

## 20-m long-distance detection. Safety light curtain (Type 4) is ideal for detection of intrusion of human bodies in large machines and conveyor lines.



- Complies with IEC standards, EN standards, and North American standards. EC-based certification from TÜV for EU machine directives. Can be used as a safety guard for satisfaction of OSHA requirements for on-site labor safety in North America.
- Special controller not needed. Detection of human body intrusion is possible using just the sensor unit.
- Includes “Start/restart interlock function” to prevent automatic reset of output.
- Includes floating blanking function (disables 1 or 2 unspecified beam) and channel select (fixed blanking: disables specified light)
- Built-in MPCE (external relay) monitor. Back-check is possible without a controller.

Be sure to read the “Safety Precautions” on page 6 and the “Precautions for All Safety Sensors”.

## Ordering Information

### Main Unit

Infrared

Sensor type	Appearance	Detecting distance			Operating mode	Detection width (mm)	Model
Through-beam		<input type="checkbox"/>	0.3 to 20 m	Light ON	351	F3SL-A0351P30	
					523	F3SL-A0523P30	
					700	F3SL-A0700P30	
					871	F3SL-A0871P30	
					1,046	F3SL-A1046P30	
					1,219	F3SL-A1219P30	
					1,394	F3SL-A1394P30	
					1,570	F3SL-A1570P30	
					1,746	F3SL-A1746P30	
					1,920	F3SL-A1920P30	
					2,095	F3SL-A2095P30	

### Accessories (Order Separately)

Special Cables (please order one each for the emitter and the receiver)

Cable length	Specifications	Model	
		For emitter	For receiver
10 m	Connector	F39-JL10A-L	F39-JL10A-D
15 m		F39-JL15A-L	F39-JL15A-D
30 m		F39-JL30A-L	F39-JL30A-D

### Mirrors (12% detection distance attenuation)

Mirror material	Width (mm)	Thickness (mm)	Length (mm)	Model
Glass mirror	145	32	406	F39-MLG0406
			610	F39-MLG0610
			711	F39-MLG0711
			914	F39-MLG0914
			1,067	F39-MLG1067
			1,219	F39-MLG1219
			1,422	F39-MLG1422
			1,626	F39-MLG1626
			1,830	F39-MLG1830
			2,134	F39-MLG2134

