

# Short-range Safety Light Curtain (Type 4)

# F3SN-A□SS

## Greater resistance to external light interference. Significantly less interference with other sensors.

- Interference reduced both between Sensors of the same type and Sensors of different types.
- Setting Console Optimizes Light Sensitivity for Specific Ranges
- Ideal Where Installation Space Is Limited
- Conforms to International Safety Standards
- Korean standard "S-mark" models are also available.

**Note:** Be sure to read the "Safety Precautions" on page 23.



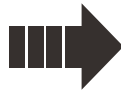
## Features

### New Emitter Mechanism Eliminates Excessive Light

Removing excessive light is the key to eliminating mutual interference, external light interference, and other similar causes of unwanted line stoppages.

#### Conventional Models

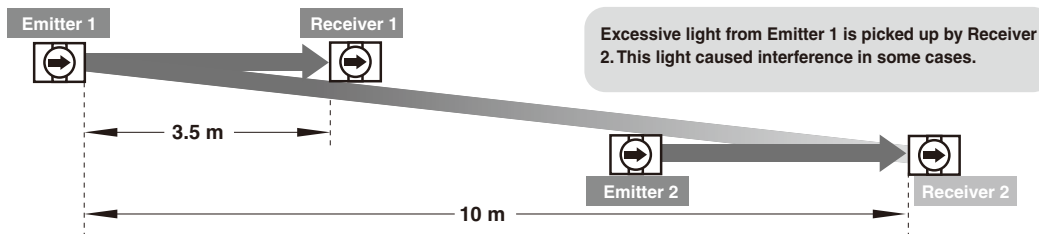
Conventional models had an operating range that was too long. This meant that they picked up light from sensors in unexpected locations and they interfered with other sensors.



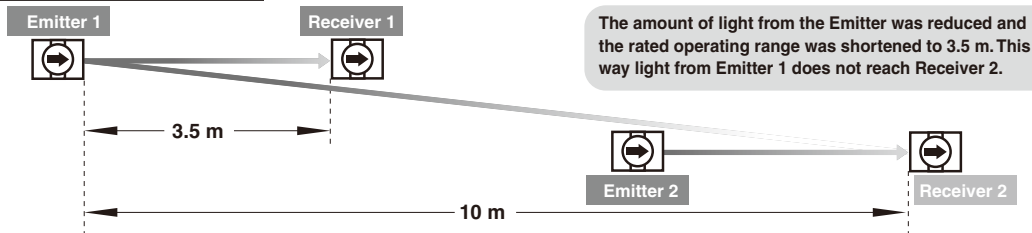
#### F3SN-A□SS Series

The operating range for the F3SN-A□SS Series is limited to 3.5 m as opposed to 10 m for conventional models. This dramatically reduces the negative impact on adjacent light curtains and surrounding photoelectric sensors even in applications where parallel light curtains are installed for multiple devices. It also eliminates additional work such as installing special wiring to prevent interference.

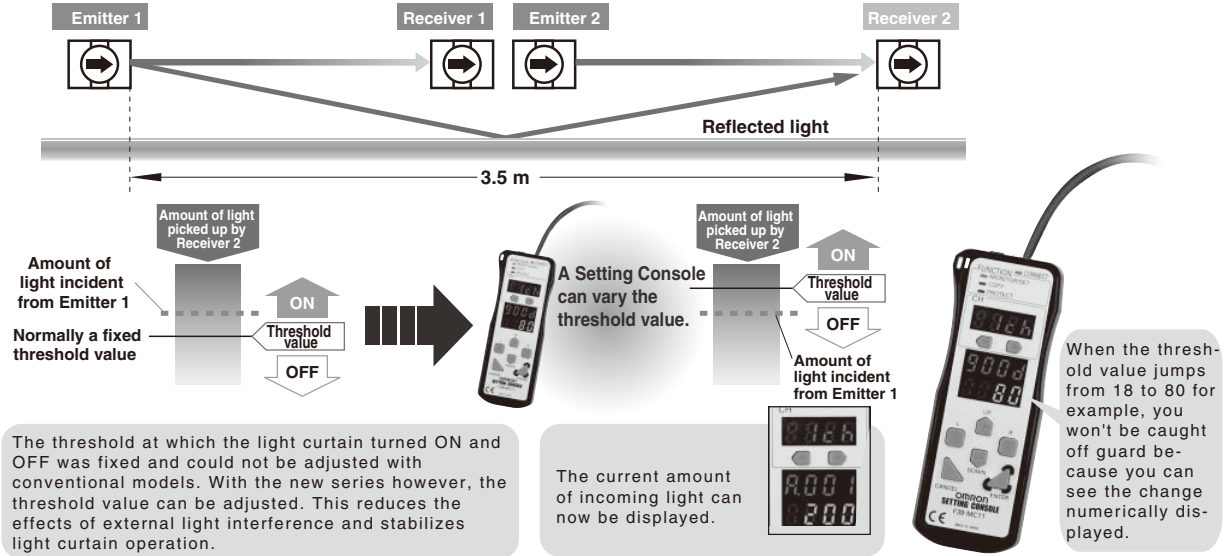
#### Conventional F3SN-A Series



#### F3SN-A□SS Series



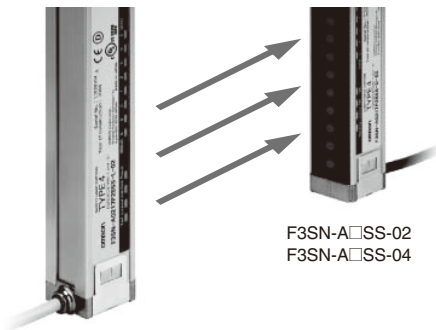
## Setting Console Optimizes Light Sensitivity for Specific Ranges Even Light Reflected from Walls



## Ideal Where Installation Space Is Limited

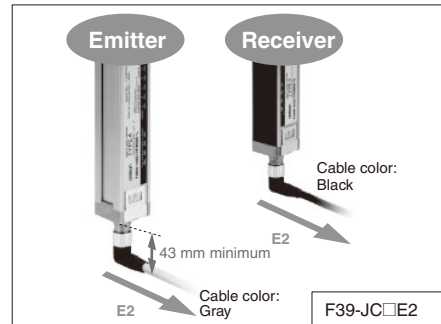
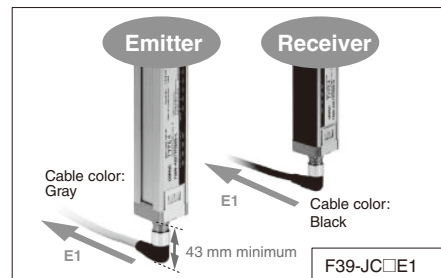
### Back-mounted Connector Cable Models and Optional Right-angle Cables

Models with connector cables attached at the back (F3SN-A□SS-02/04) can be used for installation where space is limited and there is no extra room at the bottom of the Light Curtains. The F3SN-A□SS-04 also equipped with a connector cable at the top for series connection. When there is no space at the back, traditional Straight Connector Cables or an optional L-shaped Connector Cable (F39-JC□E□) that extends from the side of the lens surface are also available.



#### More Compact Machines

The F3SN-A□P14 finger protection model is ideal for the more compact machines available today. It has a safe distance that can be as short as 88 mm. Refer to F3SN-A/ F3SN-B, F3SH-A for details.



Note: The direction of the cable is fixed.

## Conforms to International Safety Standards

The F3SN-A□SS is a Type 4 sensor with a category 4 rating. This means that it conforms to the highest standards of safety for a Safety Light Curtain. The F3SN-A□SS conforms to all the following standards.

International standard	IEC61496-1, IEC61496-2
EU regulations, EN standard	Machinery Directive, EMC Directive, EN61496-1, EN61496-2
JIS standards	JIS B9704-1, B9704-2
North American Standards	UL61496-1, UL61496-2, UL508, UL1998, CAN/CSA22.2 No.14, CAN/CSA22.2 No.0.8
Korean Standard	S-mark certification (only -S Models)

Application is also possible in devices covered by the OSHA standards (29 CFR 1910.212) of the USA. The requirements of the USA Industrial Robot Standard ANSI/RIA R15.06-1999 have also been satisfied.







# Ordering Information

## ■ Main Unit

### F3SN-A□SS Safety Light Curtains (Type 4)


A Connector Cable is not supplied with the Main Unit, and must be purchased separately.

Connection method			Min. detectable object	Beam gap	Appearance	Operating range	Protective height (mm)	Number of beams	Model
Sensor bottom	Sensor top	Application							
M12 straight connector	No connector	<ul style="list-style-type: none"> <li>Standalone</li> <li>Last set in a series connection (second of 2 sets connected in series or third of 3 sets connected in series)</li> </ul>	25 dia.	15 mm		0.2 to 3.5 m	217	13	F3SN-A0217P25SS
							262	16	F3SN-A0262P25SS
							352	22	F3SN-A0352P25SS
							427	27	F3SN-A0427P25SS
							502	32	F3SN-A0502P25SS
							592	38	F3SN-A0592P25SS
							667	43	F3SN-A0667P25SS
							742	48	F3SN-A0742P25SS
							832	54	F3SN-A0832P25SS
							907	59	F3SN-A0907P25SS
							982	64	F3SN-A0982P25SS
							1072	70	F3SN-A1072P25SS
							1147	75	F3SN-A1147P25SS
							1222	80	F3SN-A1222P25SS
							1312	86	F3SN-A1312P25SS
							1462	96	F3SN-A1462P25SS
							1627	107	F3SN-A1627P25SS
1792	118	F3SN-A1792P25SS							
M12 straight connector	M12 Connector	<ul style="list-style-type: none"> <li>Not the last set in a series connection (first of 2 sets connected in series, or first or second of 3 sets connected in series)</li> <li>For external indicator installations</li> </ul>	25 dia.	15 mm		0.2 to 3.5 m	217	13	F3SN-A0217P25SS-01
							262	16	F3SN-A0262P25SS-01
							352	22	F3SN-A0352P25SS-01
							427	27	F3SN-A0427P25SS-01
							502	32	F3SN-A0502P25SS-01
							592	38	F3SN-A0592P25SS-01
							667	43	F3SN-A0667P25SS-01
							742	48	F3SN-A0742P25SS-01
							832	54	F3SN-A0832P25SS-01
							907	59	F3SN-A0907P25SS-01
							982	64	F3SN-A0982P25SS-01
							1072	70	F3SN-A1072P25SS-01
							1147	75	F3SN-A1147P25SS-01
							1222	80	F3SN-A1222P25SS-01
							1312	86	F3SN-A1312P25SS-01
							1462	96	F3SN-A1462P25SS-01
							1627	107	F3SN-A1627P25SS-01
1792	118	F3SN-A1792P25SS-01							
Connector with 0.4-m cable	No connector	<ul style="list-style-type: none"> <li>Standalone</li> <li>When dimensions at the bottom of the Sensor are restricted</li> <li>Last set in a series connection (second of 2 sets connected in series or third of 3 sets connected in series)</li> </ul>	25 dia.	15 mm		0.2 to 3.5 m	217	13	F3SN-A0217P25SS-02
							262	16	F3SN-A0262P25SS-02
							352	22	F3SN-A0352P25SS-02
							427	27	F3SN-A0427P25SS-02
							502	32	F3SN-A0502P25SS-02
							592	38	F3SN-A0592P25SS-02
							667	43	F3SN-A0667P25SS-02
							742	48	F3SN-A0742P25SS-02
							832	54	F3SN-A0832P25SS-02
							907	59	F3SN-A0907P25SS-02
							982	64	F3SN-A0982P25SS-02
							1072	70	F3SN-A1072P25SS-02
							1147	75	F3SN-A1147P25SS-02
							1222	80	F3SN-A1222P25SS-02
							1312	86	F3SN-A1312P25SS-02
							1462	96	F3SN-A1462P25SS-02
							1627	107	F3SN-A1627P25SS-02
1792	118	F3SN-A1792P25SS-02							

