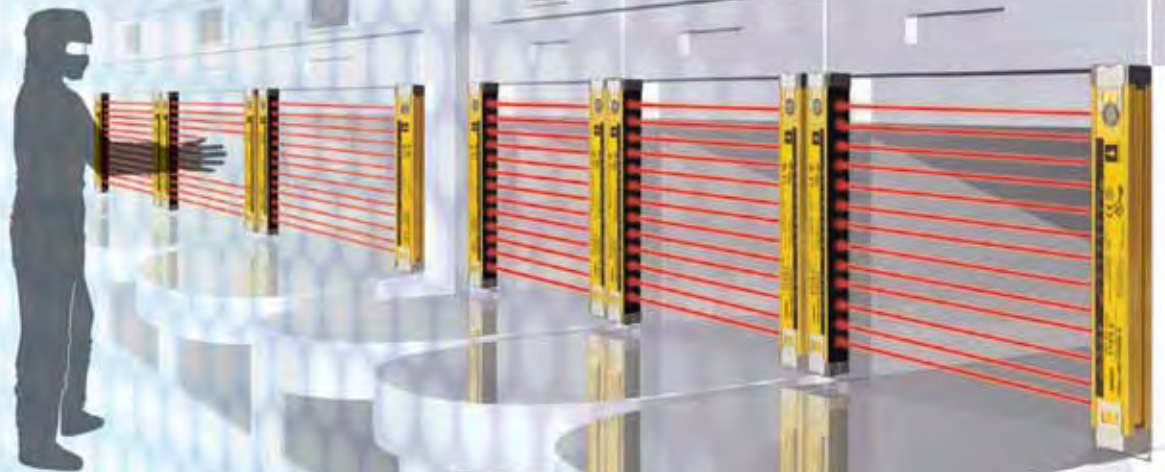


F3SN Series Addition

Short-range Safety Light Curtain (Type 4)

F3SN-A□SS

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



F3SN-A□SS

Short-range Safety Light Curtain (Type 4)

Operating Range of 3.5 m and Hand Protection (Minimum Detectable Object: 25-mm Dia.)

No interference with sensors from the same series and virtually no interference with other types of sensors

New Emitter Mechanism Eliminates Excessive Light NEW

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

Conventional Models

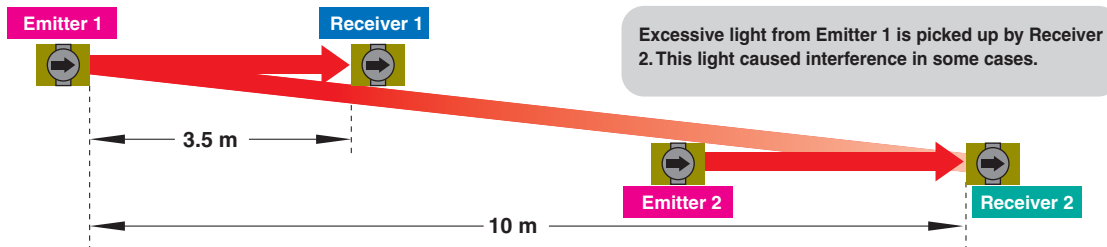
Conventional models had an operating range that was too long. This meant that they picked up light from sensors in unexpected locations and they interfered with other sensors.



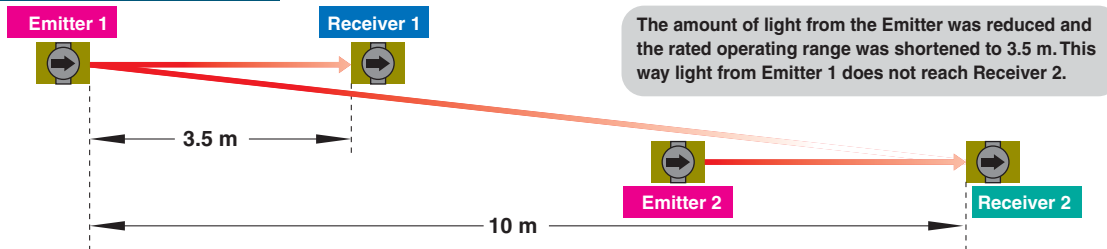
F3SN-A□SS Series

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

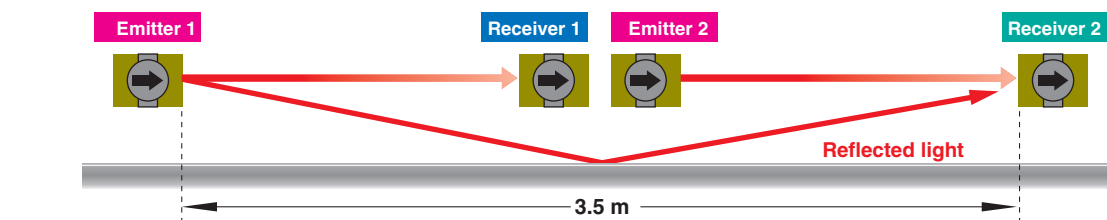


F3SN-A□SS Series



Setting Console Optimizes Light Sensitivity for Specific Ranges

Even light reflected from walls



Amount of light received from Emitter 1

Normally a fixed threshold value

Threshold value

ON

OFF

Amount of light picked up by Receiver 2

ON

Threshold value

OFF

A Setting Console can vary the threshold value.

Amount of light picked up by Receiver 2

ON

Threshold value

OFF

Amount of light received from Emitter 1

The current amount of incoming light can now be displayed.

When the threshold value jumps from 18 to 80 for example, you won't be caught off guard because you can see the change numerically displayed.

The threshold at which the light curtain turned ON and OFF was fixed and could not be adjusted with conventional models. With the new series however, the threshold value can be adjusted. This reduces the effects of external light interference and stabilizes light curtain operation.

The current amount of incoming light can now be displayed.

When the threshold value jumps from 18 to 80 for example, you won't be caught off guard because you can see the change numerically displayed.

2

Ideal Where Installation Space Is Limited

NEW

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

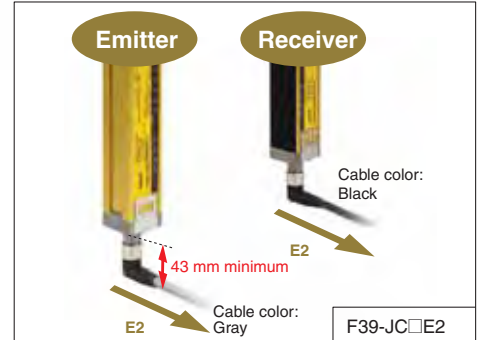
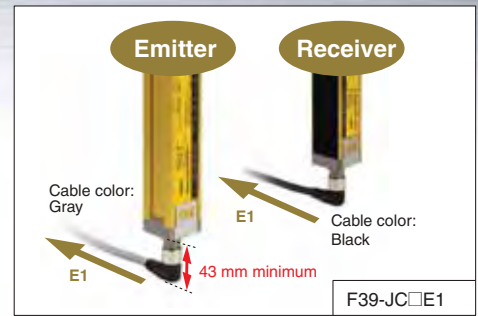
Use back-mounted Connector Cable models like the F3SN-A□SS-02 and the F3SN-A□SS-04 for installations where space is a premium and where the dimensions at the bottom of the light curtain are restricted. (The F3SN-A□SS-04 also has a Connector Cable on top for series connections.) In addition to conventional Straight Connector Cables, we also have optional F39-JC□E□ Right-angle Connector Cables that connect on the left side or right side from the lens surface for installations where very little room is left behind the Light Curtain.



F3SN-A□SS-02
F3SN-A□SS-04

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 the F3SN-A/B, F3SH-A catalog (Cat. No. E322) for details.



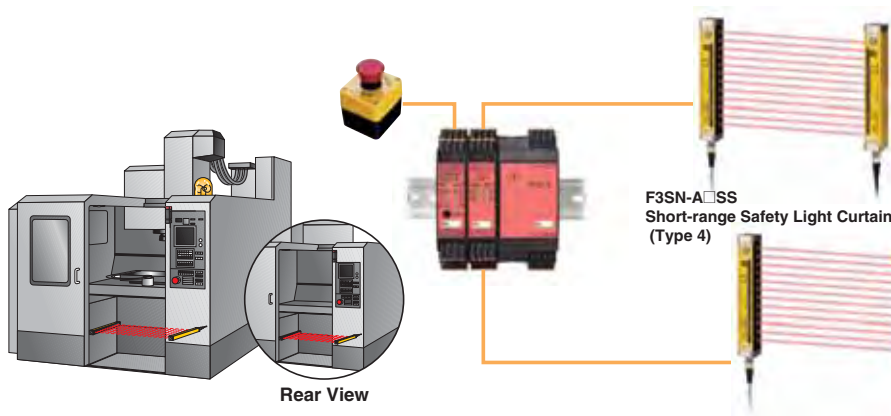
Note: The direction of the cable is fixed.

Integrated Control for Multiple Light Curtains

We recommend using an F3SX Safety Controller with the Light Curtains.

When two or more Light Curtains are used to detect intrusion in a dangerous zone, the F3SX Safety Controller can be used with them to easily create complex safety circuits. (See the safety circuit examples on pages 10 to 14.)

