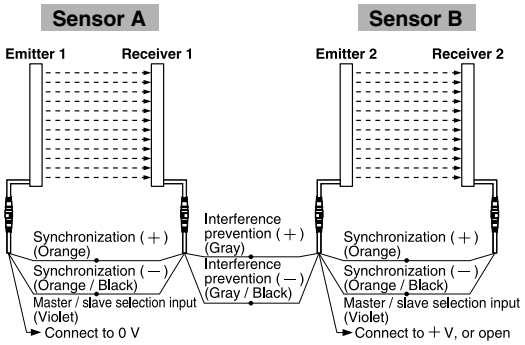
Series connection **[4 sets max. (192 beam channels max.) connectable]**

- When the danger region can be approached from two or more directions, multiple sets of emitters and receivers should be connected in series. When a beam of any set is interrupted, the output turns OFF.



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

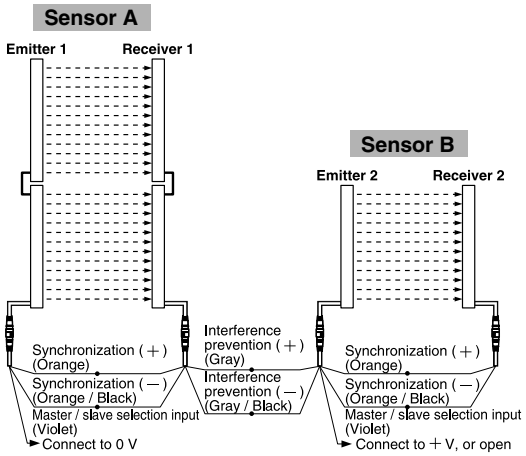
- In case there are two, or more, danger regions which can be approached from a single direction only, multiple sets of emitters and receivers can be connected in parallel by connecting their interference prevention wires to individually monitor the danger regions. Since the outputs are separate, only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



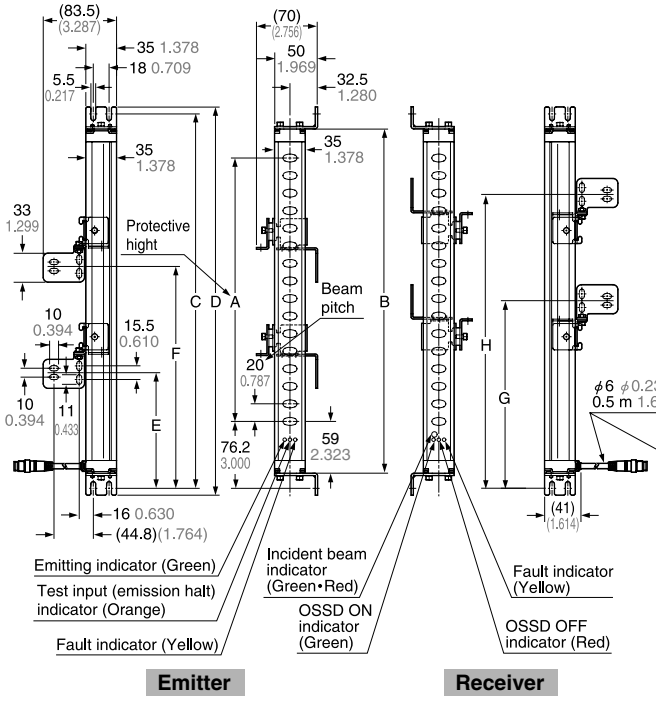
DIMENSIONS (Unit: mm in)