Connection method			Min. detectable object	Beam gap	Appearance	Operating range	Protective height (mm)	Number of beams	Model
Sensor bottom	Sensor top	Application							
Connector with 0.4-m cable	Connector with 0.2-m cable	<ul style="list-style-type: none"> <li>Not the last set in a series connection (first of 2 sets connected in series, or first or second of 3 sets connected in series)</li> </ul>	25 dia.	15 mm		0.2 to 3.5 m	217	13	F3SN-A0217P25SS-04
							262	16	F3SN-A0262P25SS-04
							352	22	F3SN-A0352P25SS-04
							427	27	F3SN-A0427P25SS-04
							502	32	F3SN-A0502P25SS-04
							592	38	F3SN-A0592P25SS-04
							667	43	F3SN-A0667P25SS-04
							742	48	F3SN-A0742P25SS-04
							832	54	F3SN-A0832P25SS-04
							907	59	F3SN-A0907P25SS-04
							982	64	F3SN-A0982P25SS-04
							1072	70	F3SN-A1072P25SS-04
							1147	75	F3SN-A1147P25SS-04
							1222	80	F3SN-A1222P25SS-04
							1312	86	F3SN-A1312P25SS-04
							1462	96	F3SN-A1462P25SS-04
1627	107	F3SN-A1627P25SS-04							
1792	118	F3SN-A1792P25SS-04							

### F3SN-A□SS-S S-Mark Type 4 Safety Light Curtain

A Connector Cable is not supplied with the Main Unit, and must be purchased separately.




Connection method			Min. detectable object	Beam gap	Appearance	Operating range	Protective height (mm)	Number of beams	Model
Sensor bottom	Sensor top	Application							
M12 straight connector	No connector	<ul style="list-style-type: none"> <li>Standalone</li> </ul>	25 dia.	15 mm		0.2 to 3.5 m	217	13	F3SN-A0217P25SS-S
							262	16	F3SN-A0262P25SS-S
							352	22	F3SN-A0352P25SS-S
							427	27	F3SN-A0427P25SS-S
							502	32	F3SN-A0502P25SS-S
							592	38	F3SN-A0592P25SS-S
							667	43	F3SN-A0667P25SS-S
							742	48	F3SN-A0742P25SS-S
							832	54	F3SN-A0832P25SS-S
							907	59	F3SN-A0907P25SS-S
							982	64	F3SN-A0982P25SS-S
							1072	70	F3SN-A1072P25SS-S
							1147	75	F3SN-A1147P25SS-S
							1222	80	F3SN-A1222P25SS-S
							1312	86	F3SN-A1312P25SS-S
							1462	96	F3SN-A1462P25SS-S
1627	107	F3SN-A1627P25SS-S							
1792	118	F3SN-A1792P25SS-S							

- Note:**
1. A Connector Cable is not supplied with the Main Unit, and must be purchased separately. The overall length of the cable connecting a Safety Light Curtain to the DC power supply must not exceed 10 m.
  2. Two ferrite cores are provided with Safety Light Curtains that are S-Mark compliant. Attach one ferrite core to the emitter cable and the other to the receiver cable when connecting the Light Curtain with the optional Connector Cable.
  3. Japanese-, English-, and Korean-language operation manuals are available on the CD-ROM provided with the S-Mark Safety Light Curtain.

■ Accessories (Optional)


**Cable with Connector on One End (For Emitter and Receiver, 1 Set of 2 Cables)**

For Connection with Safety Devices such as Relays with Forcibly Guided Contacts, Safety Relay Units, and Safety Controllers

Type	Appearance	Cable length	Specification	Model
Straight Connectors		3 m	M12 straight connectors (8-pin)	F39-JC3A
		7 m		F39-JC7A
		10 m		F39-JC10A
		15 m		F39-JC15A
Right-angle Connectors, Emitter Cable to Right and Receiver Cable to Left		3 m	M12 right-angle connectors (8-pin) Cables go to the back when the Emitter is mounted on the left side and the Receiver is mounted on the right side.	F39-JC3E1
		7 m		F39-JC7E1
		10 m		F39-JC10E1
		15 m		F39-JC15E1
Right-angle Connectors, Emitter Cable to Left and Receiver Cable to Right		3 m	M12 right-angle connectors (8-pin) Cables go to the front when the Emitter is mounted on the left side and the Receiver is mounted on the right side.	F39-JC3E2
		7 m		F39-JC7E2
		10 m		F39-JC10E2
		15 m		F39-JC15E2

**Cable with Connectors on Both Ends (For Emitter and Receiver, 1 Set of 2 Cables)**






For Series Connection or Connection with the F3SP-B1P Safety Relay Unit

Appearance	Cable length	Specification	Application	Model
	0.2 m	M12 Straight Connectors (8-pin)	Series connection or connection with the F3SP-B1P Safety Relay Unit (See note 1.)	F39-JCR2B
	0.5 m			F39-JCR5B
	3 m			F39-JC3B
	5 m			F39-JC5B
	7 m		F39-JC7B	Connection with the F3SP-B1P Safety Relay Unit (See note 2.)
	10 m		F39-JC10B	
	15 m		F39-JC15B	



**Note: 1.** The F3SN-A□SS-04 Series is equipped with a 0.2-m series connection cable and does not require a Cable with Connectors on Both Ends for series connections. Purchase additional cables to extend cables that are too short.

**2.** The maximum length of series connection cables is 3 m. Longer cables cannot be used for series connections.

**Relays with Forcibly Guided Contacts, Safety Relay Units, and Safety Controllers**

Type	Appearance	Specification	Model	Remarks
G7SA Relays with Forcibly Guided Contacts		<ul style="list-style-type: none"> <li>No. of contacts: 4</li> <li>Contact output: 2NO + 2NC</li> <li>Rated switch load: 6 A at 250 VAC, 6 A at 30 VDC</li> </ul>	G7SA-2A2B	Refer to G7SA for other models, socket models, and other information.
		<ul style="list-style-type: none"> <li>No. of contacts: 4</li> <li>Contact output: 3NO + 1NC</li> <li>Rated switch load: 6 A at 250 VAC, 6 A at 30 VDC</li> </ul>	G7SA-3A1B	
G7S-□-E Relays with Forcibly Guided Contacts		<ul style="list-style-type: none"> <li>No. of contacts: 6</li> <li>Contact output: 4NO + 2 NC</li> <li>Rated switch load: 10 A at 250 VAC, 10 A at 30 VDC</li> </ul>	G7S-4A2B-E	Refer to G7S-□-E for other models, socket models, and other information.
		<ul style="list-style-type: none"> <li>No. of contacts: 6</li> <li>Contact output: 3NO + 3NC</li> <li>Rated switch load: 10 A at 250 VAC, 10 A at 30 VDC</li> </ul>	G7S-3A3B-E	
Dedicated Control Unit		<ul style="list-style-type: none"> <li>Quick connection/disconnection to the F3SN-A□SS with a Cable with Connectors on Both Ends.</li> <li>Contact output: 3NO + 1NC</li> </ul>	F3SP-B1P	Use an F39-JC□B Cable with Connectors on Both Ends to connect to the F3SN-A□SS.
Muting Controller		<ul style="list-style-type: none"> <li>Connects up to two F3SN-A□SS sets and provides muting capability.</li> </ul>	F3SP-U2P	Use an F39-JC□A or F39-JC□E□ Cable with Connector on One End to connect to the F3SN-A□SS. Refer to F3SP-U2P for functions and other details.
F3SX Safety Controller		<ul style="list-style-type: none"> <li>Connects two F3SN-A□SS sets and an emergency stop switch.</li> <li>DC solid-state safety output</li> </ul>	F3SX-EL2	Refer to F3SX for details on functions and other models.
		<ul style="list-style-type: none"> <li>Connects four F3SN-A□SS sets and an emergency stop switch.</li> <li>DC solid-state safety output</li> </ul>	F3SX-E-L2L2	
		<ul style="list-style-type: none"> <li>Connects two F3SN-A□SS sets and an emergency stop switch.</li> <li>Relay output (2NO + 1NC)</li> </ul>	F3SX-N-L2R	
		<ul style="list-style-type: none"> <li>Connects four F3SN-A□SS sets and an emergency stop switch.</li> <li>Relay output (2NO + 1NC)</li> </ul>	F3SX-N-L2L2R	


**Setting Console**

Type	Appearance	Model	Remarks
Setting Console		F39-MC11 (See notes 1 and 2.)	Accessories: One Branching Connector (F39-CN1), one connector cap, one special 2-m cable, instruction manual.
Extra Branching Connector		F39-CN1	One Connector is supplied with the Setting Console. Order extras if needed.

- Note:**
- The functions described in this catalog are supported by firmware version 3 or later. They are not supported by products shipped prior to August 2003.
  - Functions not described in this catalog, such as blanking and output selection, are equivalent to those of the F3SN-A Safety Light Curtain. Refer to F3SN-A/F3SN-B, F3SH-A for details.

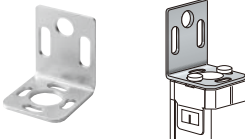




**Maintenance Tool (See note.)**

Appearance	Model	Applicable Sensors	Accessories
	F39-MT11	F3SN-A series F3SN-B series F3SH-A series	Branching Connector (1), Connector Cap (1), Special Cable (2 m), Special Cable with Plug (0.3 m), Instruction Manual


**Note:** For detail, see the product datasheet (Cat. No. E355).

**Mounting Brackets (Optional)**

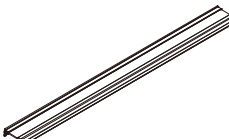
Appearance	Specification	Model	Remarks
	Wall mounting bracket Material: Iron (zinc plating) (See note.)	F39-L18	For Emitter: 2 pcs. For Receiver: 2 pcs. Total: 4 pcs./set
	Free-location bracket Materials: Zinc die-cast (zinc plating) <b>Note:</b> Not provided with an angle deflection mechanism for beam control.	F39-L19	Minimum order quantity: 1 pc. Mounting: Back-mounting only Distance from the mounting surface: 7 mm Recommended pitch: 670 mm max. Beam adjustment: Not available (rotating direction)
	Free-location bracket Materials: Sensor fixing element: Zinc die-cast (zinc plating) Mounting bracket: Iron (zinc plating) <b>Note:</b> Provided with an angle deflection mechanism for beam control.	F39-L20	Minimum order quantity: 1 pc. Mounting: Both front and back mounting Distance from the mounting surface: About 15 mm Recommended pitch: 400 mm max. Beam adjustment: Available

**Note:** Use these brackets for Sensors having a protective height where no intermediate bracket is required (with a protective height of less than 640 mm).

**External Indicator (Separate Models for Emitters and Receivers)**

Appearance	Specification	Indicator	Type	Model
	M12 connector for PNP output	Red	Emitter	F39-A01PR-L
			Receiver	F39-A01PR-D
		Green	Emitter	F39-A01PG-L
			Receiver	F39-A01PG-D

**Spatter Protection Cover (Includes Two Pieces for Emitter and Receiver)  
(Each Unit Reduces the Operating Range by 10%)**

Appearance	Model
	F39-HN□□□□-25 (See note.)