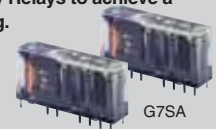
Refer to the F3SX Safety Controllers Catalog (Cat. No. Z196) for specific product details.



Other Ways to Easily Create Safety Circuits

■ Saving Space

- ▶ Save space by using the External Relay Monitor Function built into the sensor and two G7SA Safety Relays to achieve a category 4 rating.



■ Reducing Wiring

- ▶ Use the F3SP-B1P Control Unit to reduce the amount of wiring required.



F3SP-B1P

Refer to page 10 for safety circuit examples.

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 standards	IEC61496-1, IEC61496-2
EU and EN standards	Machinery Directive, EMC Directive, EN61496-1, and prEN61496-2
North American standards	UL61496-1, UL61496-2, UL508, UL1998, CAN/CSA22.2 NO.14, CAN/CSA22.2 NO.0.8
JIS standards	JIS B9704-1, B9704-2

The F3SN-A□SS can be used in machines covered by the 29 CFR1910.212 OSHA standard in the United States. It also satisfies requirements from the ANSI/RIA R15.06-1999 American National Standard for Industrial Robots and Robot Systems.



IEC

OSHA

ANSI/RIA




JIS


Ordering Information

Main Unit

F3SN-A□SS Safety Light Curtain (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"> Standalone Last set in a series connection (second of 2 sets connected in series or third of 3 sets connected in series) 					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
M12 straight connector	M12 Connector	<ul style="list-style-type: none"> 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) For external indicator installations 	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
Connector with 0.4-m cable	No connector	<ul style="list-style-type: none"> Standalone When dimensions at the bottom of the Sensor are restricted Last set in a series connection (second of 2 sets connected in series or third of 3 sets connected in series) 					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"> 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) 	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							

Accessories (Optional)


Single-ended Connector Cable (For Emitter and Receiver, 1 Set of 2 Cables)

For Connection with Safety Devices such as Safety Relays, 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






Double-ended Connector Cable (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	Connection with the F3SP-B1P Safety Relay Unit (See note 2.)		F39-JC5B
	7 m			F39-JC7B
	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 Double-ended Connector Cable 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.

Safety Relays, Safety Relay Units, and Safety Controllers

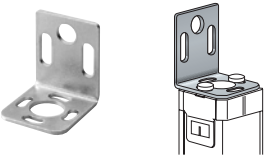


Type	Appearance	Specification	Model	Remarks
G7SA Safety Relay		<ul style="list-style-type: none"> • No. of contacts: 4 • Contact output: 2NO + 2NC • Rated switch load: 6 A at 250 VAC, 6 A at 30 VDC 	G7SA-2A2B	Refer to the Safety Components catalog (Cat. No. Y106) for details on sockets and other models.
		<ul style="list-style-type: none"> • No. of contacts: 4 • Contact output: 3NO + 1NC • Rated switch load: 6 A at 250 VAC, 6 A at 30 VDC 	G7SA-3A1B	
G7S-E Safety Relay		<ul style="list-style-type: none"> • No. of contacts: 6 • Contact output: 4NO + 2 NC • Rated switch load: 10 A at 250 VAC, 10 A at 30 VDC 	G7S-4A2B-E	
		<ul style="list-style-type: none"> • No. of contacts: 6 • Contact output: 3NO + 3NC • Rated switch load: 10 A at 250 VAC, 10 A at 30 VDC 	G7S-3A3B-E	
Dedicated Control Unit		<ul style="list-style-type: none"> • Quick connection/disconnection to the F3SN-A□SS with a Double-ended Connector Cable. • Contact output: 3NO + 1NC 	F3SP-B1P	Use an F39-JC□B Double-ended Connector Cable to connect to the F3SN-A□SS.
Muting Controller		<ul style="list-style-type: none"> • Connects up to two F3SN-A□SS sets and provides muting capability. 	F3SP-U2P	Use an F39-JC□A or F39-JC□E□ Single-ended Connector Cable to connect to the F3SN-A□SS. Refer to the Safety Components catalog (Cat. No. Y106) for functions and other details.
F3SX Safety Controller		<ul style="list-style-type: none"> • Connects two F3SN-A□SS sets and an emergency stop switch. • DC solid-state safety output 	F3SX-EL2	Refer to the Components catalog (Cat. No. Y106) for details on functions and other models.
		<ul style="list-style-type: none"> • Connects four F3SN-A□SS sets and an emergency stop switch. • DC solid-state safety output 	F3SX-E-L2L2	
		<ul style="list-style-type: none"> • Connects two F3SN-A□SS sets and an emergency stop switch. • Relay output (2NO + 1NC) 	F3SX-N-L2R	
		<ul style="list-style-type: none"> • Connects four F3SN-A□SS sets and an emergency stop switch. • Relay output (2NO + 1NC) 	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:** 1. 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.
2. 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 the F3SN-A/B, F3SH-A Catalog (Cat. No. E322) or the Safety Component Catalog (Cat. No. Y106) for details.

Mounting Brackets (Optional)

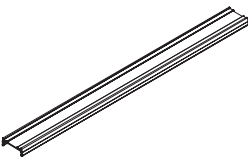
Appearance	Specification	Model	Remarks
	Wall mounting bracket Material: Iron (zinc plating) (See note.)	F39-L18	For Emitter: 2 pcs. For Receiver: 2 pcs. Total: 4 pcs./set
	Free-location bracket Materials: Zinc die-cast (zinc plating) Note: Not provided with an angle deflection mechanism for beam control.	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) Note: 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 (Refer to the instruction manual for details.)

Main Unit (Refer to the F3SN-A Series Catalog (Cat. No. SCEE-016) for details on accessories.)

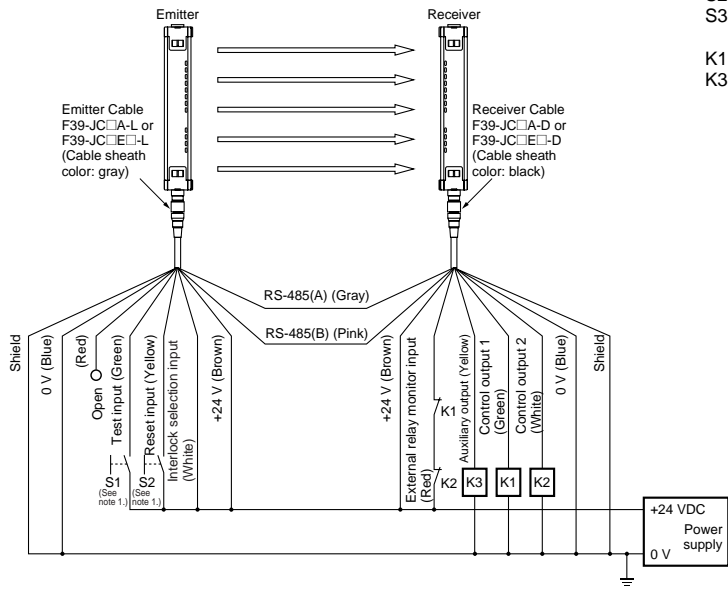
Type	Model	F3SN-A□□□□P25SS (-□□)
Sensor type	Type 4 Safety Light Curtain	
Applicable safety category	4, 3, 2, 1, B	
Operating range	0.2 to 3.5 m	
Beam gap (P)/min. detectable object	P = 15 mm/non-transparent: 25 mm in diameter	
Number of beams (n)	13 to 118 (Refer to <i>Ordering Information</i> on page 4.)	
Protective height (PH)	217 to 1792 mm PH = (n-1) x P + 37 mm	
Effective aperture angle (EAA)	Within ±2.5° for the Emitter and Receiver at a detection distance of at least 3 m according to IEC61496-2.	
Light source (luminous wavelength)	Infrared LED (870 nm)	
Supply voltage (Vs)	24 VDC±10% (ripple p-p: 10% max.)	
Current consumption under no-load conditions	Emitter	Up to 50 beams: 140 mA max., 51 to 85 beams: 155 mA max., 86 beams or more: 170 mA max.
	Receiver	Up to 50 beams: 100 mA max., 51 to 85 beams: 110 mA max., 86 beams or more: 120 mA max.
Control output (OSSD)	Two PNP transistor outputs, load current: 300 mA max., residual voltage: 2 V max. (except for voltage drop due to cable extension)	
Auxiliary output (non-safety output)	One PNP transistor output, load current: 50 mA max., residual voltage: 2 V max. (except for voltage drop due to cable extension)	
External indicator output (non-safety output) (See note 1.)	One PNP transistor output, load current: 40 mA max., residual voltage: 2 V max. (except for voltage drop due to cable extension)	
Output operation mode	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.)	
Input voltage	For test input, interlock selection input, reset input, and external relay monitor input voltages: ON voltage: 9 to 24 V (with a sink current of 3 mA max.), OFF voltage: 0 to 1.5 V or open	
Test functions (See note 2.)	<ul style="list-style-type: none"> Self test (after power ON and during operation, one cycle during response time) External test (light emission stop function by test input) 	
Mutual interference prevention function	Time-shared beam projection system by series connection <ul style="list-style-type: none"> Number of series connected Light Curtains: Up to 3 sets Number of beams: Up to 240 beams Length of the series connection cable: 3 m max. Sensitivity Automatic sensitivity adjustment capability supported by the F39-MC11.	
Safety-related functions (See note 2.)	<ul style="list-style-type: none"> Auto reset/manual reset (interlock) (See note 3.) External relay monitor Fixed blanking (See note 4.) Floating blanking (See note 4.) 	
Indicators (See note 5.)	Emitter	Power indicator (green), interlock indicator (yellow), lockout indicator (red), test indicator (orange), error mode indicator (3 red), light intensity level indicator (green: 5 levels)
	Receiver	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)
Protection	Output short-circuit protection, reverse polarity protection	
Response time (See note 6 for series connections.)	ON→OFF	Protective height: 217 to 742 mm: 10.0 ms, 832 to 1222 mm: 12.5 ms, 1312 to 1792 mm: 15.0 ms
	OFF→ON	Protective height: 217 to 742 mm: 40 ms, 832 to 1222 mm: 50 ms, 1312 to 1792 mm: 60 ms
Startup waiting time	1 s max.	
Ambient light intensity	Incandescent lamp: 3,000 lx max. (light intensity on the Receiver surface) Sunlight: 10,000 lx max. (light intensity on the Receiver surface)	
Ambient temperature	Operating: -10 to 55°C, storage: -30 to 70°C (with no icing or condensation)	
Ambient humidity	Operating/storage: 35 to 95%RH (with no condensation)	
Insulation resistance	20 MΩ min.(at 500 VDC)	
Dielectric strength voltage	1000 VAC at 50/60 Hz for 1 min	
Vibration resistance (malfunction)	10 to 55 Hz, double amplitude: 0.7 mm, X, Y, and Z directions: 20 sweeps	
Shock resistance (malfunction)	100 m/s ² , X, Y, and Z directions: 1000 times	
Degree of protection	IP65 (IEC60529)	
Connection method	M12 Connector (8 pins)	
Weight (in packaging)	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 -0 and -04 only.
 - The glossary and functions are the same as those for the F3SN-A Series. Refer to the F3SN-A/B, F3SH-A Series Catalog (Cat. No. E322).
 - 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 Emitter test indicator (orange) and the Receiver blanking indicator (green) start flashing when the accumulative ON time exceeds 30,000 hours for the purpose of preventive maintenance.
 - 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

