

SAFETY LIGHT CURTAIN



Please read and understand this instruction sheet before storing, installing, programming, operating, maintaining, or disposing of the products. Please consult your OMRON representative if you have any questions or comments.

Please refer to the User's Manual and the Quick Installation Manual for detailed instructions on usage.



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Instructions in the EU languages and a signed EU Declaration of Conformity are available on our website at www.industrial.omron.eu/safety.

LEGISLATION AND SAFETY STANDARDS

- 1. Application of a F3SJ sensor alone cannot receive type approval provided by Article 44-2 of the Labour Safety and Health Law of Japan. It is necessary to apply it in a system. Therefore, when using the F3SJ in Japan as a "safety system for pressing or shearing machines" prescribed in Article 42 of that law, the system must receive type approval.

 2. The F3SJ is electro-sensitive protective equipment (ESPE) in accordance with European Union (EU) Machinery Directive Index Annex V, Item 2.

 3. Declaration of Conformity OMRON declares that the F3SJ is in conformity with the requirements of following EU Directives and UK Legislations:

 EU: Machinery Directive 2006/42/EC, EMC Directive 2014/30/EU, RoHS Directive 2011/65/EU,

 UK: 2008 No 1597 Machinery (Safety). 2016 No 1091 EMC. 2012 No 3032 Pol-15.

- 2011/65/ĒU, UK: 2008 No 1597 Machinery (Safety), 2016 No 1091 EMC, 2012 No 3032 RoHS 4. F3SJ is in conformity with the following standards (1) European standards EN61496-1 (Type 4 ESPE), EN61496-2 (Type 4 AOPD), EN61508-1 through -3 (SIL3), EN ISO 13849-1:2015 (Category 4, PL e)
- through -3 (SILS), EN ISO 13849-1:2015 (Čategory 4, PL e)
 (2) International standards
 IEC61496-1 (Type 4 ESPE), IEC61496-2 (Type 4 AOPD), IEC61508-1
 through -3 (SIL3), ISO 13849-1:2015 (Category 4, PL e)
 (3) JIS standards
 JIS B 9704-1 (Type 4 ESPE), JIS B 9704-2 (Type 4 AOPD)
 (4) North American Standards:
 UL61496-1(Type 4ESPE), UL61496-2(Type 4AOPD), UL508, UL1998,
 CAN/CSA C22.2 No.14, CAN/CSA C22.2 No.0.8

 5. The FSSJ received the following approvals from the EU accredited body,
 TÜV SÜD Product Service GmbH:

- The FSSJ received the following approvals from the EU accredited body, TÜV SÜD Product Service GmbH:
 EC Type-Examination in accordance with the EU Machinery Directive, Type 4 ESPE (EN61496-1), Type 4 AOPD (EN61496-2)
 TÜV SÜD Product Service Type Approval, Type 4 ESPE (EN61496-1), Type 4 AOPD (EN61496-2), SİL1, 2, 3 (EN61508-1 through -3), EN ISO 13849-1:2015 (Category 4, PL e)
 The F3SJ received the certificates of UL listing for US and Canadian safety standards from the Third Party Assessment Body UL.
 Both are: Type 4 ESPE (UL61496-1), Type 4 AOPD (UL61496-2)
 The F3SJ is designed according to the standards listed below. To make sure that the final system complies with the following standards and regulations, you are asked to design and use it in accordance with all other related standards, laws, and regulations. If you have any questions, consult with specialized organizations such as the body responsible for prescribing and/or enforcing machinery safety regulations in the location where the equipment is to be used.
 European Standards: EN415-4, EN692, EN693
 U.S. Occupational Safety and Health Standards: OSHA 29 CFR 1910.212
- LANDY ENDOY

 U.S. Occupational Safety and Health Standards: OSHA 29 CFR 1910.212

 U.S. Occupational Safety and Health Standards: OSHA 29 CFR 1910.217

 American National Standards: ANSI B11.1 to B11.19

 American National Standards: ANSI/RIA 15.06

- *-american National Standards: ANSI/RIA 15.06

 *Canadian Standards Association CSA Z142, Z432, Z434

 *SEMI Standards SEMI S2

 *Ministry of Health, Labour and Welfare "Guidelines for Comprehensive Safety Standards of Machinery", Standard Bureau's Notification No. 501 dated June 1, 2001.