**Note:** The same 4-digit numbers as protective heights (□□□□ in Light Curtain model numbers) are substituted by □□□□ in the model numbers.

# Ratings and Performance

**Note:** Refer to the instruction manual for details.

## ■ Main Unit

**Note:** Refer to F3SN-A/F3SN-B/F3SH-A for details on accessories.

Item	Model	F3SN-A□□□□P25SS (-□□)
<b>Sensor type</b>		Type 4 Safety Light Curtain
<b>Applicable safety category</b>		Category 4, 3, 2, 1, or B
<b>Operating range</b>		0.2 to 3.5 m
<b>Beam gap (P)/Detection capability</b>		P = 15 mm/Opaque objects: 25 mm in diameter
<b>Number of beams (n)</b>		13 to 118 (Refer to "Ordering Information" on page 3.)
<b>Protective height (PH)</b>		217 to 1792 mm PH = (n-1) x P + 37 mm
<b>Effective aperture angle (EAA)</b>		Within ±2.5° for the Emitter and Receiver at a detection distance of at least 3 m according to IEC61496-2.
<b>Light source (emitted wavelength)</b>		Infrared LED (870 nm)
<b>Power supply voltage (Vs)</b>		24 VDC±10% (ripple p-p: 10% max.)
<b>Current consumption (no load)</b>	<b>Emitter</b>	Up to 50 beams: 140 mA max., 51 to 85 beams: 155 mA max., 86 beams or more: 170 mA max.
	<b>Receiver</b>	Up to 50 beams: 100 mA max., 51 to 85 beams: 110 mA max., 86 beams or more: 120 mA max.
<b>Control output (OSSD)</b>		Two PNP transistor outputs, load current: 300 mA max., residual voltage: 2 V max. (except for voltage drop due to cable extension)
<b>Auxiliary output (non-safety output)</b>		One PNP transistor output, load current: 50 mA max., residual voltage: 2 V max. (except for voltage drop due to cable extension)
<b>External indicator output (non-safety output) (See note 1.)</b>		One PNP transistor output, load current: 40 mA max., residual voltage: 2 V max. (except for voltage drop due to cable extension)
<b>Output operation mode</b>		Control output: Light-ON Auxiliary output: Dark-ON (can be changed by the F39-MC11) External indicator output: Light-ON (can be changed by the F39-MC11)(See note 1.)
<b>Input voltage</b>		Test input, interlock selection input, reset input, and external relay monitor input voltages: ON voltage: 9 to 24 V (sink current: 3 mA max.), OFF voltage: 0 to 1.5 V or open
<b>Test functions (See note 2.)</b>		<ul style="list-style-type: none"> <li>Self test (when power is turned ON and while power is supplied, one cycle during response time)</li> <li>External test (light emission stop function by test input)</li> </ul>
<b>Mutual interference prevention function</b>		Time-shared beam projection system by series connection <ul style="list-style-type: none"> <li>Number of series connected Light Curtains: Up to 3 sets</li> <li>Number of beams: Up to 240 beams</li> <li>Length of the series connection cable: 3 m max.</li> </ul> Sensitivity Automatic sensitivity adjustment capability supported by the F39-MC11.
<b>Safety functions (See note 2.)</b>		<ul style="list-style-type: none"> <li>Auto-reset/manual reset (interlock) (See note 3.)</li> <li>External relay monitor</li> <li>Fixed blanking (See note 4.)</li> <li>Floating blanking (See note 4.)</li> </ul>
<b>Indicators (See note 5.)</b>	<b>Emitter</b>	Power indicator (green), interlock indicator (yellow), lockout indicator (red), test indicator (orange), error mode indicator (3 red), light intensity level indicator (green: 5 levels)
	<b>Receiver</b>	OFF-state indicator (red), ON-state indicator (green), lockout indicator (red), blanking indicator (green), error mode indicator (3 red), light intensity level indicator (green: 5 levels)
<b>Protective circuits</b>		Output short-circuit protection, reverse polarity protection
<b>Response time (See note 6 for series connections.)</b>	<b>ON→OFF</b>	Protective height: 217 to 742 mm: 10.0 ms, 832 to 1222 mm: 12.5 ms, 1312 to 1792 mm: 15.0 ms
	<b>OFF→ON</b>	Protective height: 217 to 742 mm: 40 ms, 832 to 1222 mm: 50 ms, 1312 to 1792 mm: 60 ms
<b>Startup waiting time</b>		1 s max.
<b>Ambient operating light intensity</b>		Incandescent lamp: 3,000 lx max. (light intensity on the receiver surface) Sunlight: 10,000 lx max. (light intensity on the receiver surface)
<b>Ambient temperature</b>		Operating: -10 to 55°C, storage: -30 to 70°C (with no icing or condensation)
<b>Ambient humidity</b>		Operating/storage: 35% to 95% (with no condensation)



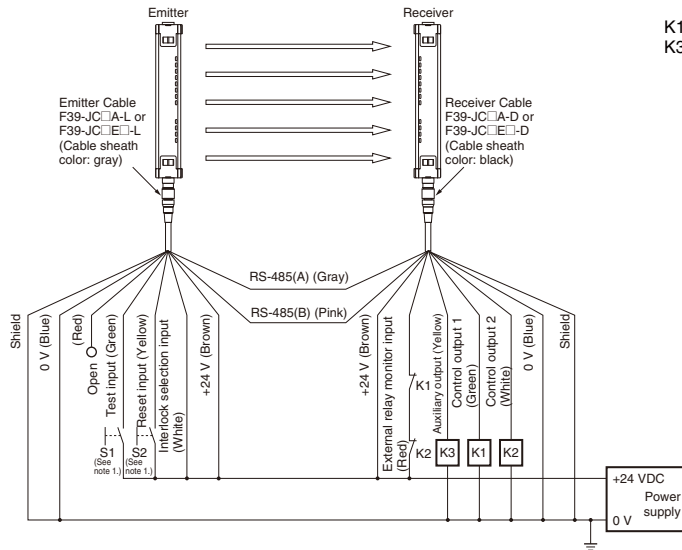
Item	Model	F3SN-A□□□□P25SS (-□□)
Insulation resistance		20 MΩ min.(at 500 VDC)
Dielectric strength		1000 VAC 50/60 Hz 1 min
Vibration resistance (malfunction)		10 to 55 Hz, 0.7-mm double amplitude, 20 sweeps in X, Y, and Z directions
Shock resistance (malfunction)		100 m/s <sup>2</sup> , 1000 times in X, Y, and Z directions
Degree of protection		IP65 (IEC60529)
Connection method		M12 Connector (8 pins)
Weight (packed state)		Weight (g) = (Protective height) x 2.4 +α+β α = 700 when the protective height is 217 to 592 mm α = 800 when the protective height is 667 to 1222 mm α = 900 when the protective height is 1312 to 1792 mm β = 0 for models with no suffix or ending with -01 β = 100 for models ending with -02 β = 200 for models ending with -04
Materials		Case: Aluminum, end cap: Zinc die-cast, optical cover: PMMA resin (acrylic resin)
Accessories		Test rod, instruction manual, error mode label, mounting brackets (top and bottom), mounting brackets (intermediate) (See note 7.)
Applicable standards		IEC61496-1, EN61496-1 Type 4 ESPE (Electro-Sensitive Protective Equipment) IEC61496-2 Type 4 AOPD (Active Opto-electronic Protective Devices)

- Note:**
- Models ending in -01 and -04 only.
  - The glossary and functions are the same as those for the F3SN-A Series. Refer to F3SN-A/F3SN-B, F3SH-A.
  - The default setting of the manual reset mode is for both "Start" and "Restart" interlocks. Use the F39-MC11 to select start interlock only or restart interlock only.
  - The function is not factory set. It can be set with the F39-MC11.
  - The test indicator (orange) on the Emitter and the blanking indicator (green) on the Receiver will flash to indicate the need for preventive maintenance when the total ON time exceeds 30,000 hours. (Models without this flashing function are also available as options. An "-NT" to the model number. Ask your OMRON representative for details.)
  - Use the following equations to determine series connection response time.
    - Series connection with two sets
      - Response time (ON→OFF): Sensor 1 response time + Sensor 2 response time + 3 ms
      - Response time (OFF→ON): Sensor 1 response time + Sensor 2 response time + 12 ms
    - Series connection with three sets
      - Response time (ON→OFF): Sensor 1 response time + Sensor 2 response time + Sensor 3 response time + 4 ms
      - Response time (OFF→ON): Sensor 1 response time + Sensor 2 response time + Sensor 3 response time + 16 ms
  - Intermediate mounting brackets are supplied with the following models:
    - When the overall Light Curtain length is 640 to 1280 mm or less: 1 set included
    - When the overall Light Curtain length is over 1280 mm: 2 sets included

# Wiring Diagram

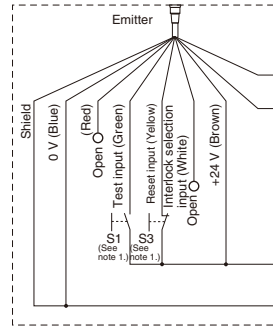
## Basic Connection

### Wiring for the manual reset mode and the EDM function



- S1: External test switch
- S2: Interlock/lockout reset switch
- S3: Lockout reset switch
- (If the switch is not necessary, connect between the reset input and +24 VDC.)
- K1, K2: Relay that controls the dangerous parts of machines, etc.
- K3: Load, PLC, etc. (used for monitoring)

### Wiring for the Auto-reset Mode

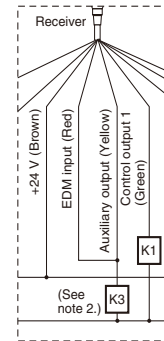


- Note: 1.** Use a switch suitable for micro loads.
- 2.** If K3 is not necessary, short-circuit the auxiliary output with the EDM input.

### When the EDM is Not Used

When the EDM is not necessary

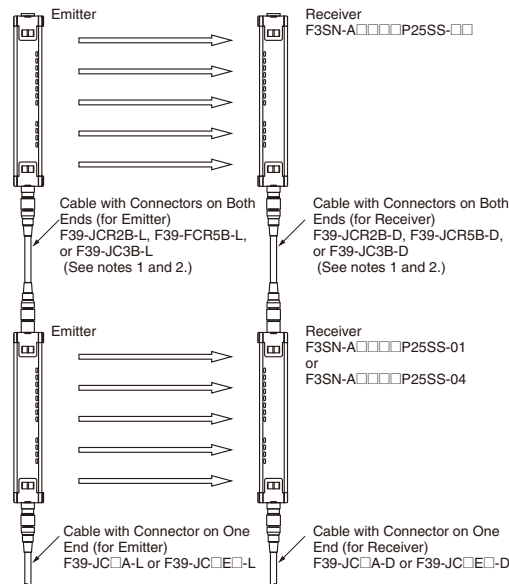
1. Use the F39-MC11 to disable the EDM.
- or
2. Disable the EDM by changing the wiring as shown in the figure below when the auxiliary output is set to the Dark-ON mode.