## Specifications

Model	F3SL-A0351 P30	F3SL-A0523 P30	F3SL-A0700 P30	F3SL-A0871 P30	F3SL-A1046 P30	F3SL-A1219 P30	F3SL-A1394 P30	F3SL-A1570 P30	F3SL-A1746 P30	F3SL-A1920 P30	F3SL-A2095 P30
<b>Item</b>											
<b>Sensor type</b>	Type 4 Safety Light Curtain										
<b>Safety category</b>	Category 4, 3, 2, 1, or B										
<b>Detection capability</b>	Opaque objects, 30 mm in diameter or greater (52 mm or 74 mm in diameter when using floating blanking)										
<b>Beam gap (P)</b>	22 mm										
<b>Number of beams (n)</b>	16	24	32	40	48	56	64	72	80	88	96
<b>Protective height (PH)</b>	351 mm	523 mm	700 mm	871 mm	1,046 mm	1,219 mm	1,394 mm	1,570 mm	1,746 mm	1,920 mm	2,095 mm
<b>Lens diameter</b>	Diameter 8 mm										
<b>Sensing distance</b>	0.3 to 20 m										
<b>Response time (under stable light incident condition)</b>	<b>ON→OFF</b>	20 ms max.			25 ms max.			30 ms max.		35 ms max.	
<b>Startup waiting time</b>	3 s max.										
<b>Power supply voltage (Vs)</b>	24 VDC ±20% including 5% ripple (p-p)										
<b>Current consumption (no load)</b>	Emitter: 285 mA or less, receiver: 1.4 A or less (including load output current)										
<b>Light source (emitted wavelength)</b>	Infrared LED (850 nm)										
<b>Effective aperture angle (EAA)</b>	Emitter/receiver: ±2.5° or less each (based on IEC61496-2 at Sensing distance of 3 m or greater)										
<b>Control outputs (OSSD)</b>	Two PNP transistor outputs, load current 500 mA or less (residual voltage 2 V or less) (excluding voltage drop due to cable extension), Light ON										
<b>Auxiliary output (non-safety output)</b>	Same signal as control output: one PNP transistor output (non-safety output), load current 100 mA or less (residual voltage 1 V or less) (excluding voltage drop due to cable extension)										
<b>Output operation mode</b>	Control output: Light-ON Auxiliary output: Light-ON										
<b>Indicators</b>	<b>Emitter</b>	Emitting (operation) indicator (yellow)									
	<b>Receiver</b>	Channel selection or floating blanking indicator (Orange), interlock or malfunction indicator (Yellow), OFF-state indicator (Red), ON-state indicator (Green)									
<b>Test functions</b>	<ul style="list-style-type: none"> <li>Self diagnosis functions when the power is turned on</li> <li>External relay (MPCE) monitor function (connect external relay monitor input wire to contact b of external relay, 50 mA 24 V DC)</li> </ul>										
<b>Safety functions</b>	<ul style="list-style-type: none"> <li>Start/restart interlock function (select enable/disable with switch)</li> <li>Blanking functions (1) Channel select (fixed blanking) (2) Floating blanking (3) No blanking (initial setting) Select (1), (2), or (3) with switch.</li> </ul> The beams for (1) blanking are determined by the teaching program.										
<b>Connection method</b>	M12 Connector										
<b>Protective circuits</b>	Output load short circuit protection, reverse power connection protection										
<b>Ambient temperature</b>	Operating/Storage: 0 to 55°C (with no icing or condensation)										
<b>Ambient humidity</b>	Operating/Storage: 35% to 95% (with no condensation)										
<b>Degree of protection</b>	IEC Standard IP65										
<b>Vibration resistance</b>	Malfunction/destruction: 10 to 55 Hz, 0.7-mm amplitude 20 sweeps each in X, Y, and Z directions										
<b>Shock resistance</b>	Malfunction/destruction: 100 m/s <sup>2</sup> , 1,000 times each in X, Y, and Z directions										
<b>Material</b>	Case: Aluminum										
<b>Weight (packed state)</b>	11 kg max.										
<b>Accessories</b>	Test load, mounting clamps (upper/lower), Instruction Manual, special hex wrench for program button access, test load resistors (510 Ω, 2 resistors), surge protector (2)										
<b>Applicable standards</b>	IEC (EN) 61496-1 TYPE4 ESPE *1 , IEC61496-2 TYPE4 AOPD *2										


\*1. ESPE (Electro-Sensitive Protective Equipment)

\*2. AOPD (Active Opto-electronic Protective Devices)

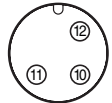
# Connections

## Wiring Method

### Receiver Connector

Front view diagram	Pin No.	Signal name	Wire color of special cable
		Receiver	
	1	Control output 1	Orange
	2	0 V	Brown
	3	Shielded	---
	4	+24 VDC	White
	5	Auxiliary output (AUXILIARY)	Purple
	6	MPCE monitor	Pink
	7	Start	Gray
	8	Control output 2	Yellow