Suitability for Use

Omron Companies shall not be responsible for conformity with any standards, codes or regulationswhich apply to the combination of the Product in the Buyer's application or use of the Product. At Buyer's request, Omron will provide applicable third party certification documents identifying ratings and limitations of use which apply to the Product. This information by itself is not sufficient for a complete determination of the suitability of the Product in sufficient for a complete determination of the suitability of the Product in combination with the end product, machine, system, or other application or use. Buyer shall be solely responsible for determining appropriateness of the particular Product with respect to Buyer's application, product or system. Buyer shall take application responsibility in all cases. NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY OR IN LARGE QUANTITIES WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT(S) IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

PRECAUTIONS ON SAFETY

Regarding the alert symbols and meanings used for the safe uses. In order for our customers to use the F3SJ in safety, precautions are indicated in this manual with the alert symbols and statements such as the followings. Those safety precautions relate to the important descriptions that must be obeyed for the safe uses and operations. Be sure to obey the precautions. The following indictions and symbols are used for the descriptions.



Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in serious injury or death. Additionally there may be significant property damage.



Indicates prohibited actions

Indicates mandatory actions. Indicates the risk of electric shock.

Alert Statements in this Manual

⚠ WARNING

The F3SJ must be installed, configured, and incorporated into a machine control system by a sufficiently trained and qualified person. An unqualified person may not be able to perform these operations properly, which may cause a person to go undetected, resulting in serious injury.

MARNING

Do not use this sensor for machines that cannot be stopped by electrical control. For example, do not use it for a pressing machine that uses full-rotation clutch. Otherwise, the machine may not stop before a person eaches the hazardous part, resulting in serious injury.

Do not use the auxiliary output or external indicator output for safety applications. Human body may not be detected when F3SJ fails, resulting in serious injury.

/ WARNING Make sure to test the operation of the F3SJ after installation to verify that the F3SJ operates as intended. Make sure to stop the machine until the test is complete. Unintended function settings may cause a person to go undetected, resulting in serious injury.

Make sure to install the F3SJ at the safe distance from the hazardous part of the equipment. Otherwise, the machine may not stop before a person reaches the hazardous part, resulting in serious injury.

Install a protective structure so that the hazardous part of a machine can only instain a protective structure so that the hazardous part of a machine can only be reached by passing through the sensor's detection zone. Install the sensors so that part of the person is always present in the detection zone when working in a machine's hazardous areas. If a person is able step into the hazardous area of a machine and remain behind the F3SI's detection zone, configure the system with an interlock function that prevents the machine from being restarted. Failure to do so may result in serious injury.

Install the interlock reset switch in a location that provides a clear view of the entin hazardous area and where it cannot be activated from within the hazardous area.

The F3SJ cannot protect a person from an object flying from a hazardous area. Install protective cover(s) or fence(s). Warning zone output is non-safety output. You must not include it to calculation of safety distance. Otherwise safety distance may be reduced,

resulting in serious injury. The muting and override functions disable the safety functions of the device You must ensure safety using other method when these functions are operating.

Install muting sensors so that they can distinguish between the object that is being allowed to pass through the detection zone and a person. If the muting function is activated by the detection of a person, it may result in serious injury. Muting lamps (external indicators) that indicate the state of the muting and override functions must be installed where they are clearly visible to workers from all the operating positions.

0

Use independent 2 input devices for muting inputs

You must install F3SJ, muting sensor, and physical barrier so that an operator should not enter hazardous zone. 0 A switch to activate the override function must be a hold-to-run device such as a spring return key switch and must be installed in a location that provides a clear view of the entire hazardous zone and where it cannot be activated from within the hazardous zone. Make sure that nobody is in the hazardous reaches the control of the con

hazardous area before activating the override function. Install the sensor system so that it is not affected by the reflective surface of the F3SJ. 0

When using more than 1 set of F3SJ, install them so that mutinterference does not occur, such as by configuring series conusing physical barriers between adjacent sets.