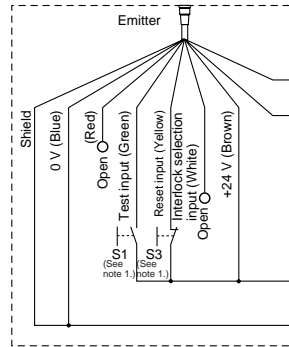
Basic Connection

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)

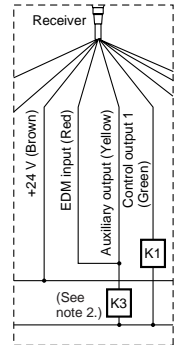
Wiring for the Auto Reset Mode



- 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

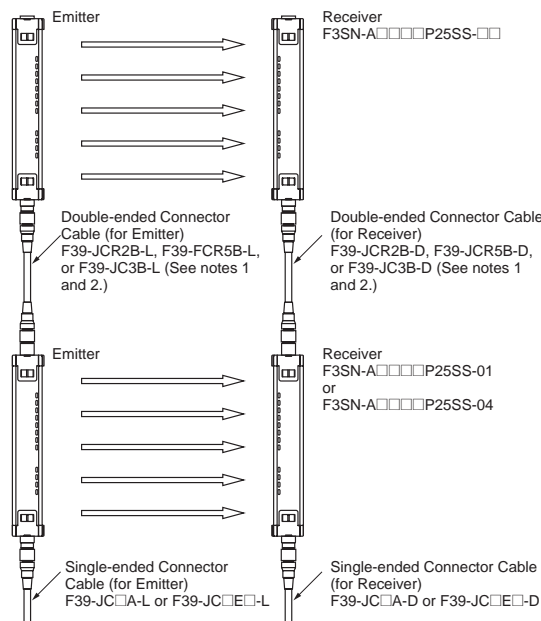
- When the EDM is not necessary
- (1) Use the F39-MC11 to disable the EDM.
 - or
 - (2) Disable the EDM by changing the wiring as shown in the figure below when the auxiliary output is set to the Dark-ON mode.



Series Connection (Up to 3 Sets)

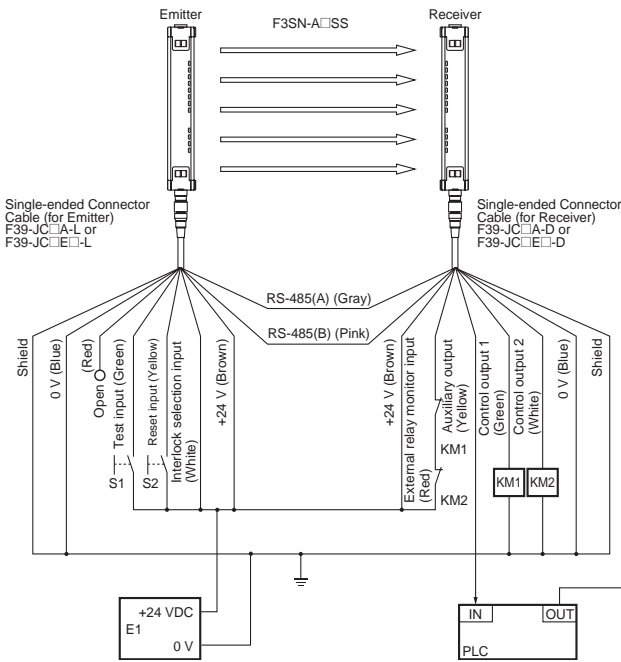
The use of series connection types (models ending in -01 or -04) enables series connection as shown in the figure at the right. Any type of Sensor can be used at the top end.

- 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 Double-ended Connector Cable 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

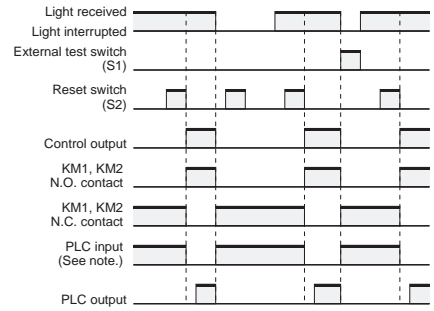
- Manual reset mode
- Using the external relay monitor function

S1: External test switch
 S2: Interlock/lockout reset switch
 KM1, KM2: Safety relay with forcibly-guided contracts (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.)

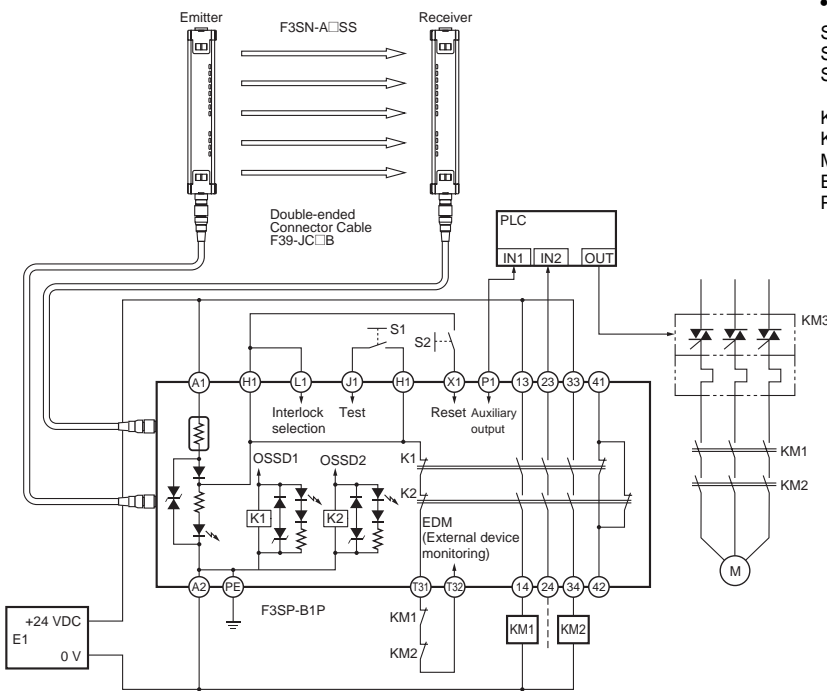
Timing Chart



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

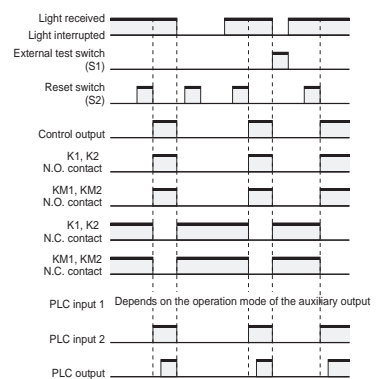
S1: External test switch
 S2: Interlock/lockout reset switch
 S3: Lockout reset switch (If the switch is not necessary, connect between X1 and H1.)