## Series Connection (Up to 3 Sets)

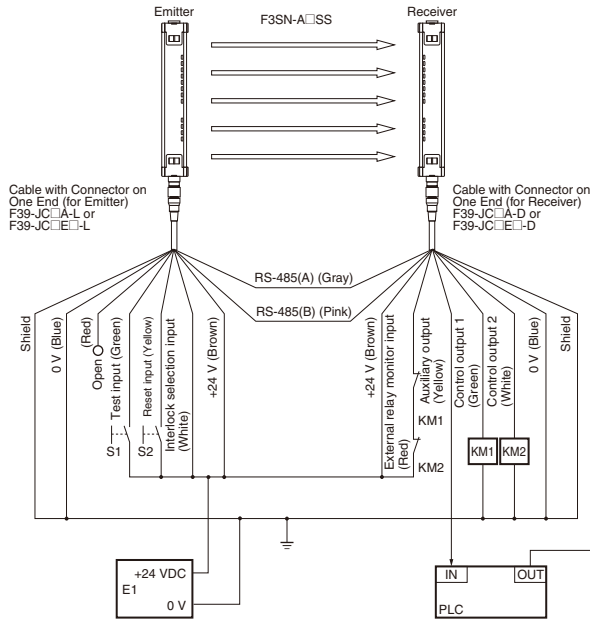
The use of series connection types (models ending in -01 or -04) enables series connection as shown in the figure at the right. Any type of Sensor can be used at the top end.

- Note: 1.** In order to maintain performance characteristics, use the F39-JCR2B, F39-JCR5B, or F39-JC3B to connect Light Curtains in series. The F39-JC7B, F39-JC10B, or F39-JC15B cannot be connected in series.
- 2.** Models ending in -04 can be connected in series without an optional Cable with Connectors on Both Ends because they have a Connector with a 0.2-m cable on top.



## An Example of Safety Circuits Where No Controller is Used

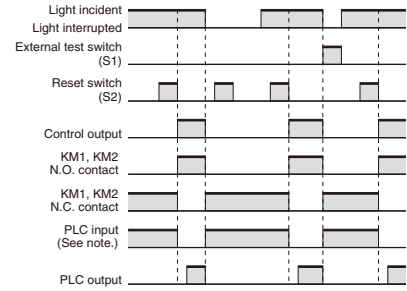
For category 4 rating



- Applicable operation mode
- Manual reset mode
  - Using the external relay monitor function

- S1: External test switch  
 S2: Interlock/lockout reset switch  
 KM1, KM2: Relay with forcibly guided contacts (G7SA)  
 KM3: Solid-state contactor (G3J)  
 M: 3-phase motor  
 E1: 24 VDC power supply (S82K)  
 PLC: Programmable Controller  
 (Used for monitoring. This is not a part of a safety system.)

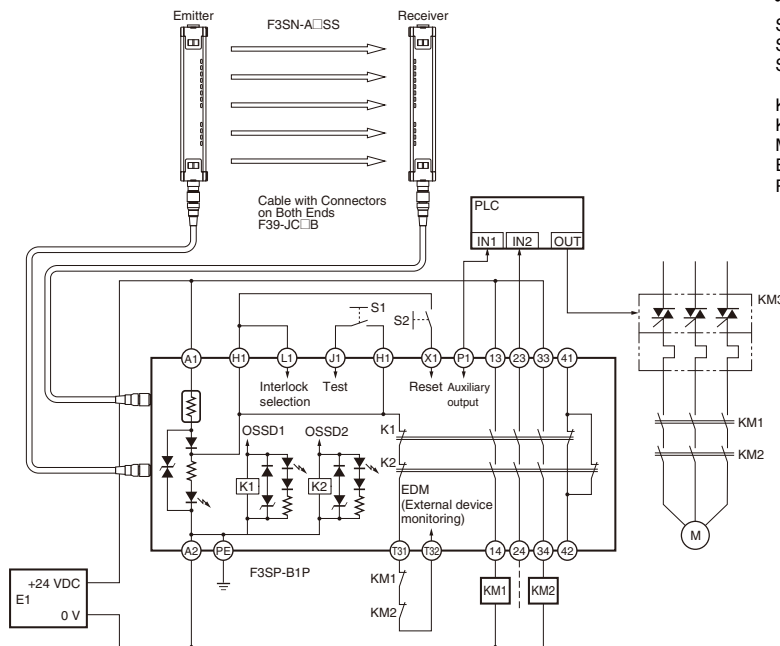
### Timing Chart



Note: The output operation mode of the auxiliary output is the Dark-ON output mode.

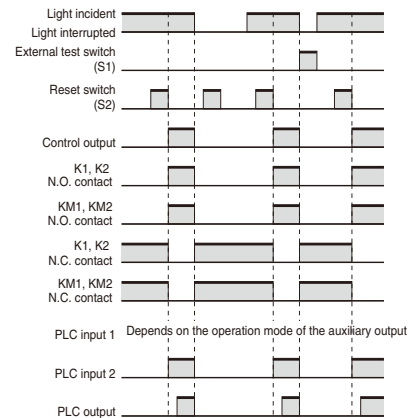
## An Example of Safety Circuits Where the F3SP-B1P Controller is Used

For category 4 rating

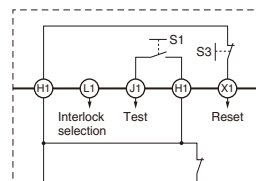


- Applicable operation mode
- Manual reset mode
- S1: External test switch  
 S2: Interlock/lockout reset switch  
 S3: Lockout reset switch (If the switch is not necessary, connect between X1 and H1.)  
 KM1, KM2: Relay with forcibly guided contacts (G7SA)  
 KM3: Solid-state contactor (G3J)  
 M: 3-phase motor  
 E1: 24 VDC power supply (S82K)  
 PLC: Programmable Controller  
 (Used for monitoring. This is not a part of a safety system.)

### Timing Chart



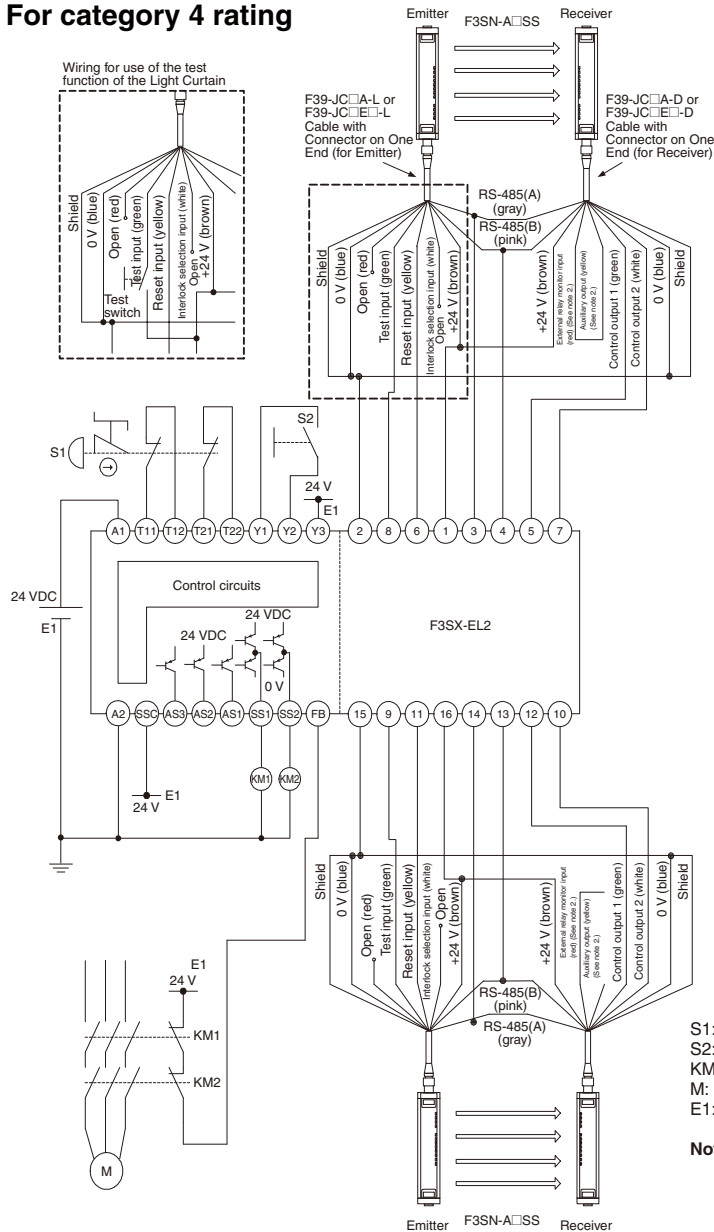
### Wiring for the auto-reset mode



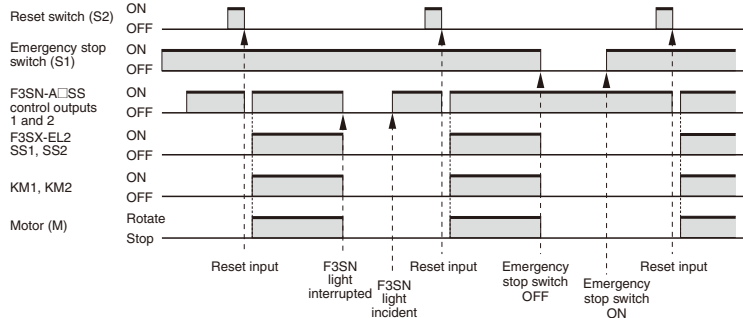
- Note: 1. If the EDM is not necessary, short-circuit T31 and T32.  
 2. For the number and arrangement of all terminals on the F3SP-B1P, see the instruction manual packaged together with the F3SP-B1P.

**An Example of Safety Circuits Where the F3SX Safety Controller is Used  
(with Two F3SN-A□SS Sets Connected)**

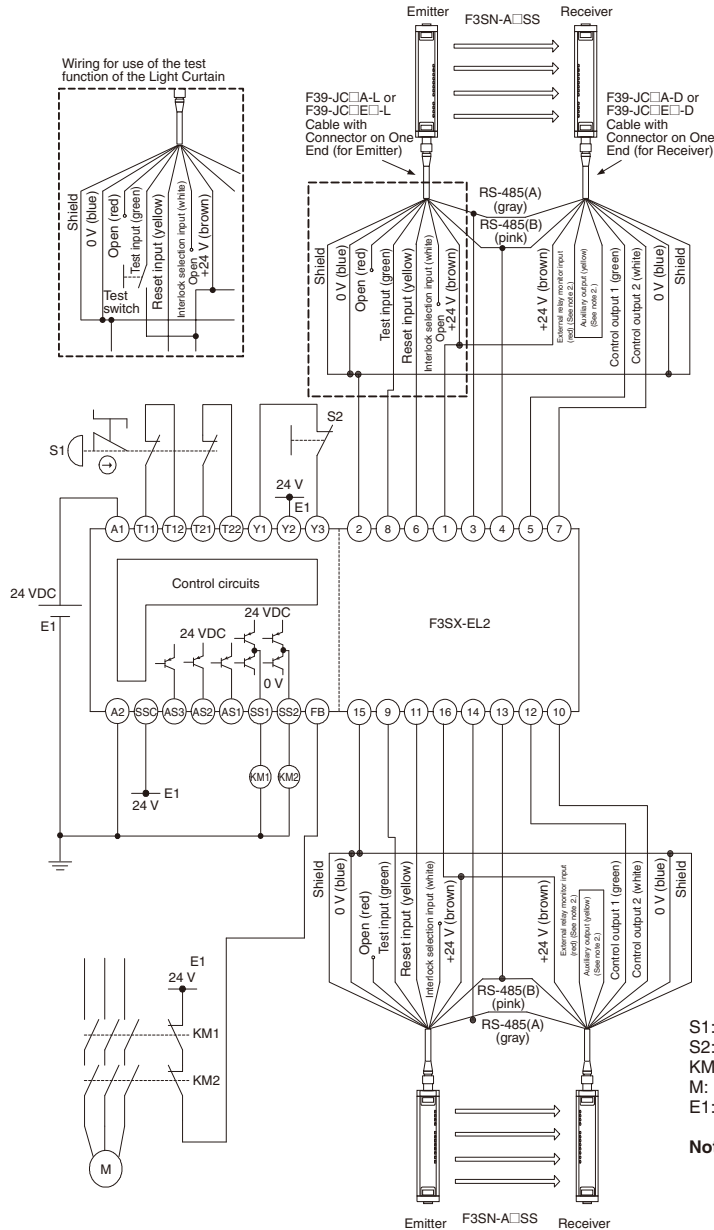
**F3SX-EL2 (Manual Reset)  
For category 4 rating**