Make sure that the F3SJ is securely mounted and its cables and connector are properly connected. Make sure that foreign material such as water, oil, or dust does not enter the F3SJ or the connector while the cap is removed.

Do not use the sensor system with mirrors in a retro-reflective configuration Doing so may hinder detection. It is possible to use mirrors to "bend" the detection zone to a 90-degree angle.

Perform an inspection for all F3SJ as described in "Chapter 5 Checklists" of User's manual. When using series connections, perform inspections for every connected F3SJ.

⚠ WARNING

Connect the load between the output and 0V line (PNP output). Connecting the load between the output and +24V line will result in a dangerous condition because operation is reversed to ON when blocked. 0

Do not short-circuit the output line to the +24V line. Otherwise, the output is always ON. Also, the OV of the power supply must be grounded so that output does not turn ON due to grounding of the output line. Configure the system by using the optimal number of safety outputs that

satisfy the requirements of the necessary safety category.

Do not connect each line of F3SJ to a DC power supply of more than 24VDC+209%. Also, do not connect to an AC power supply. Failure to do so may result in electric shock.

For the F3SJ to comply with IEC 61496-1 and UL 508, the DC power supply unit must satisfy all of the following conditions:

Must be within the rated power voltage (24V DC ±20%)

Must have tolerance against the total rated current of devices if it is connected to

- multiple devices

 Must comply with EMC directives (industrial environment)

 Double or reinforced insulation must be applied between the primary and
- secondary circuits
- secondary circuits

 Automatic recovery of overcurrent protection characteristics (reversed L sagging)

 Output holding time must be 20ms or longer

 Must satisfy output characteristic requirements for class 2 circuit or limited voltage current circuit defined by UL508

 Must comply with laws and regulations, regarding EMC and electrical equipment safety, of the country or region where the F3SJ is used (Ex: In EU, the power supply must comply with the EMC Directive and the Low Voltage Directive.)
- Double or reinforced insulation from hazardous voltage must be applied to all input and output lines. Failure to do so may result in electric shock. Extension of the cable must be within a specified length. If it isn't, safety function may not work properly, resulting in danger.

⚠ WARNING

To use the F3SJ in PSDI mode (Reinitiation of cyclic operation by the protective equipment), you must configure an appropriate circuit between the F3SJ and the machine. For details about PSDI, refer to OSHA1910.217. IEC61496-1, and other relevant standards and regulations

Do not try to disassemble, repair, or modify this product. Doing so may cause the safety functions to stop working properly. Do not use the F3SJ in environments where flammable or explosive gases a

present. Doing so may result in explosion Perform daily and 6-month inspections for the F3SJ. Otherwise, the system may fail to work properly, resulting in serious injury.

PRECAUTIONS FOR SAFE USE

Make sure to observe the following precautions that are necessary for ensuring safe use of the product.

• Thoroughly read this manual and understand the installation procedures, operation check procedures, and maintenance procedures before using the

product.
• Loads must satisfy both of the following conditions: Not short-circuited

Not used with a current that is higher than the rating

Do not drop the product.
Dispose of the product in accordance with the relevant rules and regulations of the country or area where the product is used.

PRECAUTIONS FOR CORRECT USE

Observe the precautions described below to prevent operation failure, malfunctions, or undesirable effects on product performance.

■ Installation environment

Do not install the F3SJ in the following types of environments:

Areas exposed to intense interference light, such as direct sunlight

Areas with high humidity where condensation is likely to occur

Areas where corrosive gases are present

Areas exposed to vibration or shock levels higher than in the specification provisions

provisions

•Areas where the product may come into contact with water

Areas where the product may go wet with oil that can solve adhesive Do not use radio equipment such as cellular phones, walkie-talkies, or transceivers near the F3SI.
This is a class A product. In residential areas it may cause radio interference, in which case the Responsible Person may be required to take adequate measures to reduce interference.
Install a cover to protect the F3SI from spatter in an environment where foreign material such as spatter adheres.
Wiring and installation
Make sure to perform wiring while the power supply is OFF. Otherwise, the F3SI may fail to operate due to the diagnosis function.
Do not short-circuit output lines to +24V line. Otherwise a fault of F3SJ may occur.

occur.