KM1, KM2: Safety relay with forcibly-guided contacts (G7SA)
 KM3: Solid-state contactor (G3J)

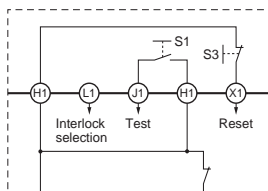
M: 3-phase motor
 E1: 24 VDC power supply (S82K)

PLC: Programmable Controller
 (Used for monitoring. This is not a part of a safety system.)

Timing Chart



Wiring for the auto reset mode

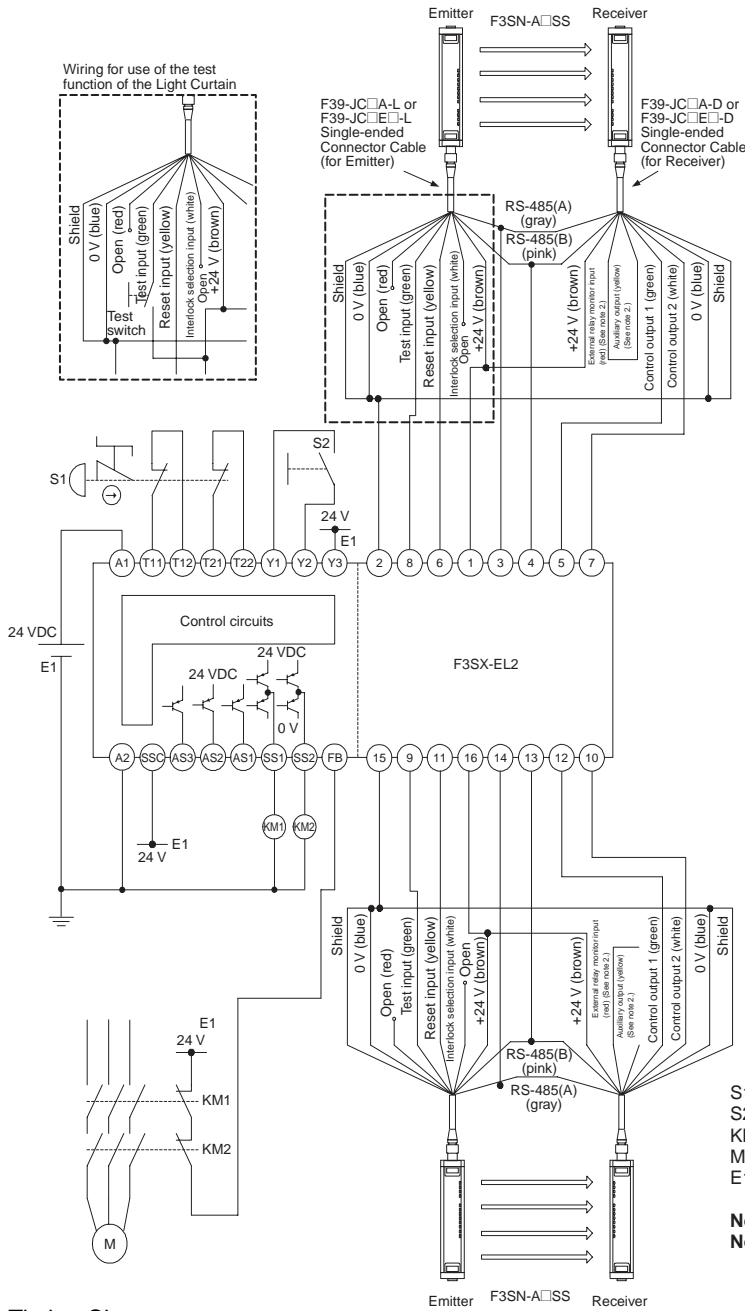


- Note: 1. If the EDM is not necessary, short-circuit T31 and T32.
 2. For the number and arrangement of all terminals on the F3SP-B1P, see the instruction manual packaged together with the F3SP-B1P.

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

F3SX-EL2 (Manual Reset)

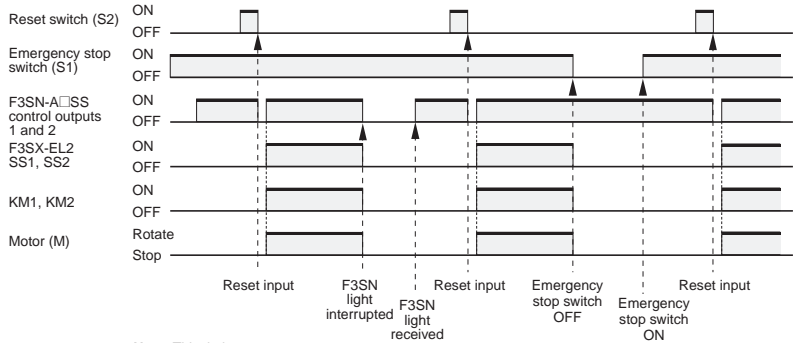
For category 4 rating



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

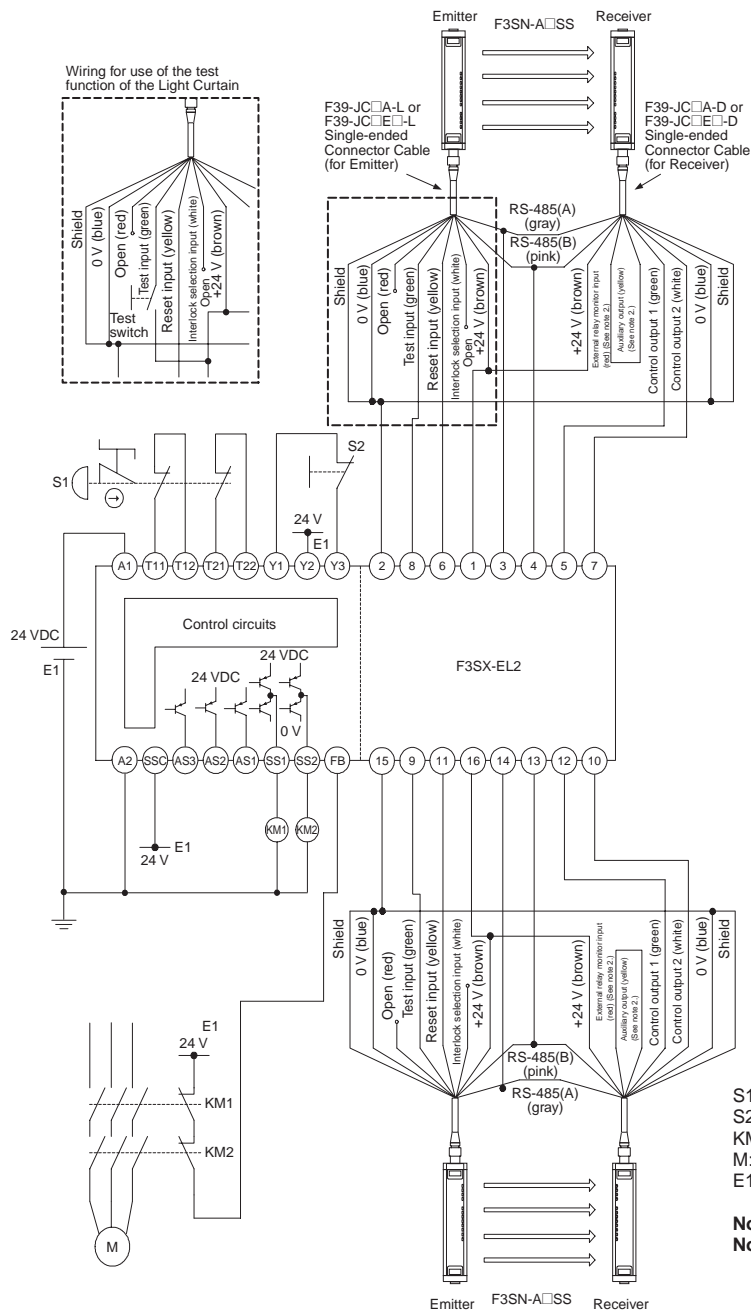
Note 1: The above circuit diagram conforms to Category 4.
Note 2: In this connection example, the auxiliary output is set to the standard setting (Dark-ON operation). To operate using non-standard settings, refer to the catalog or operation manuals for the F3SN-A□SS. Use the optional F39-MC11 Setting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

Timing Chart



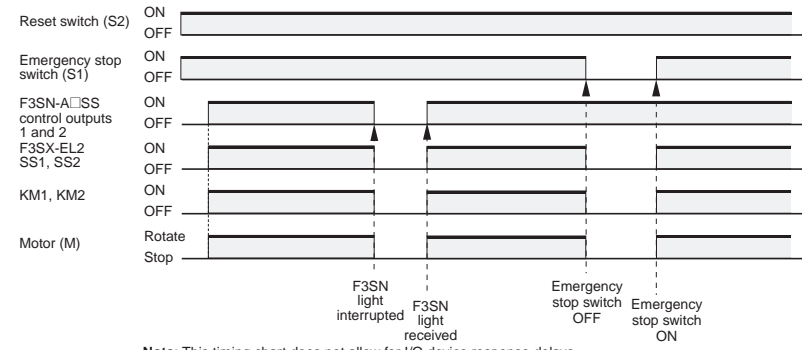
Note: This timing chart does not allow for I/O device response delays.