**Timing Chart**



**F3SX-EL2 (Auto-reset)**  
For category 4 rating



- S1: Emergency stop switch (A165E, A22E)
- S2: Reset switch
- KM1, KM2: Relay with forcibly guided contacts
- M: Three-phase motor
- E1: 24-VDC power supply (S82K)

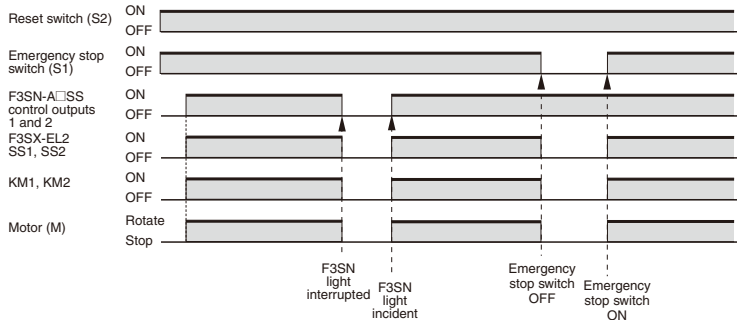
**Note 1:** The above circuit diagram conforms to Category 4.

**2:** In this connection example, the auxiliary output is set to the standard setting (Dark-ON operation).

To operate using non-standard settings, refer to the catalog or *Instruction Manual* for the F3SN-A□SS.

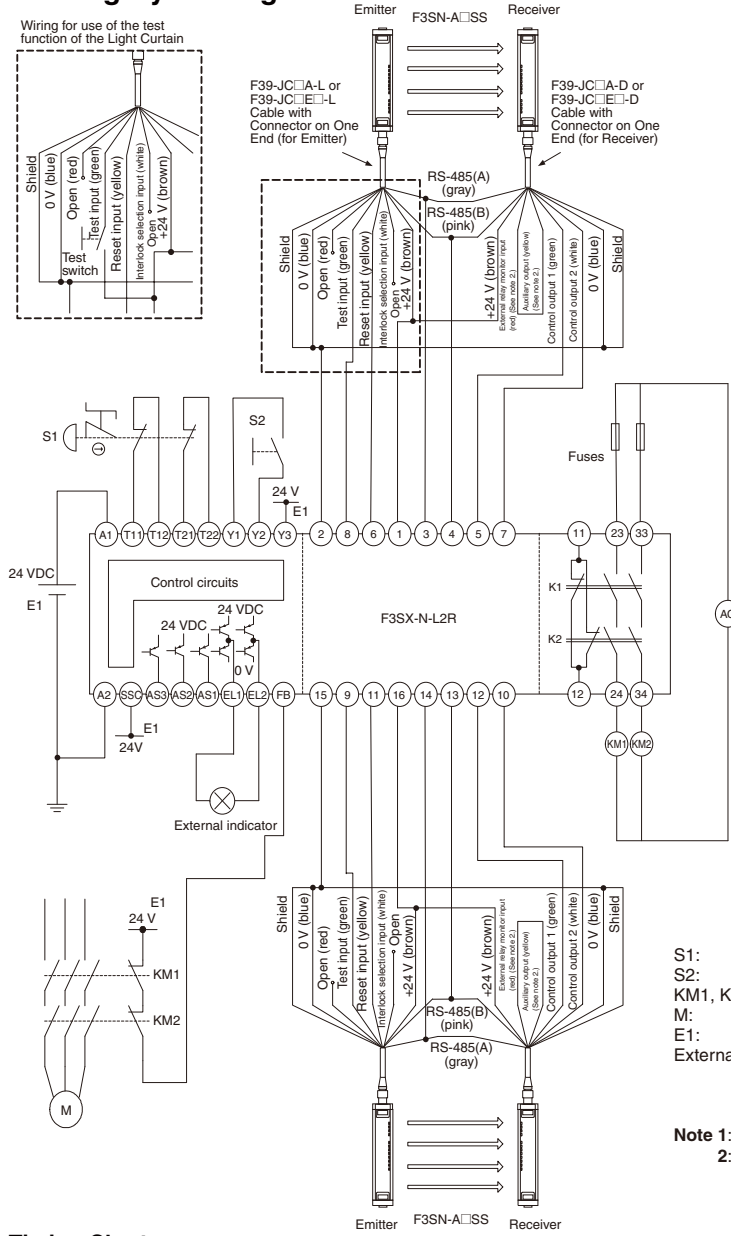
Use the optional F39-MC11 Setting Console to disable the EDM.

**Timing Chart**



**Note:** This timing chart does not allow for I/O device response delays.

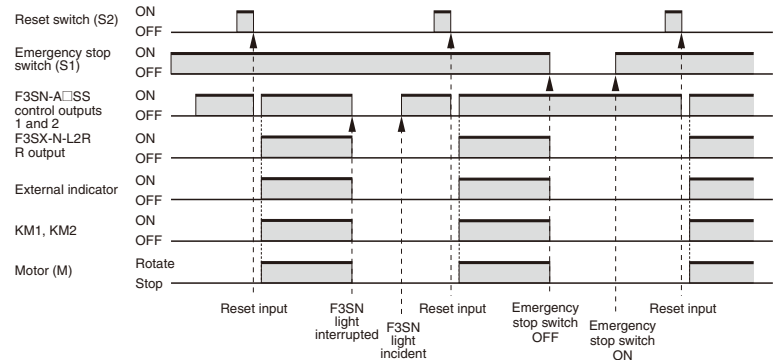
**F3SX-N-L2R (Manual Reset)**  
For category 4 rating



- S1: Emergency stop switch (A165E, A22E)
- S2: Reset switch
- KM1, KM2: Relay with forcibly guided contacts or magnetic contactor
- M: Three-phase motor
- E1: 24-VDC power supply (S82K)
- External indicator: Filament-type indicator  
(When an external indicator is not necessary, connect resistance of 1/4 W, 4.7 kΩ.)

**Note 1:** The above circuit diagram conforms to Category 4.  
**Note 2:** In this connection example, the auxiliary output is set to the standard setting (Dark-ON operation).  
 To operate using non-standard settings, refer to the catalog or *Instruction Manual* for the F3SN-A□SS.  
 Use the optional F39-MC11 Setting Console to disable the EDM.

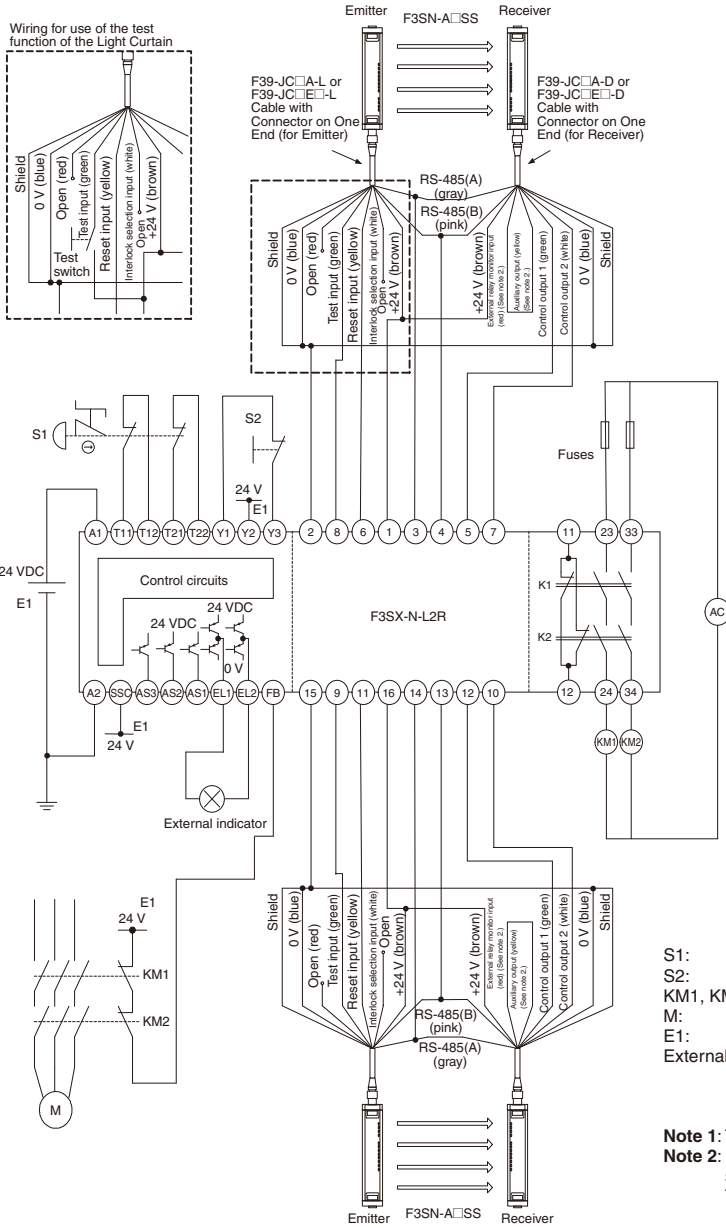
**Timing Chart**



**Note:** This timing chart does not allow for I/O device response delays.



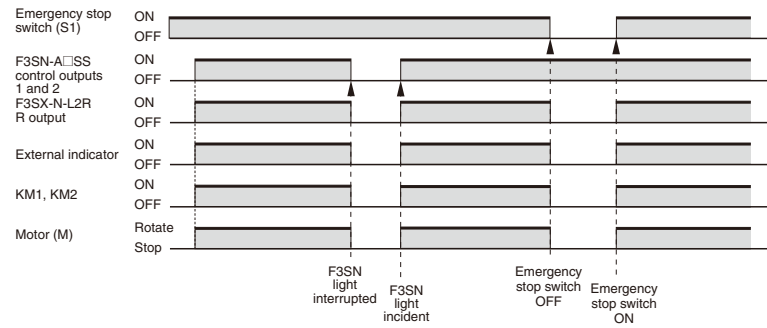
**F3SX-N-L2R (Auto-reset)**  
For category 4 rating



- S1: Emergency stop switch (A165E, A22E)
- S2: Reset switch
- KM1, KM2: Relay with forcibly guided contacts or magnetic contactor
- M: Three-phase motor
- E1: 24-VDC power supply (S82K)
- External indicator: Filament-type indicator  
(When an external indicator is not necessary, connect resistance of 1/4 W, 4.7 kΩ.)

**Note 1:** The above circuit diagram conforms to Category 4.  
**Note 2:** In this connection example, the auxiliary output is set to the standard setting (Dark-ON operation). To operate using non-standard settings, refer to the catalog or *Instruction Manual* for the F3SN-A□SS. Use the optional F39-MC11 Setting Console to disable the EDM.