### Emitter Connector

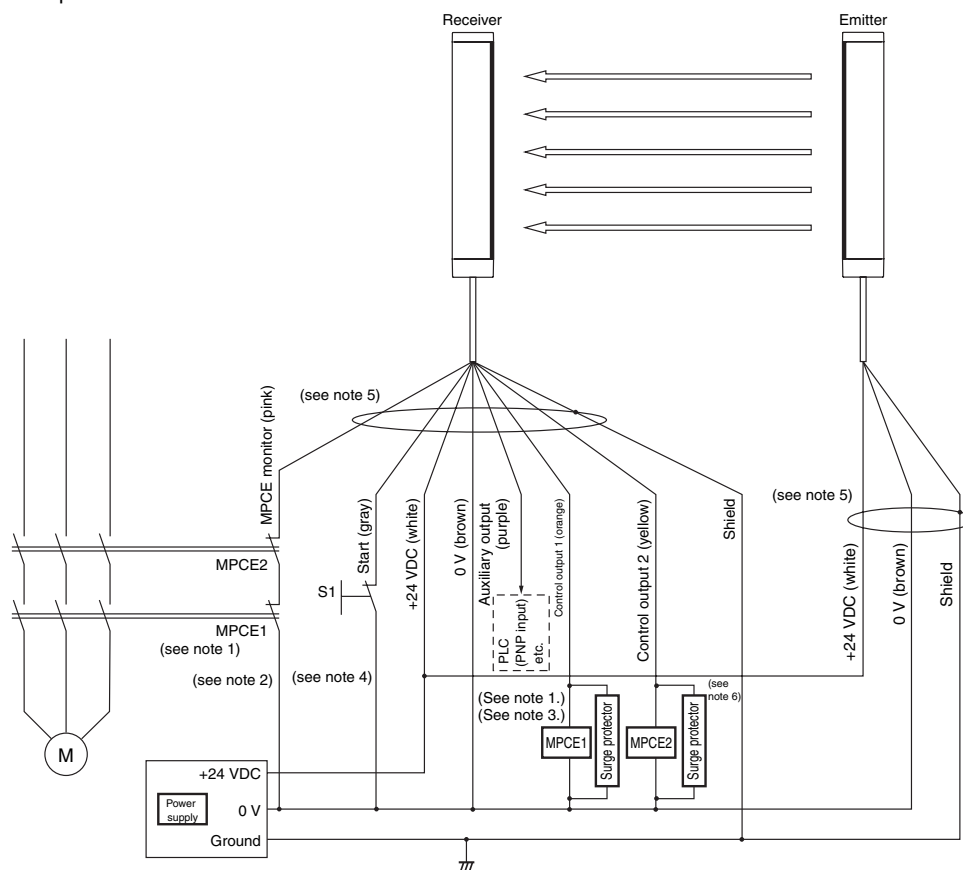
Front view diagram	Pin No.	Signal name	Wire color of special cable
		Emitter	
	10	Shielded	---
	11	+24 VDC	White
	12	0 V	Brown

### Special Cables (Purchase Separately)

For emitter (3-pin)		For receiver (8-pin)		Cable length
F39-JL10A-L	Black connector	F39-JL10A-D	Red connector	10 m
F39-JL15A-L		F39-JL15A-D		15 m
F39-JL30A-L		F39-JL30A-D		30 m

**Note:** Please order one each for the Emitter and the Receiver.

Wire the F3SL only after all power has been turned OFF.