F3SX-EL2 (Auto Reset)
For category 4 rating

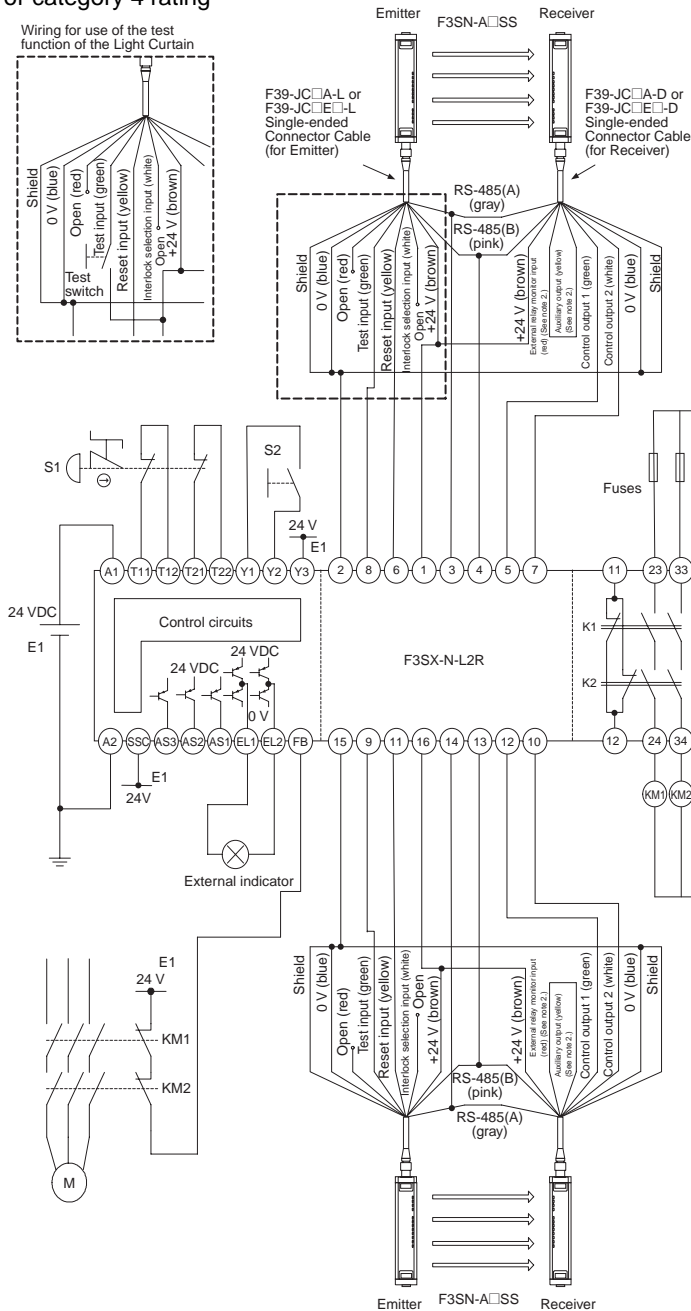


Note 1: The above circuit diagram conforms to Category 4.
Note 2: In this connection example, the auxiliary output is set to the standard setting (Dark-ON operation). To operate using non-standard settings, refer to the catalog or operation manuals for the F3SN-A□SS. Use the optional F39-MC11 Setting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

Timing Chart



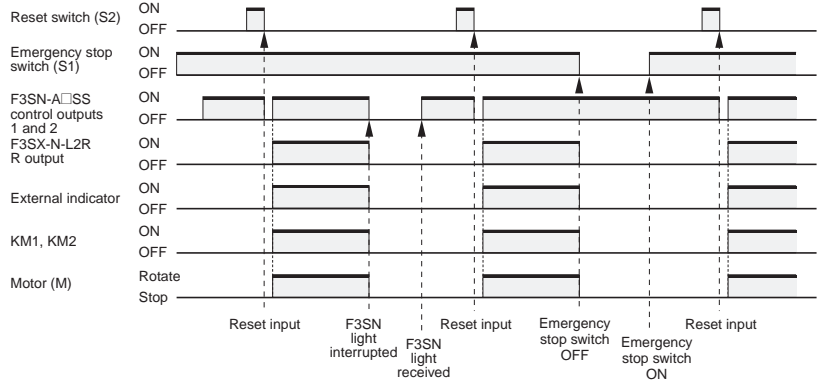
F3SX-N-L2R (Manual Reset)
For category 4 rating



- S1: Emergency stop switch (A165E, A22E)
- S2: Reset switch
- KM1, KM2: Safety 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.)

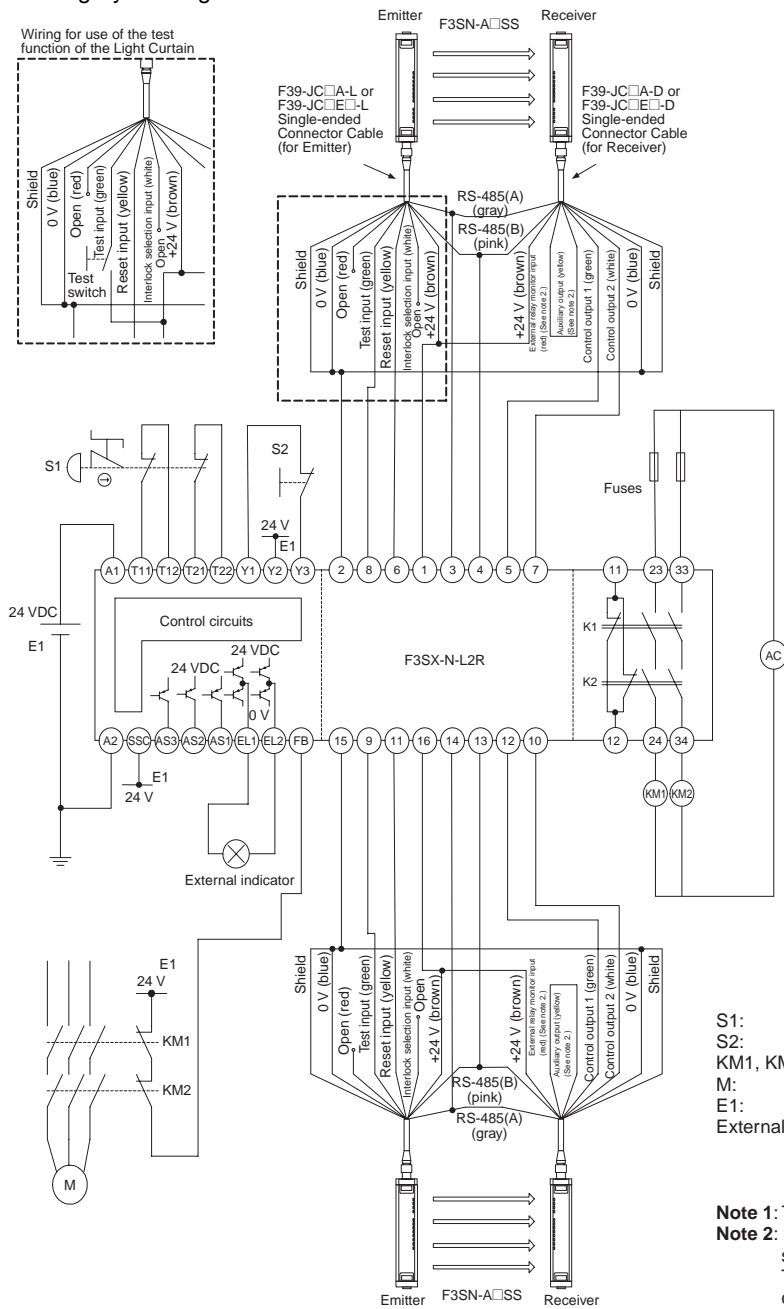
Note 1: The above circuit diagram conforms to Category 4.
Note 2: In this connection example, the auxiliary output is set to the standard setting (Dark-ON operation).
 To operate using non-standard settings, refer to the catalog or operation manuals for the F3SN-A□SS.
 Use the optional F39-MC11 Setting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



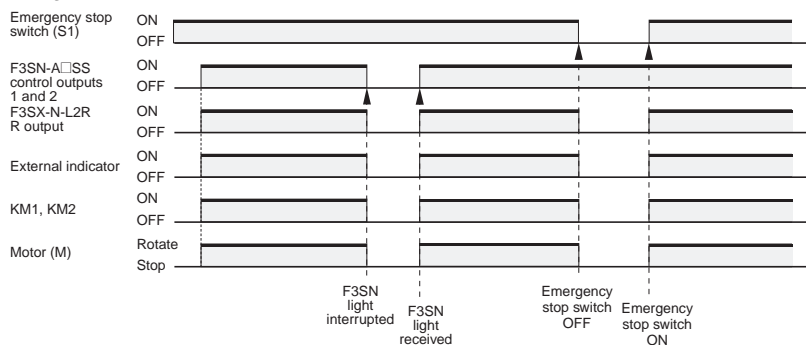
- S1: Emergency stop switch (A165E, A22E)
- S2: Reset switch
- KM1, KM2: Safety relay with forcibly-guided contacts or magnetic contactor
- M: Three-phase motor
- E1: 24-VDC power supply (S82K)
- External indicator: Filament-type indicator
(When an external indicator is not necessary, connect resistance 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 operation manuals for the F3SN-A□SS. Use the optional F39-MC11 Setting Console to disable the EDM.