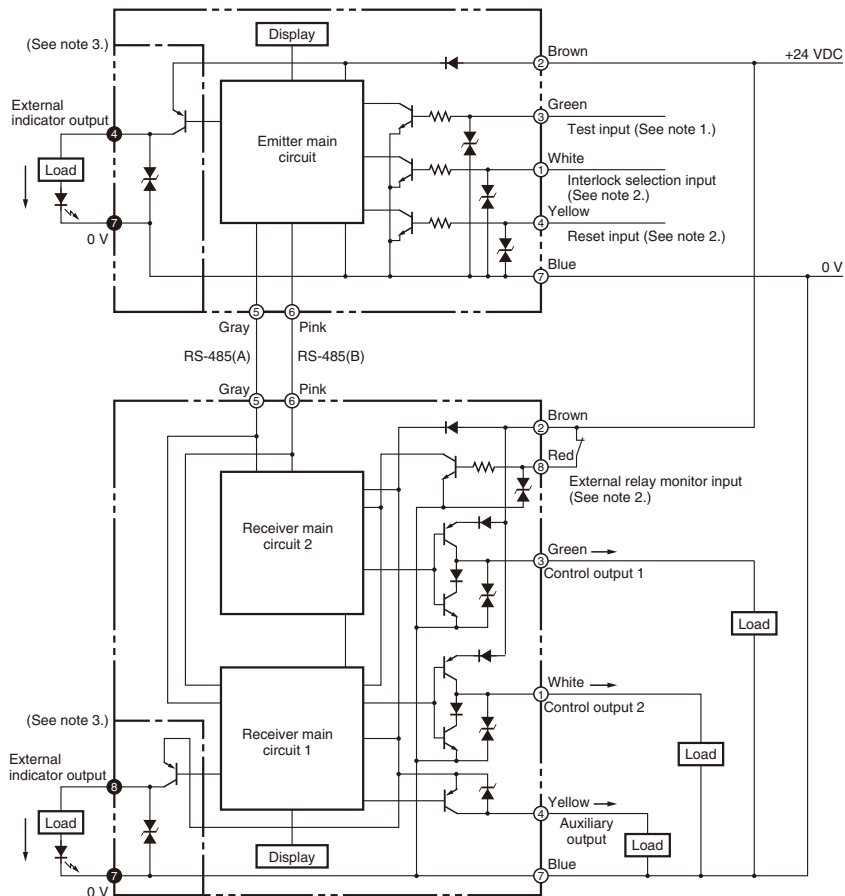
**Timing Chart**



**Note:** This timing chart does not allow for I/O device response delay.

# I/O Circuit

## ■ Circuit



- Note:**
1. Open: normal light emission, short: stops light emission
  2. Refer to "Wiring Diagram: Basic Connection" on page 10.
  3. The section encircled with the dashed line applies to models ending in -01 and -04 only.
  4. The numbers in ○ indicate pin numbers of the Connector.  
The numbers in ● indicate pin numbers of the series connection Connectors.

## ■ Cable with Connector on One End

Model	Internal wiring	Pin No.	Cable sheath color	Signal name	
				Receiver	Emitter
F39-JC3A (3 m) F39-JC7A (7 m) F39-JC10A (10 m) F39-JC15A (15 m) F39-JC3E□ (3 m) F39-JC7E□ (7 m) F39-JC10E□ (10 m) F39-JC15E□ (15 m)		1	White	Control output 2	Interlock selection input
		2	Brown	+24 V	+24 V
		3	Green	Control output 1	Test input
		4	Yellow	Auxiliary output	Reset input
		5	Gray	RS-485 (A)	RS-485 (A)
		6	Pink	RS-485 (B)	RS-485 (B)
		7	Blue	0 V	0 V
		8	Red	EDM input	N.C.

# Dimensions

**Note:** All units are in millimeters unless otherwise indicated.

## ■ Main Unit

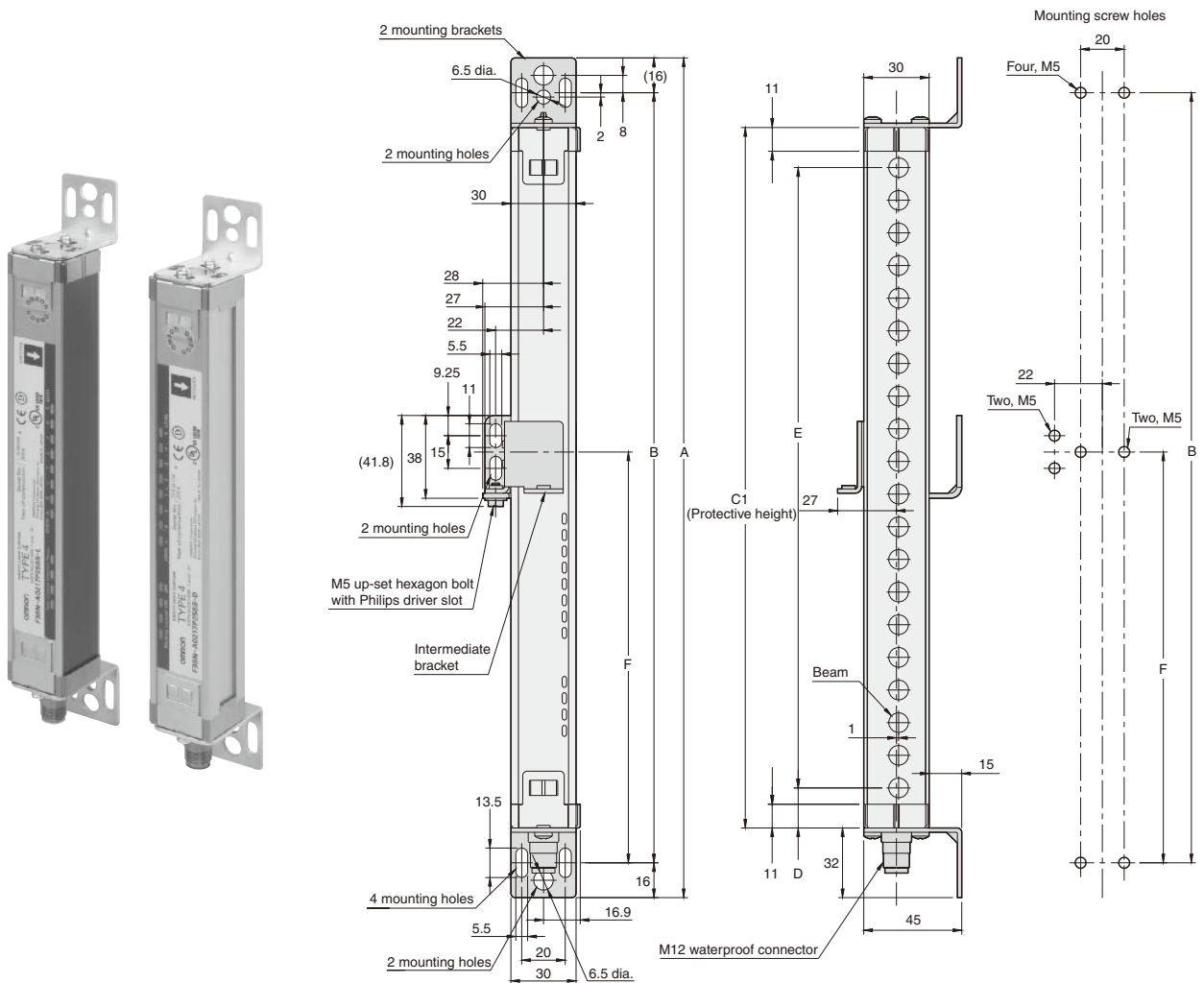
### F3SN-A□□□P25SS-□□

Dimensions can be calculated for each model by using the following equations.

- Dimension C1 (protective height): 4 digits in the model name
- Dimension A = C1 + 64
- Dimension B = C1 + 32
- Dimension D = 18.5
- Dimension E = C1 - 37
- Dimension F = Refer to the table below.

Protective height (C1)	Number of intermediate mounting brackets	Dimension F (See note.)
to 0640	0	---
0641 to 1280	1	F = B/2
1281 to 1822	2	F = B/3

**Note:** If value F obtained from the above equation is not used, set F to 670 mm or less.



### Mounting Precautions

- Note:** 1. The mounting bracket (3) (see Mounting Brackets (Intermediate)) is shown on the left-hand side of the Sensor as an example. If the mounting bracket (3) is on the right-hand side of the Sensor, then the mounting holes must also be on the right-hand side.
2. When using the cable bent, use a minimum bending radius of  $R = 36\text{ mm}$ . Fig. A shows an example when using a Cable with a Straight Connector. Fig. B shows the dimensions when using a Cable with a Right-angle Connector.

Fig. A

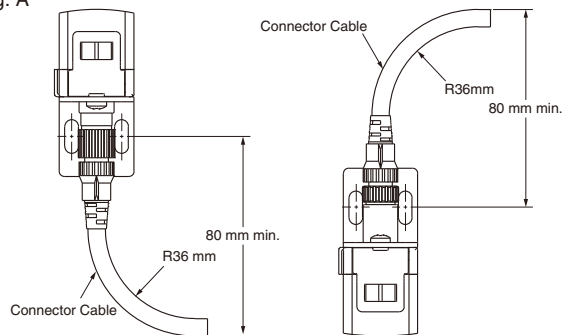
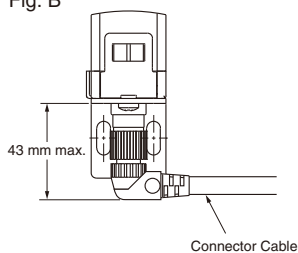
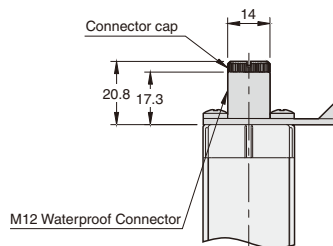
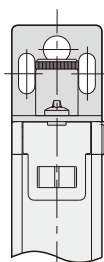


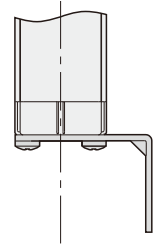
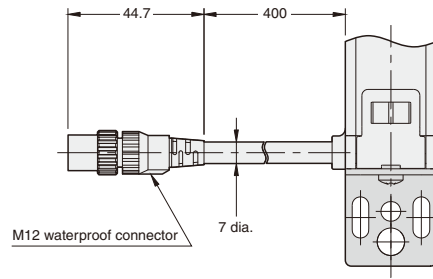
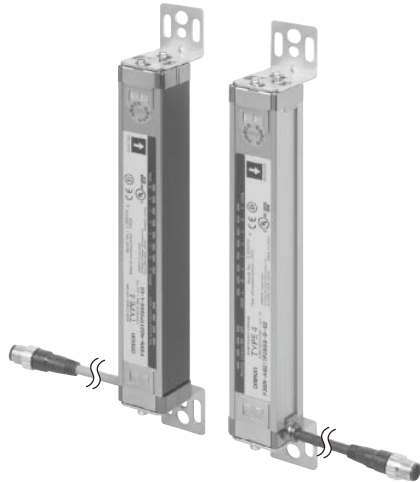
Fig. B