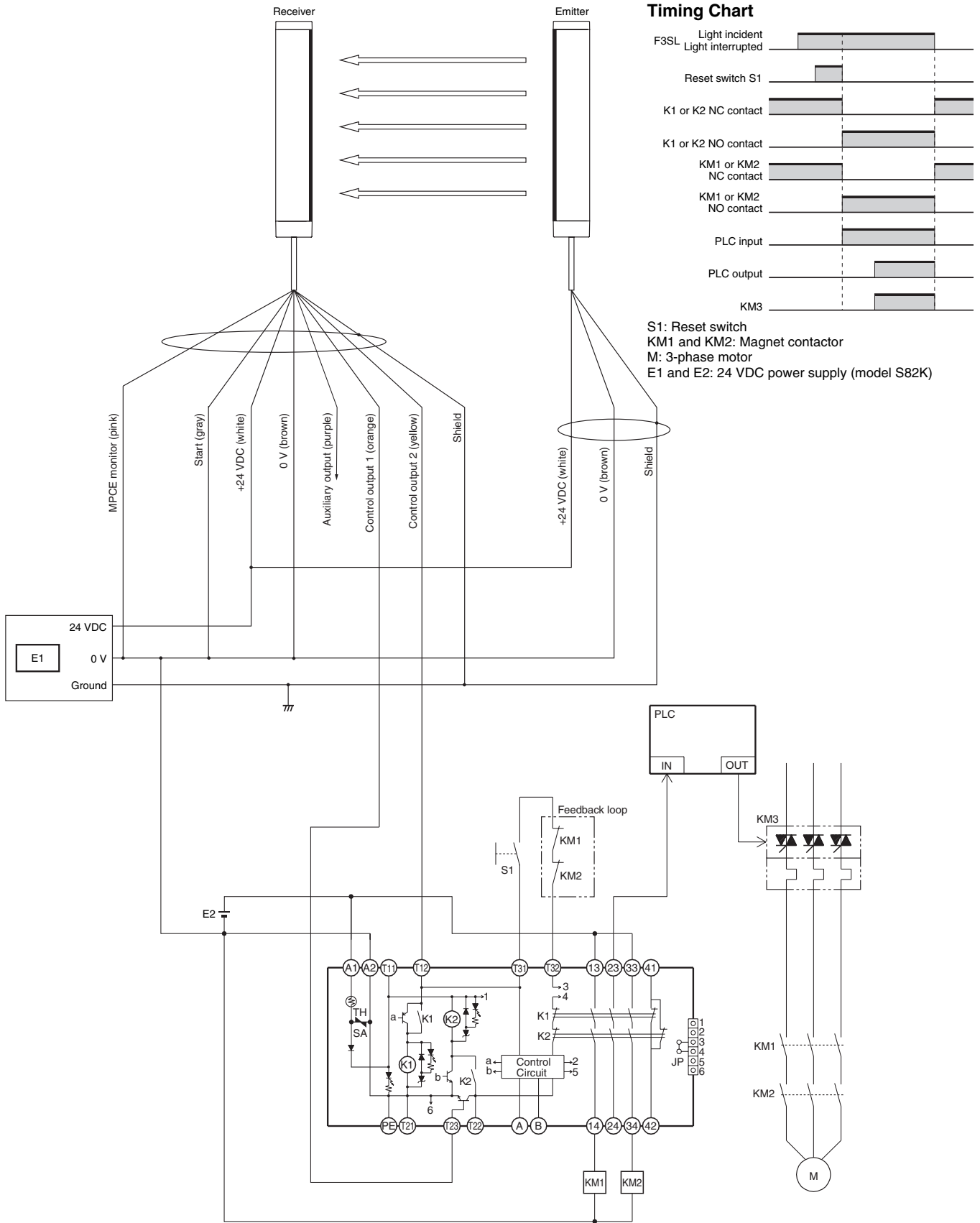


M: Mechanical drive unit including 3-phase motor  
 S1: Start switch for interlock reset (NC contact)  
 MPCE1, MPCE2: Contactor or relay with forcibly guide mechanism (G7SA is recommended)

- Note:**
1. Please use a relay with a forcibly guided contact (such as the G7SA) for MPCE1 and MPCE2, which are relays that perform ultimate control of the machine.
  2. If you do not intend to use the MPCE monitor function, short the MPCE monitor line (pink) to power supply 0 V.
  3. If a load is not connected to control output 1 and control output 2, an error will result and normal operation will not take place. For testing purposes during installation or at other times, connect the 510 Ω resistors included with the operation manual to the MPCE1 and MPCE2 positions.
  4. If you intend to use auto start mode, short the start line (gray) to power supply 0 V.
  5. Take care when wiring not to make any mistakes regarding the cable colors. In particular, the wire colors of the power supply line (+ 24 V DC: white, 0 V: brown) are different from the regular sensor wires.
  6. Connect the provided surge protector in parallel with MPCE1 and MPCE2.