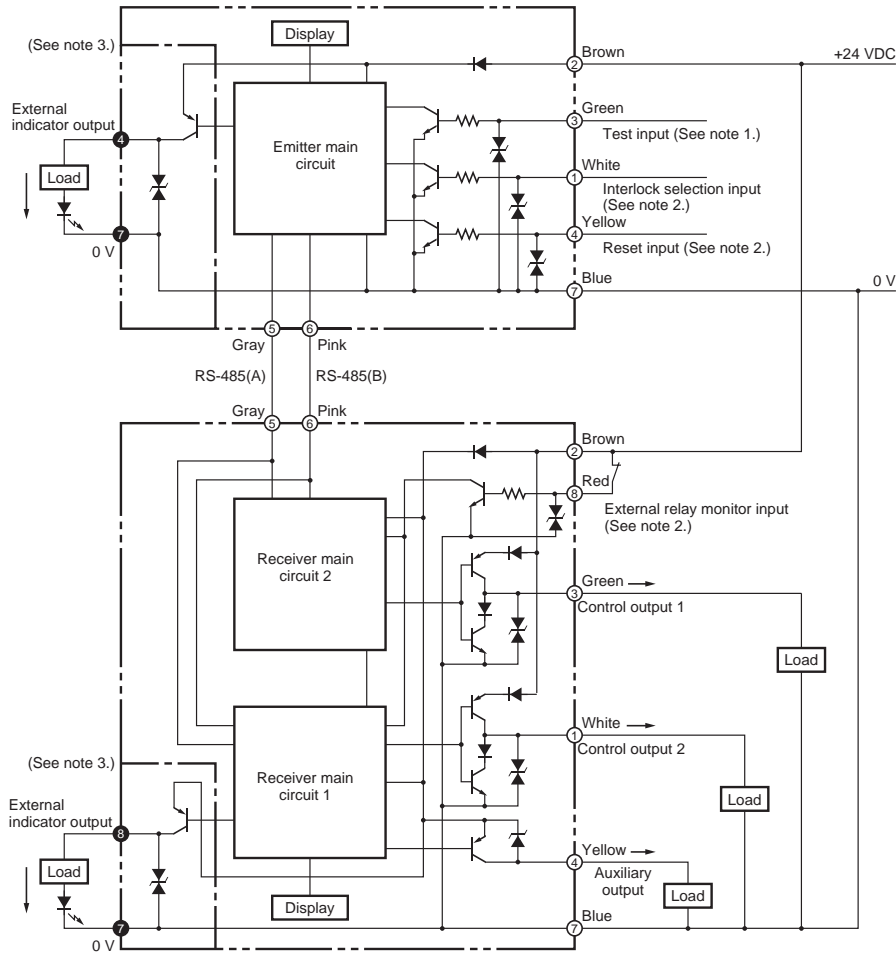
Timing Chart



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 9.
 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.

Single-ended Connector Cable

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□ (10m) 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.

Precautions

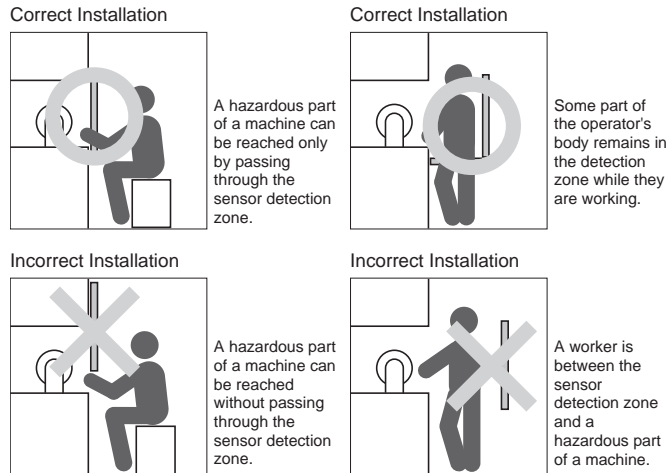
Refer to the F3SN-A/B, F3SH-A Series catalog (Cat. No. E322) for relevant laws and regulations.

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.



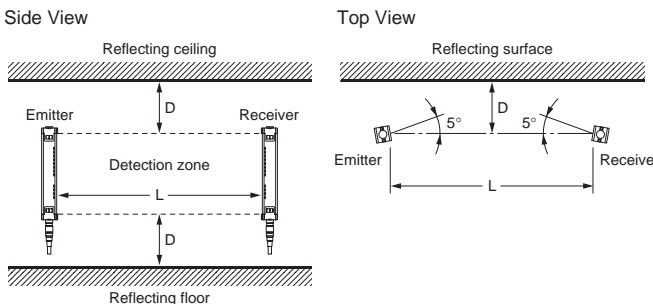
• **Use of the Fixed Blanking Function**

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.



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

Distance between Emitter and Receiver (operating range L)	Minimum installation distance D
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.

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

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 F3SN-A/B, F3SH-A Series Catalog (Cat. No. E322) for an example of the safety distance calculation.

● **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.

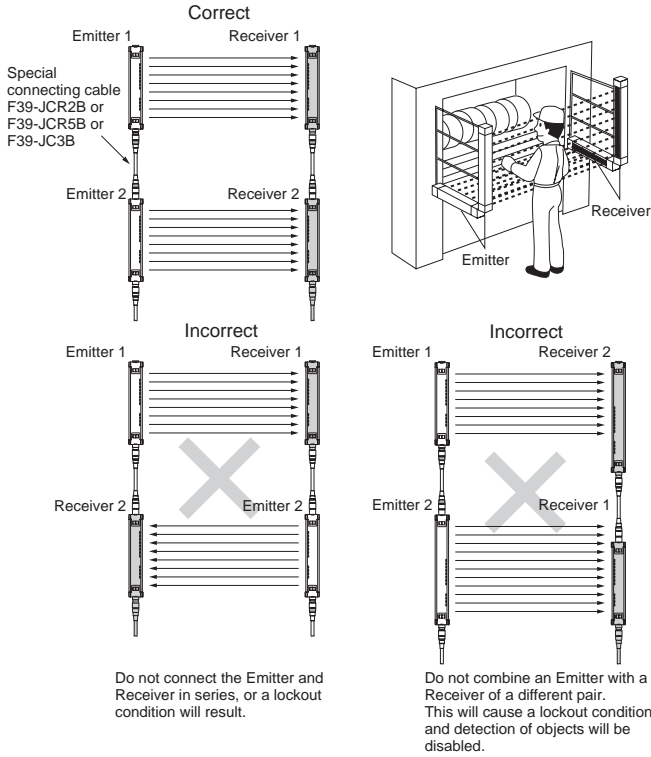


Precautions for Correct Use

● **Installation**

How to Prevent Mutual Interference

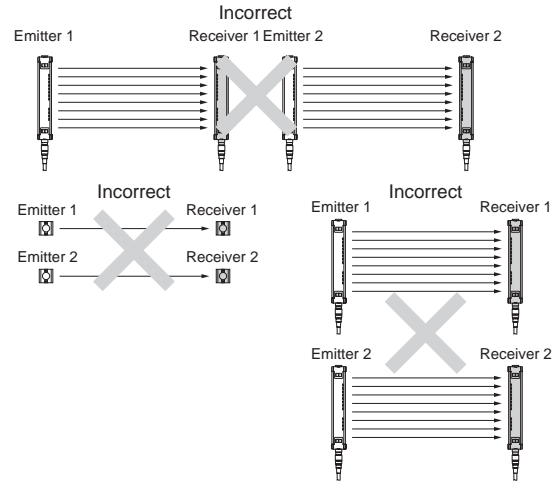
Series Connections (Up to 3 sets, 240 beams, Sensor models ending in -01 and -04 are required for series connection)
 Two or more pairs of the F3SN-A□SS can be connected in series. When connected in series, the F3SN-A□SS Sensors generate beams in a time-sharing manner to prevent mutual interference and ensure safety.