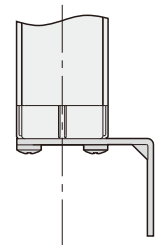
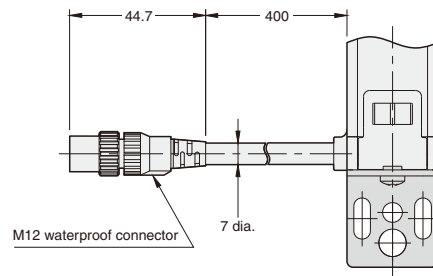
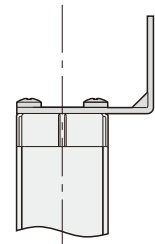
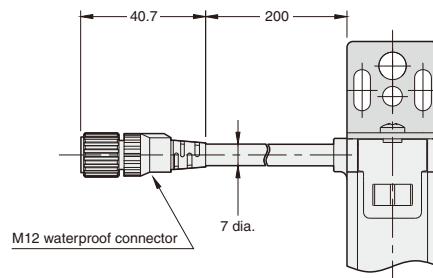
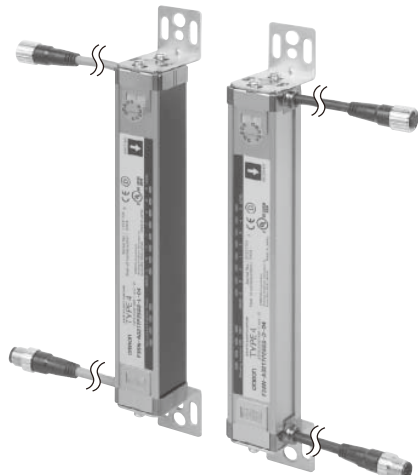
### F3SN-A□□□□P25SS-01



F3SNA-□□□□P25SS-02



F3SN-A□□□□P25SS-04



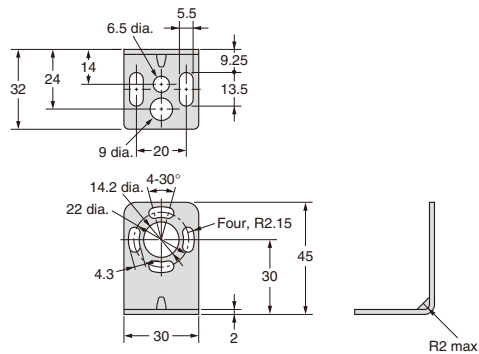
## Accessories

### Mounting Brackets (Top and Bottom)



Material: Iron (zinc plating)

Note: Provided with the main unit.

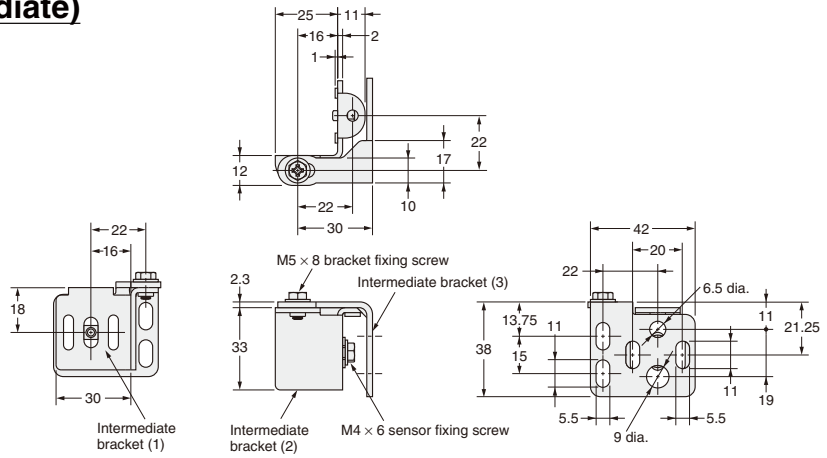


### Mounting Brackets (Intermediate)



Material: Iron (zinc plating)

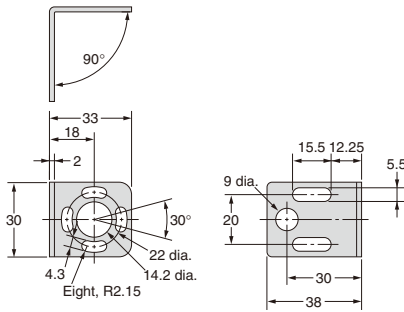
**Note:** Provided with the main unit.  
The number of brackets required depends on the total length of the Sensor.



### Accessories (Optional)

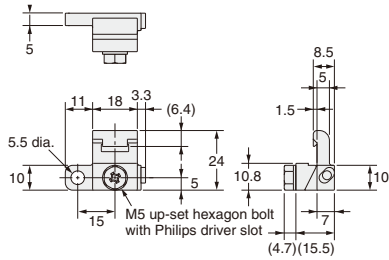
#### Wall Mounting Bracket

F39-L18

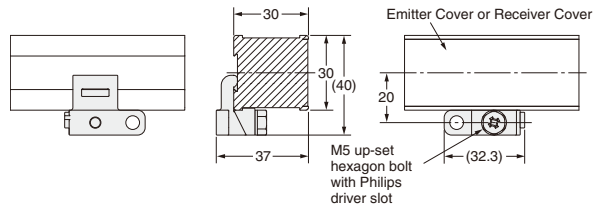


#### Free-location Bracket

F39-L19



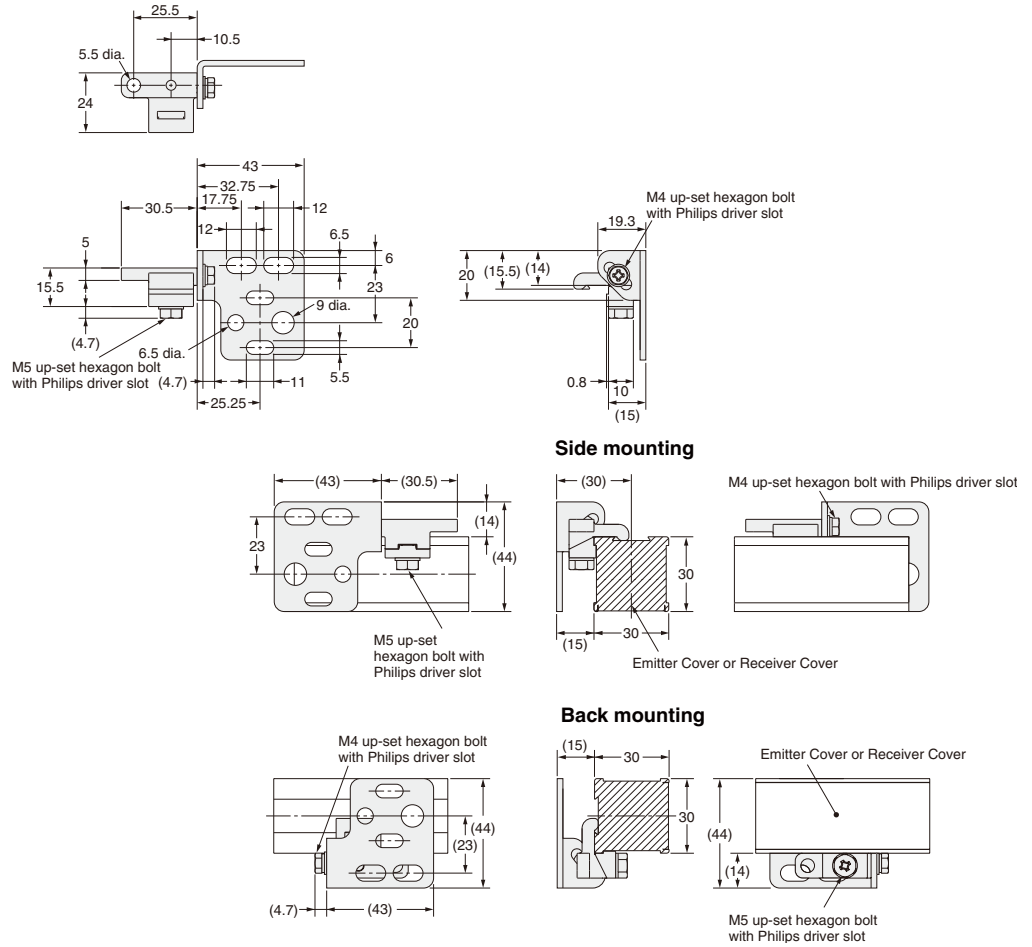
#### Mounting





**Free-location Bracket**

**F39-L20**



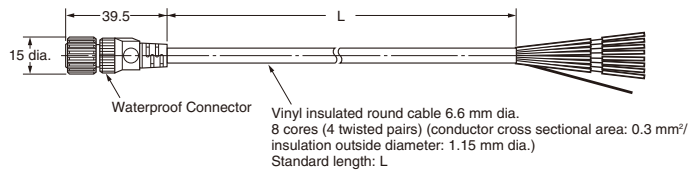
**Cable with Connector on One End with Straight Connectors**

F39-JC3A (L = 3 m)  
F39-JC7A (L = 7 m)

F39-JC10A (L = 10 m)  
F39-JC15A (L = 15 m)

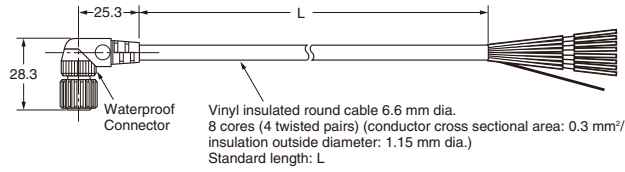


Color: Emitter (gray)  
Receiver (black)



**Cable with Connector on One End with Right-angle Connectors**

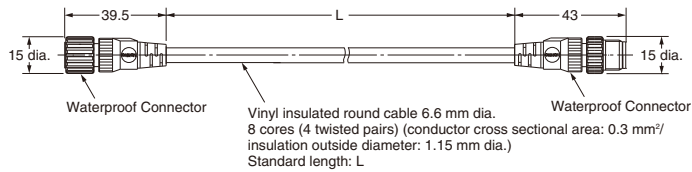
- |                       |                       |
|-----------------------|-----------------------|
| F39-JC1E1 (L = 1 m)   | F39-JC1E2 (L = 1 m)   |
| F39-JC3E1 (L = 3 m)   | F39-JC3E2 (L = 3 m)   |
| F39-JC7E1 (L = 7 m)   | F39-JC7E2 (L = 7 m)   |
| F39-JC10E1 (L = 10 m) | F39-JC10E2 (L = 10 m) |
| F39-JC15E1 (L = 15 m) | F39-JC15E2 (L = 15 m) |



Color: Emitter (gray)  
Receiver (black)

**Cable with Connectors on Both Ends with Straight Connectors**

- |                       |                      |
|-----------------------|----------------------|
| F39-JCR2B (L = 0.2 m) | F39-JC7B (L = 7 m)   |
| F39-JCR5B (L = 0.5 m) | F39-JC10B (L = 10 m) |
| F39-JC3B (L = 3 m)    | F39-JC15B (L = 15 m) |
| F39-JC5B (L = 5 m)    | F39-JC20B (L = 20 m) |



Color: Emitter (gray)  
Receiver (black)

# Safety Precautions

Refer to "Regulations and Standards" and "Safety Precautions" for F3SN-A/F3SN-B/F3SH-A.

"Type Certification" specified in the Chapter 44. 2 of the Industrial Safety and Health Law in Japan does not apply to independent F3SS Sensors. This law applies to systems incorporating the Sensor. When using the F3SL Sensor in Japan as a "safety device for presses or shearing machines," as specified in the Chapter 42 of the same law, apply for certification for the overall system.

## ⚠ WARNING

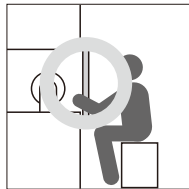
### Detection Zone and Intrusion Path

Install protective structures around the machine so that you must pass through the detection zone of the F3SN-A□SS to reach a hazardous part of the machine.

Install the F3SN-A□SS so that some part of the operator's body remains in the detection zone at all times when the operator works in a hazardous area. Failure to do so may result in serious injury.