## Connection with OMRON G9SA-301 Safety Relay Unit (Category 4)

When connecting the F3SL to the G9SA-301, disable the F3SL's start/restart interlock and the external relay (MPCE) monitoring functions, and use the equivalent functions in the G9SA-301 instead.

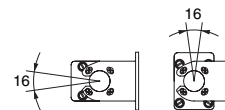
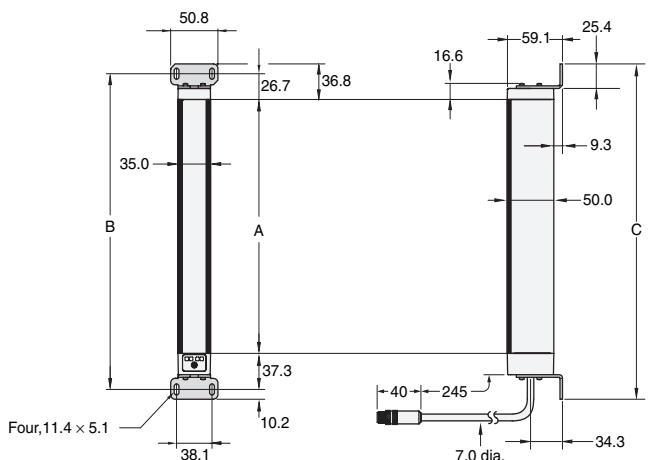


## Dimensions

### Main Unit

#### F3SL

#### Mounting Bracket Adjustment Angles



Model	A (mm)	B (mm)	C (mm)
F3SL-A0351P30	351	415	435.3
F3SL-A0523P30	523	587	607.3
F3SL-A0700P30	700	764	784.3
F3SL-A0871P30	871	935	955.3
F3SL-A1046P30	1,046	1,110	1,130.3
F3SL-A1219P30	1,219	1,283	1,303.3
F3SL-A1394P30	1,394	1,458	1,478.3
F3SL-A1570P30	1,570	1,634	1,654.3
F3SL-A1746P30	1,746	1,810	1,830.3
F3SL-A1920P30	1,920	1,984	2,004.3
F3SL-A2095P30	2,095	2,159	2,179.3

A = Detection width B = A + 64.0 C = A + 84.3

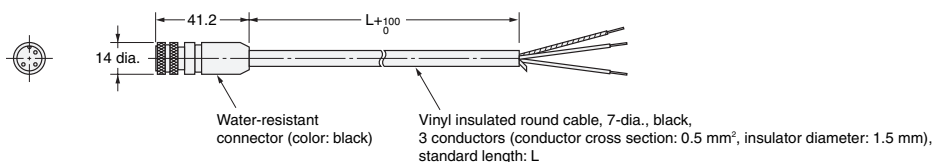
### Accessories (Order Separately)

#### Special Cable (for emitter)

F39-JL10A-L (L = 10 m)

F39-JL15A-L (L = 15 m)

F39-JL30A-L (L = 30 m)

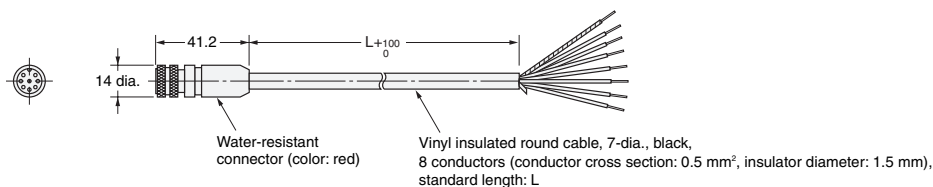


#### Special Cable (for receiver)

F39-JL10A-D (L = 10m)

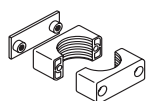
F39-JL15A-D (L = 15m)