SF2-EH□(-N) Sensor

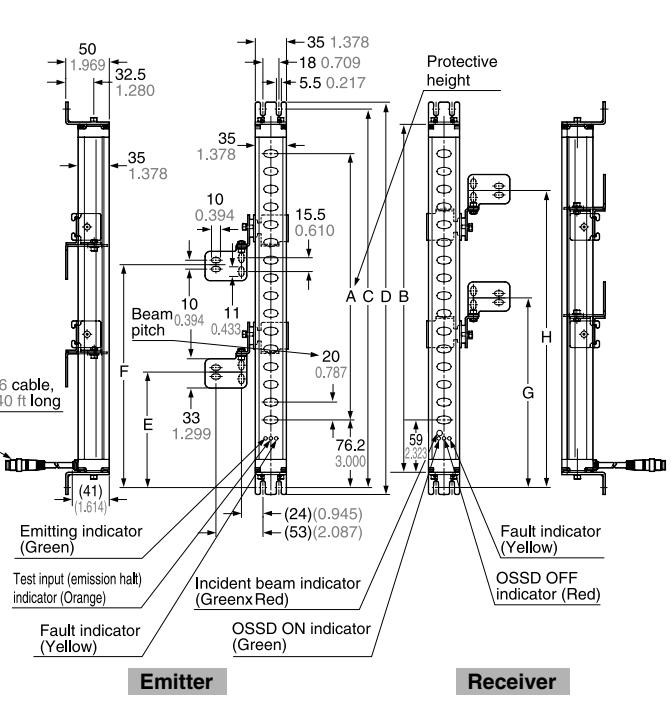
Assembly dimensions

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

<Side mounting>



<Back mounting>



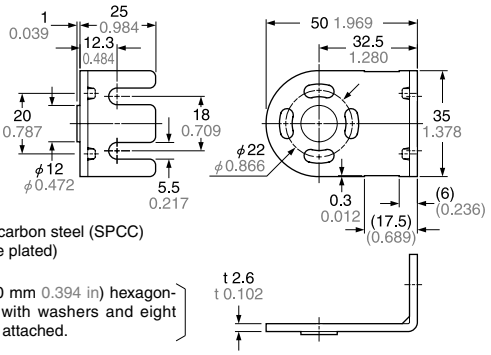
Model No.	A	B	C	D	E	F	G	H
SF2-EH12(-N)	220 8.661	312 12.283	342 13.465	362 14.252	———	———	———	———
SF2-EH16(-N)	300 11.811	392 15.433	422 16.614	442 17.402	———	———	———	———
SF2-EH20(-N)	380 14.961	472 18.583	502 19.764	522 20.551	———	———	———	———
SF2-EH24(-N)	460 18.110	552 21.732	582 22.913	602 23.701	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-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

SF2-EH

DIMENSIONS (Unit: mm in)

MS-SF2-1 Sensor mounting bracket (Accessory)

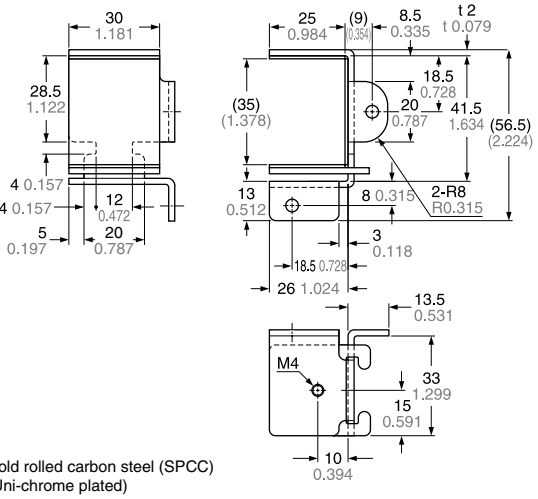


Material: Cold rolled carbon steel (SPCC)
(Uni-chrome plated)

Four bracket set
Eight M4 (length 10 mm 0.394 in) hexagon-socket-head bolts with washers and eight spring washers are attached.

MS-SF2-2 Intermediate supporting bracket (Accessory)

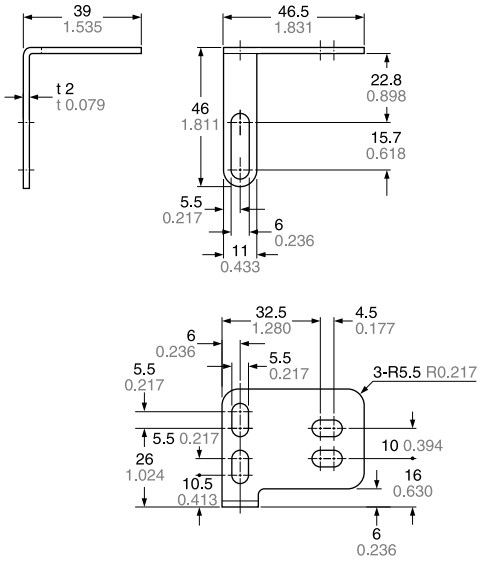
U-shaped intermediate supporting bracket



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



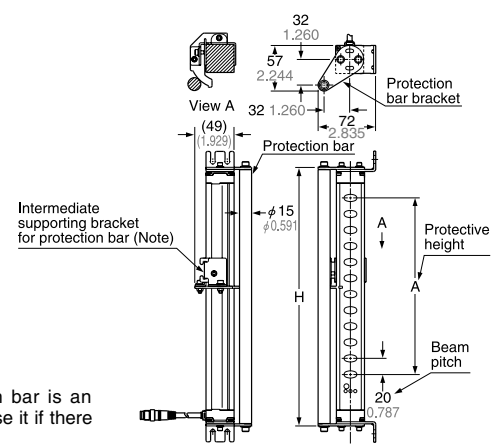
Material: Cold rolled carbon steel (SPCC)
(Uni-chrome plated)

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

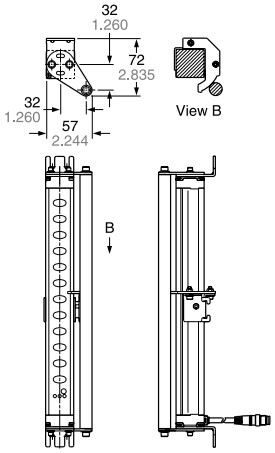
MC-SF2EH-□ Front protection bracket (Optional)

Model No.	A		H	
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

<Side mounting>



<Back mounting>



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.