•When extending the communication line with a cable (twisted-pair wire) other than the dedicated cable (F39-JD□□), use a cable with the same or superior specification. Connect the shield to the 0V line.

•When replacing the cable connectors with other types of connectors, use connectors that provide a protection grade of IP54 or higher.

•Properly perform the wiring after confirming the signal names of all the terminals.

Properly perform the wiring after confirming the signal names of all the terminals.
Do not operate the control system until 2 seconds or more (2.2 seconds or more in case of series connection) after turning ON the power of the F3SJ.
Be sure to route the F3SJ cable separate from high-potential power lines or through an exclusive conduit.
When using a commercially available switching regulator power supply, make sure to ground the FG terminal (frame ground terminal).
Install the emitter and receiver so that their vertical direction should match.
If the protective height is 600 mm or more, use intermediate mounting brackets of specified quantities and locations according to the dimensions.
If the brackets described above are not used, ratings and performance cannot be not met. be not met.
•Sharing the power supply with other devices may cause the F3SJ to be affected by noise or voltage drop. It is recommended that the F3SJ use a

affected by noise or voltage drop. It is recommended the dedicated power supply but do not share with other devices. dedicated power suppry out as a limit Cleaning
Cleaning
Do not use thinner, benzene, or acetone for cleaning, because they affect the

product's resin parts and paint on the case.

Object detection
The F3SJ cannot detect transparent and/or translucent objects.