F39-JL30A-D (L = 30m)

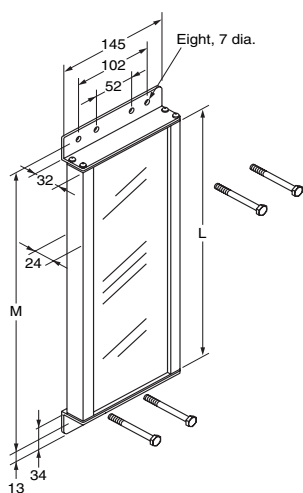
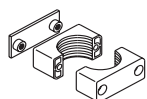


### Mirrors

#### F39-MLG□



Post (42 ±1 dia.) mounting clamps (included)



Model	L (mm)	M (mm)
F39-MLG0406	445	487
F39-MLG0610	648	690
F39-MLG0711	749	792
F39-MLG0914	953	995
F39-MLG1067	1,105	1,148
F39-MLG1219	1,257	1,300
F39-MLG1422	1,461	1,503
F39-MLG1626	1,664	1,706
F39-MLG1830	1,867	1,910
F39-MLG2134	2,172	2,214

## Safety Precautions

### Regulations and Standards

- “Type Certification” specified in the Chapter 44. 2 of the Industrial Safety and Health Law in Japan does not apply to independent F3SL 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.
- The F3SL is classified under electro-sensitive protective equipment (ESPE) in the European Union (EU) Machinery Directive Annex IV, B, Safety Components, Item 1.
- The following certification have been obtained for the F3SL from EU Certification Bodies: EC type certification (type 4 ESPE) under the Machinery Directive from TÜV Rheinland.

**⚠ WARNING**

#### Installation Conditions

Refer to “Precautions for All Safety Sensors” for installation conditions.

#### Safety Distance

Always maintain a safe distance (S) between the F3SL and a hazardous part of a machine. Failure to do so causes the machine to fail to stop before an operator reaches the dangerous area and may result in serious injury.



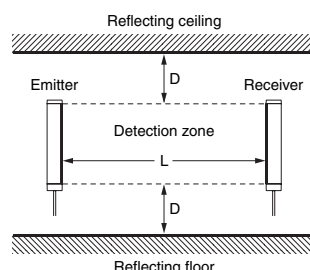
Refer to the “Precautions for All Safety Sensors” for calculating the Safety distance.

### Distances from Reflective Surfaces

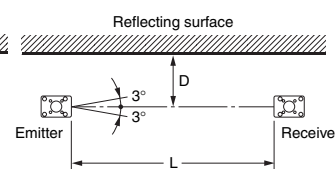
Be sure to install the F3SL to minimize the effects of reflection from nearby surfaces. Failure to do so may cause detection to fail and may result in serious injury.



#### Side view



#### Top view



Install the F3SL with minimum Distance D shown above 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	0.16 m
3 to 20 m	$L \times \tan 3^\circ = L \times 0.052$ (m)

#### Precautions for Correct Use

Do not use the product in atmospheres or environments that exceed product ratings. Refer to “Precautions for All Safety Sensors” for information on preventing mutual interference.

## Safety Functions

### Blanking Functions

The F3SL supports both floating blanking (a function that ignores one or two non-specific broken beams) and channel selection (also called fixed blanking, a function to disable specified beams). These functions are disabled in the factory settings.

#### Channel Selection: Fixed Blanking

This function disables specified beams, e.g., those that would be interrupted by jigs or tools. The beams to be disabled can be taught using built-in switches while interrupting the beams to be disabled. When the interrupting objects are removed from the disabled beams, the control output will turn OFF and safety can be maintained. The beams to be disabled can be selected from any or all of the beams in the detection area except for the bottom two beams (i.e., the beams closest to the cable). Depending on the beams that are disabled, the size of the smallest detectable object may increase.