When Not Connected in Series

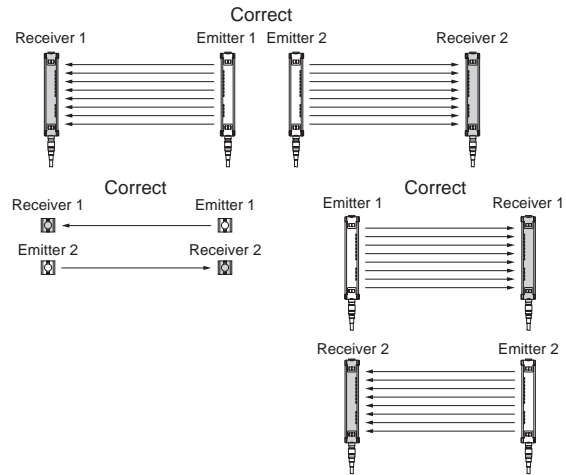
Mutual interference is minimized by the shorter operating range of the F3SN-A□SS Series in comparison the F3SN-A Series or by optimizing light receiving sensitivity using an optional F39-MC11 Setting Console. If interference occurs, install the F3SN-A□SS using one of the following methods to eliminate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

● Installation which may cause mutual interference

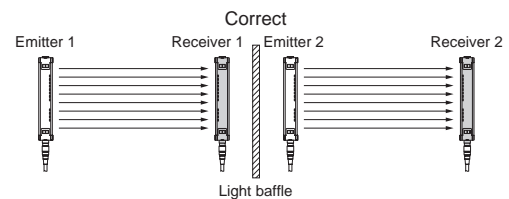


● Installation to prevent mutual interference

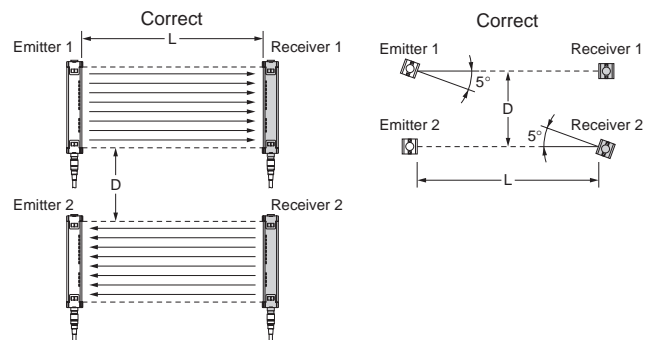
(1) Install the F3SN-A□SS so that the two Light Curtains emit in the opposite directions (staggered).



(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 the F3SN-A/B, F3SH-A Series Catalog (Cat. No. E322) for names and functions of indicators.

Dimensions

(Unit: mm)

Main Unit

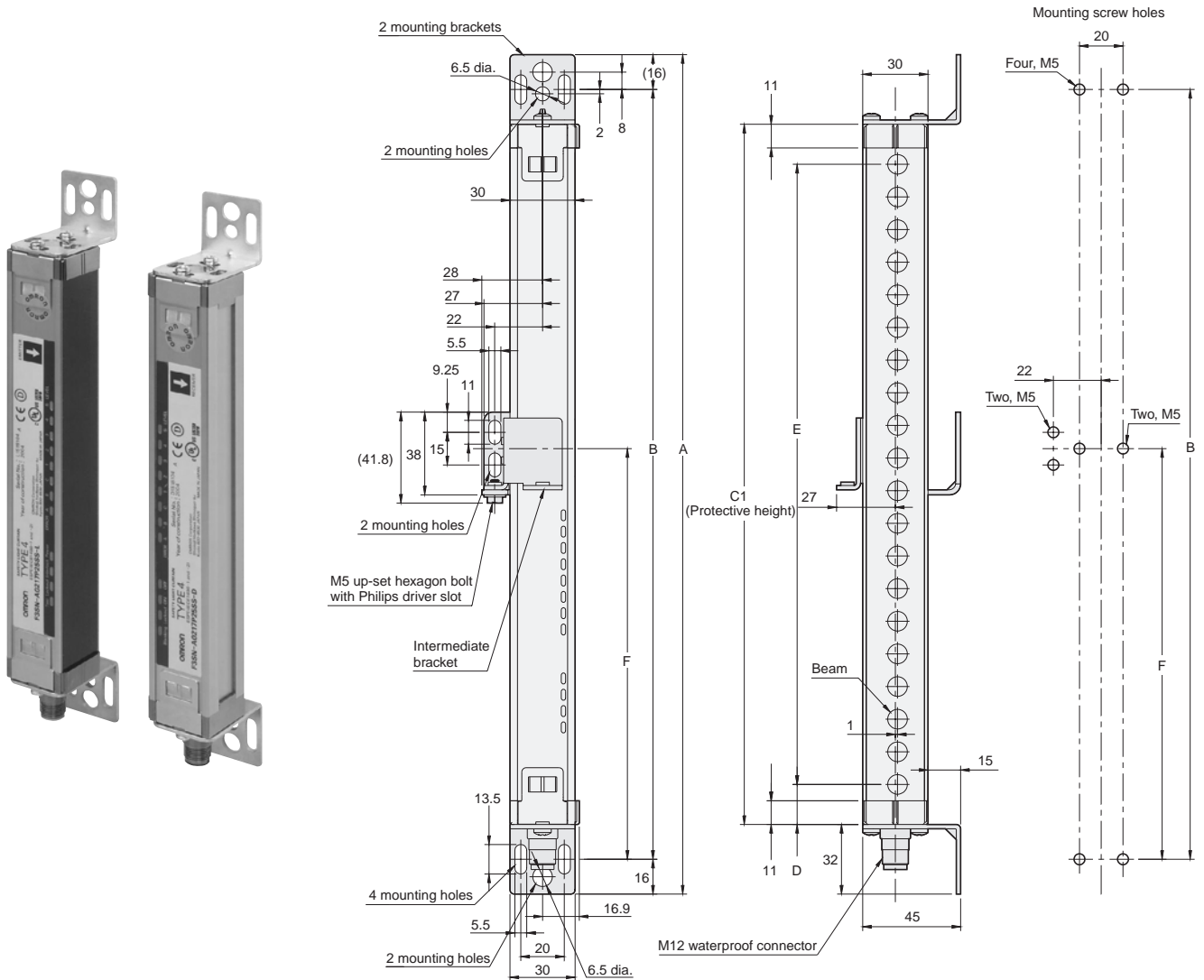
F3SN-A□□□P25SS-□□

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

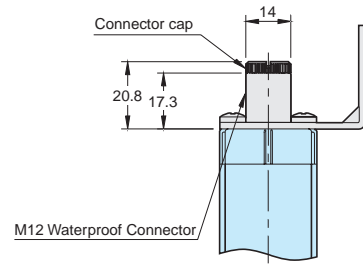
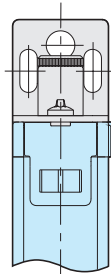
Note: If value F obtained from the above equation is not used, set F to 670 mm or less.



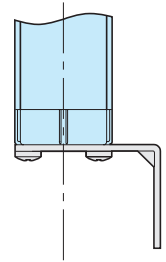
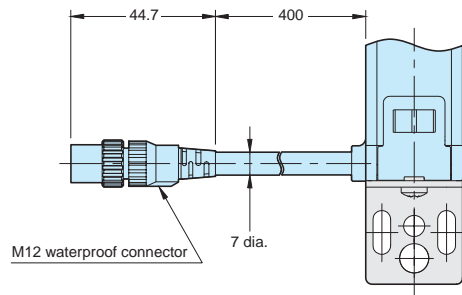
Mounting Precautions

Note: 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

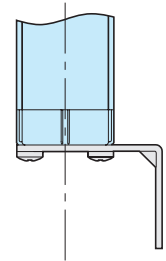
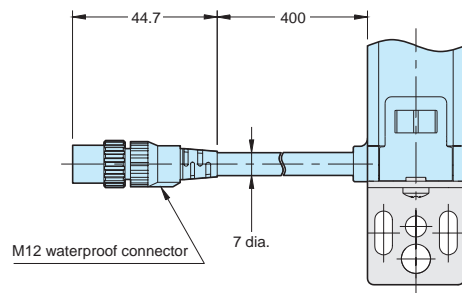
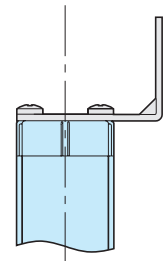
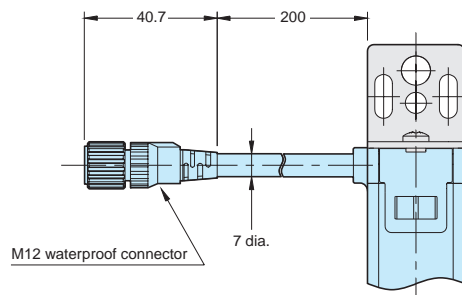
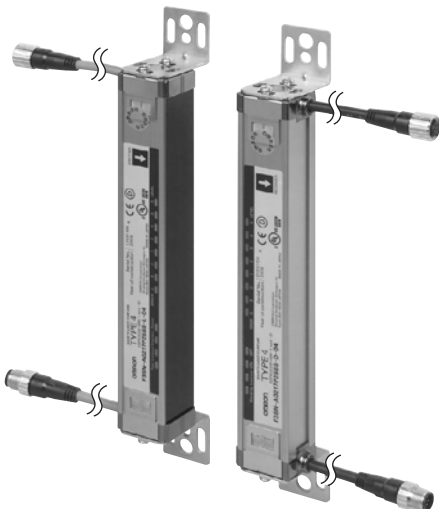
F3SN-A□□□□P25SS-01



F3SNA-□□□□P25SS-02



F3SN-A□□□□P25SS-04



Note: When using the cable bent, use a minimum bending radius of $R = 36$ 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