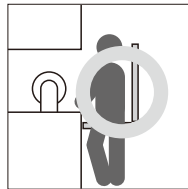


Correct Installation



A hazardous part of a machine can be reached only by passing through the sensor detection zone.

Correct Installation



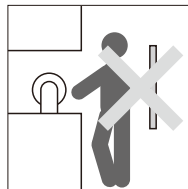
Some part of the operator's body remains in the detection zone while they are working.

Incorrect Installation



A hazardous part of a machine can be reached without passing through the sensor detection zone.

Incorrect Installation



A worker is between the sensor detection zone and a hazardous part of a machine.

### Use of the Fixed Blanking Function

Install protective structures in all parts of the detection zone where detection is disabled by the fixed blanking function so no one can pass through the detection zone to reach the hazardous part of the machine. Failure to do so may result in serious injury.

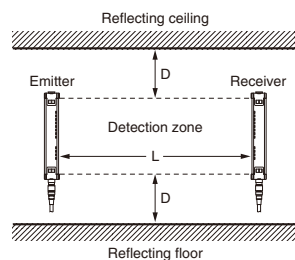


### Distance from Reflective Surfaces

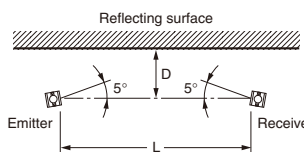
Be sure to install the F3SN-A□SS in a way that minimizes the effects of reflection from nearby surfaces. Failure to do so may cause detection to fail and may result in serious injury.



Side View



Top View



Install the F3SN-A□SS using the minimum Distance D shown below from reflective surfaces (highly reflective surfaces), such as metal walls, floors, ceilings, and work pieces.

Distance between Emitter and Receiver (operating range L)	Minimum installation distance D
0.2 to 3 m	0.13 m
Over 3 m	$L/2 \times \tan 5^\circ = L \times 0.044$ (m)

### Safety Distance

Always maintain a safety distance (S) between the Light Curtain and a hazardous part of a machine. Failure to do so may prevent the machine from stopping before an operator reaches the dangerous area and may result in serious injury.



Floating blanking is used to increase the minimum detectable object size. Be sure to use the minimum detectable object size for floating blanking when calculating safety distance. Failure to do so may prevent the machine from stopping before an operator reaches the dangerous area and may result in serious injury.



The safety distance is the minimum distance that must be maintained between the F3SN-A□SS and a hazardous part of a machine in order to stop the machine before someone or something reaches it. It is calculated based on the following equation when a person moves perpendicular to the detection zone of a Light Curtain.

$$\begin{aligned} \text{Safety distance (S)} = & \text{Intrusion speed into the detection zone (K)} \\ & \times \text{Total response time for the machine and} \\ & \text{Light Curtain (T)} \\ & + \text{Additional distance calculated based on} \\ & \text{the detection capability of the Light Curtain} \\ & \text{(C)} \dots \dots \dots (1) \end{aligned}$$

The safety distance varies with national standards and individual machine standards. The equation is also different if the direction of intrusion is not perpendicular to the detection zone of the Light Curtain. Be sure to refer to related standards.

Refer to the "Safety Distance" and "Safety Precautions" for the F3SN-A/F3SN-B, F3SH-A.

### Installation

#### How to Prevent Mutual Interference

An Emitter and Receiver installed facing each other must be a pair from the same set. The wrong combination may create a zone where objects cannot be detected.



Do not use the Sensor for a reflected beam system, or objects may not be detected. In those applications, use a beam path diversion mirror to prevent any beam reflected by an object from entering the Receiver.



Take necessary steps to prevent mutual interference when installing two or more pairs of the F3SN-A□SS. Examples of such steps include series connection and the use of light baffle.



## ■ Precautions for Correct Use

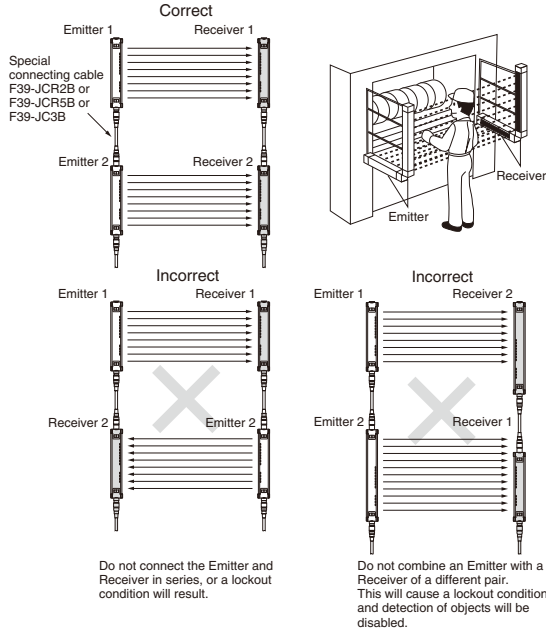
Do not use the product in atmospheres or environments that exceed product ratings.

## Installation

### How to Prevent Mutual Interference

**Series Connections (Up to 3 sets, 240 beams, Sensor models ending in -01 and -04 are required for series connection)**

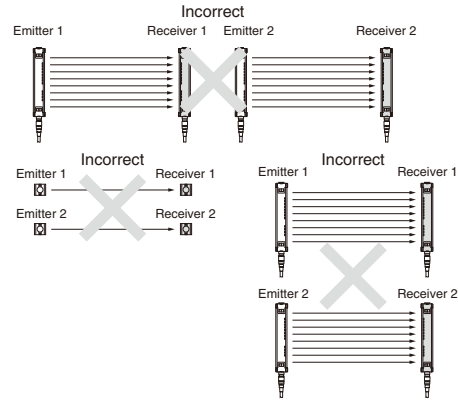
Two or more pairs of the F3SN-A□SS can be connected in series. When connected in series, the F3SN-A□SS Sensors generate beams in a time-sharing manner to prevent mutual interference and ensure safety.



### When Not Connected in Series

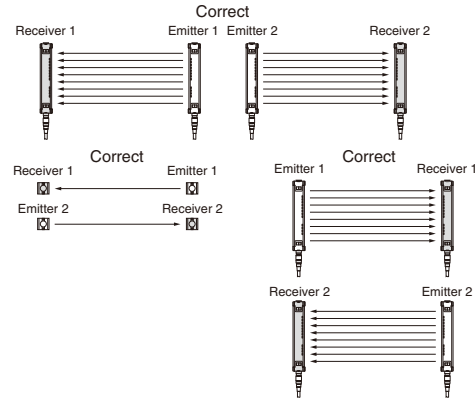
Mutual interference is minimized by the shorter operating range of the F3SN-A□SS Series in comparison the F3SN-A Series or by optimizing light receiving sensitivity using an optional F39-MC11 Setting Console. If interference occurs, install the F3SN-A□SS using one of the following methods to eliminate it.

- Installation Which May Cause Mutual Interference

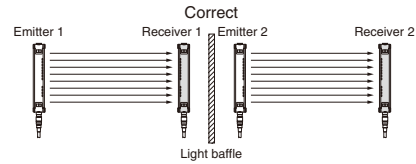


- Installation to Prevent Mutual Interference

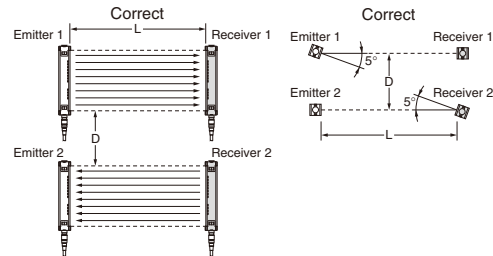
1. Install the F3SN-A□SS so that the two Light Curtains emit in the opposite directions (staggered).



2. Install a light baffle between the Sensors.



3. Install the Light Curtains far enough apart to prevent mutual interference.



Distance between the Emitter and Receiver (operating range L)	Minimum installation distance D
0.2 to 3 m	0.26 m
Over 3 m	$L/2 \times \tan 5^\circ = L \times 0.088$ (m)

## Operating Range

If the distance between the Emitter and the Receiver is less than 0.2 m, there is a possibility of chattering. Be sure to use the Sensors within the rated operating range.

Refer to "Names and Functions of Parts" for F3SN-A/F3SN-B, F3SH-A.

## Other Precautions

- The application examples provided in this catalog are for reference only. Check functions and safety of the equipment before use.
- Never use the products under any conditions or in any environment not described in this catalog or for any application requiring special safety requirements, such as nuclear energy control systems, railroad systems, aviation systems, vehicles, combustion equipment, medical equipment, amusement machines, or other application involving serious risk to life or property, without ensuring that there is sufficient leeway in ratings and performance and that sufficient safety measures have been installed. Always consult with your OMRON representative and confirm specifications before using the products in such an application.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. F067-E1-03

In the interest of product improvement, specifications are subject to change without notice.



## WARNING

This catalog is a guide to help customers select the proper safety products. Observe the following items when choosing products, select the right products for your devices or equipment, and develop a safety-related system to fully utilize product functions.

### Setting Up a Risk Assessment System

The items listed in this catalog must be used properly in terms of product location as well as product performance and functionality. Part of the process of selecting and using these products should include the introduction and development of a risk assessment system early in the design development stage to help identify potential dangers in your equipment that will optimize safety product selection. A badly designed risk assessment system often results in poor choices when it comes to safety products.

- Related International Standards:  
ISO 14121 Principles of Risk Assessment

### Safety Policy

When developing a safety system for the devices and equipment that use safety products, make every effort to understand and conform to the entire series of international and industrial standards available, such as the examples given below.

- Related International Standards:  
ISO 12100 Basic Concepts, General Principles for Design  
IEC 61508 Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems

### Role of Safety Products

Safety products have functions and mechanisms that ensure safety as defined by standards. These functions and mechanisms are designed to attain their full potential within safety-related systems. Make sure you fully understand all functions and mechanisms, and use that understanding to develop systems that will ensure optimal usage.

- Related International Standards:  
ISO 14119 Interlocking Devices Associated with Guards-Principles for Design and Selection

### Installing Safety Products

Make sure that properly educated and trained engineers are selected to develop your safety-related system and to install safety products in devices and equipment.

- Related International Standards:  
ISO 12100 Basic Concepts, General Principles for Design  
IEC 61508 Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems

### Observing Laws and Regulations

Safety products should conform to pertinent laws, regulations, and standards, but make sure that they are used in accordance with the laws, regulations, and standards of the country where the devices and equipment incorporating these products are distributed.

- Related International Standards:  
IEC 60204 Electrical Equipment of Machines

### Observing Usage Precautions

Carefully read the specifications and precautions listed in this catalog for your product as well as all items in the Operating Manual packed with the product to learn usage procedures that will optimize your choice. Any deviation from precautions will lead to unexpected device or equipment failure not anticipated by safety-related systems or fire originating from equipment failure.

### Transferring Devices and Equipment

When transferring devices and equipment, be sure to keep one copy of the Operating Manual and pack another copy with the device or equipment so the person receiving it will have no problem operating it.

- Related International Standards:  
ISO 12100 Basic Concepts, General Principles for Design  
IEC 61508 Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems



## Read and Understand This Catalog

Please read and understand this catalog before purchasing the products. Please consult your OMRON representative if you have any questions or comments.

## Warranty and Limitations of Liability

### WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

### LIMITATIONS OF LIABILITY

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In no event shall responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

## Application Considerations

### SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the product.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products:

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this catalog.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

## Disclaimers

### CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons.

It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the product may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased product.

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