#### Floating Blanking

Floating blanking can be used to disable one or two unspecified beams except for the bottom two beams (i.e., the beams closest to the cable). This function is useful when part of the machine or workpieces interrupts one or two beams during movement.

The smallest detectable object size is increased from a 30-mm diameter to a 52-mm diameter for one-beam floating and to a 74-mm diameter for 2-beam floating. This will increase the safety distance.

### Start/Restart Interlocks

#### Auto-start (Factory Setting)

The Sensor will start in an OFF state when the power is turned ON and then the control output will be turned ON automatically after the Sensor has confirmed that none of the beams are interrupted. From then on, the Sensor will turn OFF the control output when beams are interrupted and turn ON the control output when beam interruption stops.

#### Start Interlock

The Sensor will start in an OFF state when the power is turned ON and remain interlocked in an OFF state. The control output will not be turned ON even if all of the beams are no longer interrupted. When the start switch (NC contact) is opened when there are no beams interrupted, the interlock status will be released and the control output will turn ON. From then on, the Sensor will turn OFF the control output when beams are interrupted and turn ON the control output when beam interruption stops. The interlock indicator lights yellow to show the interlock status.

#### Start/Restart Interlock

The Sensor will start in an OFF state when the power is turned ON or after beams are interrupted and remain interlocked in an OFF state. The control output will not be turned ON even if all of the beams are no longer interrupted. When the start switch (NC contact) is opened when there are no beams interrupted, the interlock status will be released and the control output will turn ON. The control output will never turn ON automatically. The interlock indicator lights yellow to show the interlock status.

- Note:**
1. Install the switch to release the interlock outside of the hazardous area but in a location where the hazardous area can be seen well.
  2. Refer to the Instruction Manual (SCEE-712) for instructions on setting the mode switch.

## Self-diagnosis Functions

### Power ON Self Diagnosis

Self diagnosis is performed for 3 seconds after the power supply is turned ON to the F3SL. If no errors are found, normal operation will be started.

### Errors

If an error is found in self diagnosis, the F3SL will immediately turn OFF the control output and the type of error will be shown on the indicators. When the cause of the error has been removed, the F3SL will clear the error status and return to normal operation unless an external relay monitor input error has occurred when the control output was ON. The power supply must be turned OFF and ON to clear these errors.

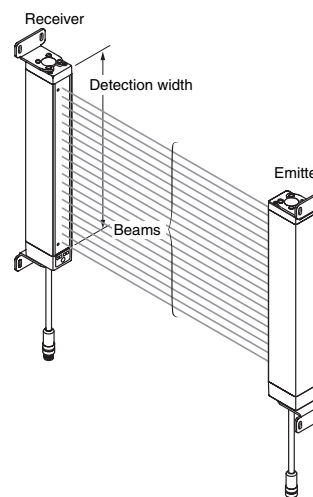
### External Relay (MPCE) Monitoring (MPCE: Machine Primary Control Element)

This function monitors the state of the NC contact to detect fused relays or other operating faults in external relays or contactors controlling hazardous parts of machines. This function is provided as a standard feature on the F3SL. Connect the NC contact of the external relay to the MPCE monitor input line of the Receiver. The external relay monitor input will be constantly monitored and, if the correct logical relationship between the control output and the external relay monitor input is not kept, the F3SL will enter error status and immediately turn OFF the control output.

Although there is a delay (reset time) between the control output turning OFF and the NC contact closing, the F3SL will not treat any delay up to 300 ms as an error and will continue normal operation. To ensure the correct usage of this function, a Safety Relay with forcibly guided contacts, such as the G7SA, must be used. A switch can be set to disable the MPCE function.

### Detection Area (Detection Width)

The detection width extends to both ends of the filter on the front (i.e., to the caps on both ends of the Sensor.) There are light interruption indicators next to the top and bottom beams on the Receiver that light when the beams are interrupted. Use these as a guide for the detection width and when aligning beams.





## 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

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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 PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

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