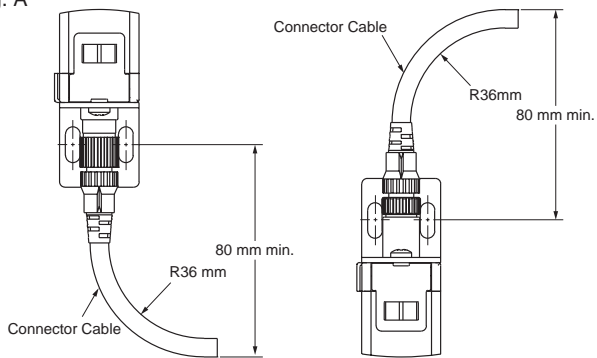
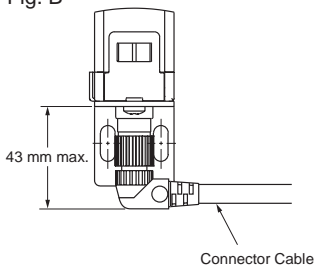


Fig. B



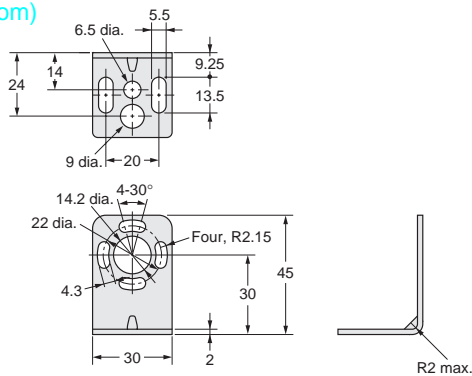
Accessories

Mounting Brackets (Top and Bottom)



Material: Iron (zinc plating)

Note: Provided with the main unit.

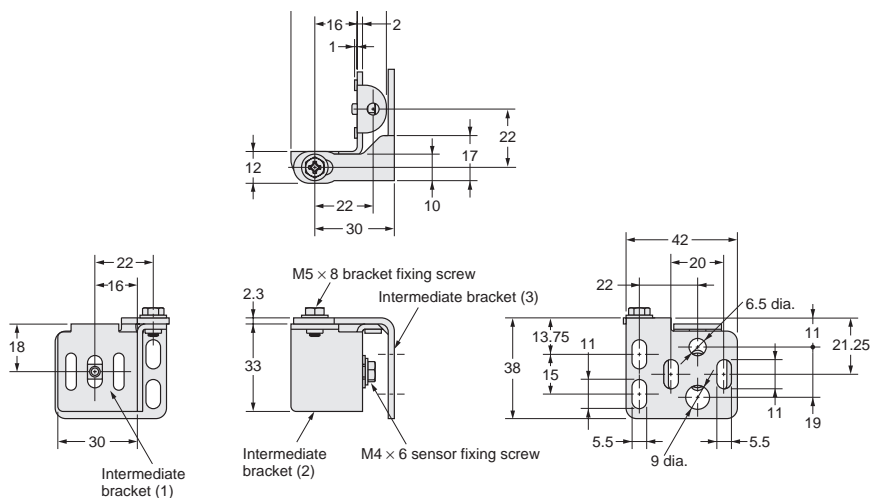


Mounting Brackets (Intermediate)



Material: Iron (zinc plating)

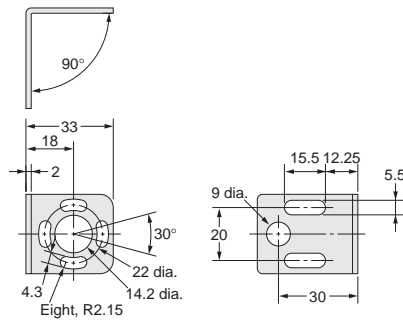
Note: Provided with the main unit. The number of brackets required depends on the total length of the Sensor.



Accessories (Optional)

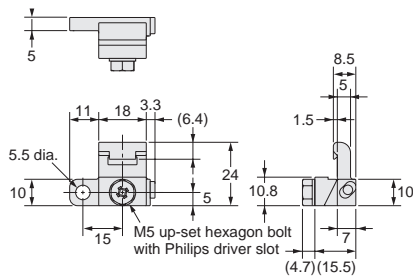
Wall Mounting Bracket

F39-L18

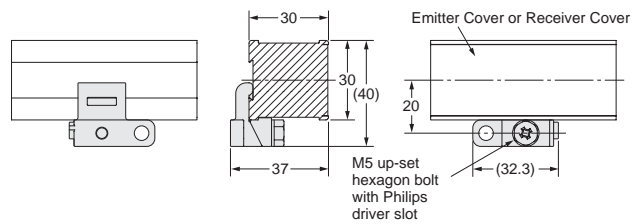


Free-location Bracket

F39-L19

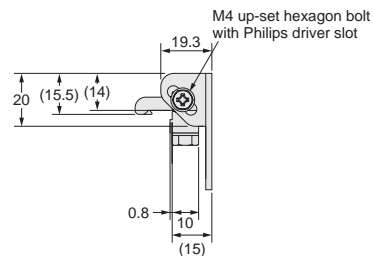
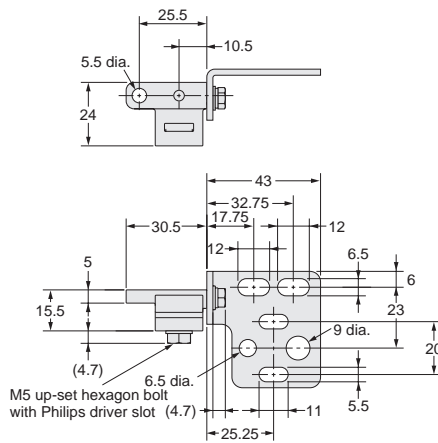


Mounting

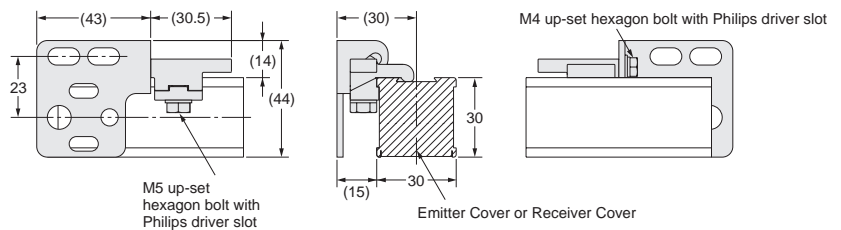


Free-location Bracket

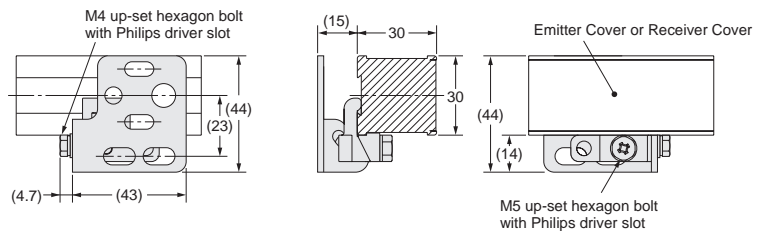
F39-L20



Side mounting

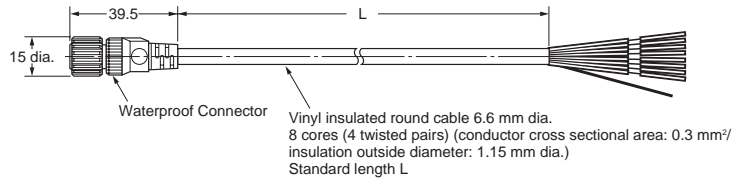


Back mounting



Single-ended Connector Cables with Straight Connectors

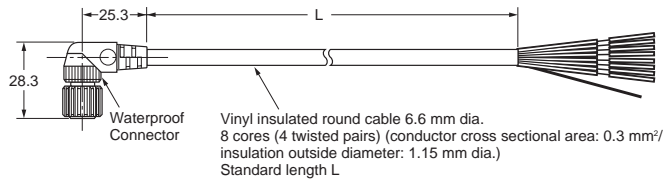
- F39-JC3A (L = 3 m) F39-JC10A (L = 10 m)
- F39-JC7A (L = 7 m) F39-JC15A (L = 15 m)



Color: Emitter (gray)
Receiver (black)

Single-ended Connector Cables with Right-angle Connectors

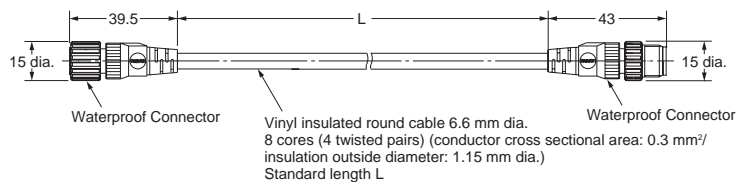
- F39-JC1E1 (L = 1 m) F39-JC1E2 (L = 1 m)
- F39-JC3E1 (L = 3 m) F39-JC3E2 (L = 3 m)
- F39-JC7E1 (L = 7 m) F39-JC7E2 (L = 7 m)
- F39-JC10E1 (L = 10 m) F39-JC10E2 (L = 10 m)
- F39-JC15E1 (L = 15 m) F39-JC15E2 (L = 15 m)



Color: Emitter (gray)
Receiver (black)

Double-ended Connector Cables 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)

Refer to the F3SN-A/B, F3SH-A Series catalog (Cat. No. E322) and the Safety Components catalog (Cat. No. Y106) for information not provided in this catalog.