RATINGS

- Jr		□□□ contain the 4 digits indicating the prote F3SJ-A□□□□□P20-01TS	F3SJ-A□□□□P25-01TS			
Detection capability		Opaque objects	Opaque objects			
D		Diameter 20mm	Diameter 25mm 20mm			
Beam gap Number of beams		15mm 16 to 166	13 to 125			
Protective height		245 to 2,495mm	260 to 2,500mm			
Lens diameter Operating range		Diameter 5mm 0.2 to 9m (for protective height up to 1649 r	nm)			
Operating range		0.2 to 7m (for protective height 1655 mm or	greater)			
Response time			DN: 40ms to 90ms max. (when incidence is stable).			
Startup waiting time		Refer to the reverse side for details. 2s max. (2.2s max in case of series connecti	on)			
Power supply voltage (V		24VDC ±20% (ripple p-p10% max.)				
Current	Emitter		ms: 106 mA max., 101 to 150 beams: 130 mA max., 151 to 166			
consumption (no load)	Receiver	beams: 153 mA max. Up to 50 beams: 68 mA max 51 to 100 bea	ms: 90 mA max., 101 to 150 beams: 111 mA max.,151 to 166			
		beams: 128 mA max.	ins. 50 mr max., 101 to 150 beams. 111 mr max.,151 to 100			
Light source Effective aperture angle	(EAA)	Infrared LED (870nm wavelength) Within +2.5° for the emitter and receiver at	a detection distance of at least 3 m according to IEC61496-2			
Safety outputs (OSSD)	(LAA)		OmA max, Residual voltage 2V max. (except for voltage drop due			
			d), Maximum capacity load 2.2 μF, Leakage current 1 mA max. logic (ON/OFF) because safety circuit is used.)			
Auxiliary output 1 (Non-	-safety		mA max., Residual voltage 2V max. (except for voltage drop due			
output)		to cable extension), Leakage current 1mA m	ax.			
External indicator output (Non-safety output)	İ	Connectable external indicator - Incandescent lamp: 24VDC, 3 to 7W				
(11011 sarety output)		- LED lamp: Load current 10 to 300mA.				
			ble F39-JJ3N or F39-A01P□PAC is required when using an			
Output operation mode		external indicator.) Safety outputs : ON when receiving light				
		Auxiliary output 1: Reverse output of safety output				
		External indicator output 1: Reverse output of muting system)	of safety output (for basic system), ON during muting/override (for			
			for basic system), ON during muting/override (for muting system)			
Input voltage		Test input:				
		ON voltage:0-1.5V or open OFF voltage:9V to Vs* (short-circuit current: approx. 2.0mA)				
		Reset input, Muting input ON voltage:9V to Vs* (short-circuit current				
		OFF voltage:0-1.5V or open				
		External relay monitoring input is: ON voltage:9V to Vs* (short-circuit current	: approx. 3.5mA)			
		OFF voltage:open				
Indicators	Emitter	*The Vs indicates a voltage value in your env	ironment. 2, orange LED x 3): ON based on the amount of incident light			
indicators	Limitei	Error mode indicators (red LED x 3): Blink				
		Power indicator (green LED x 1): ON while Lockout indicator (yellow LED x 1): Blinks				
		External device monitoring indicator [mutin				
		Test indicator [muting input 2 indicator] (green LED x2): ON/Blink according to function				
	Receiver	Incident light level indicators (green LED x Error mode indicators (red LED x 3): Blink	2, orange LED x 3): ON based on the amount of incident light to indicate error details			
		OFF-state indicator (red LED x 1): ON whe	n safety outputs are OFF/ Blinks when in lockout			
		ON-state indicator (green LED x 1): ON wh Muting error indicator, Test indicator (green				
Mutual interference prev	ention	Interference light avoidance algorithm	a second			
function Series connection		Time division emission by series connection				
Series connection		- Number of connections: Up to 3 sets				
		- Total number of beams: Up to 240	t including series connection cable (F39-JJR□L or F39-JJR3W) and power cal			
		Lockout occurs when:				
			ber of beams of them exceed the limits described above			
Test function		- Other sensor than -01TS type is attached to the series connection - Self-test (After power ON, and during operation)				
		- External test (light emission stop function by test input)				
Safety-related functions		 External device monitoring Muting (Includes override functions, F39- 	CN6 key can for muting is required)			
Connection method		Connector method (M12, 8-pin)	ervo key cap for muting is required)			
Protection circuit		Output short-circuit protection, and power s				
Ambient temperature		During operation: -10 to 55°C (without free				
Ambient humidity Ambient light intensity		During operation: 35 to 85%RH (no condensation), During storage: 35 to 95%RH Incandescent lamp: receiving-surface light intensity of 3,000 Ix max., Sunlight: receiving-surface light intensity				
		of 10,000 Ix max.				
Insulation resistance Dielectric strength voltas	ze e	20MΩ or higher (500VDC) 1, 000VAC, 50/60Hz, 1min				
Degree of protection		IP65 (IEC60529)				
Vibration resistance		Class 3M4 (IEC TR 60721-4-3)	ide of 7 mm. Acceleration of 1C, 10 among each in V, V, and 7 3 more			
		(no delay at resonant frequencies)	de of 7 mm, Acceleration of 1G, 10 sweeps each in X, Y, and Z direction			
Shock resistance		Class 3M4 (IEC TR 60721-4-3)	harden of Care 100 deal Care 1 VVV			
		Operation limit: Acceleration of 15G, Pulse in total)	duration of 6 ms, 100 shocks for each in X, Y, and Z directions (600 shocks)			
Connection cable, Series			led shield, Allowable bending radius R5mm			
connection cable (F39-JJ JJR3W)	R□L,					
Extension cable		Dia, 6.6 mm, 8-wire (0.3mm ² x 4P, conduct	or resistance 0.058 Ω/m), with braided shield, Allowable			
(F39-JD□A, JD□B,JC□	□C)	bending radius of R36mm.				
			ner-performance cable (twisted-pair wire), and do not use the ge cables or power cables)			
		cable in the same duct as that for high-voltage cables or power cables) For details about extension lengths (Power Cable Length), refer to next page				
Material		Casing (including metal parts on both ends)	Aluminum, zinc die-cast			
		Cap: ABS resin Optical cover: PMMA resin (acrylic)				
W-t-Left 2		Cable: Oil resistant PVC				
Weight (net)		- F3SJ-A DDDDDDDTS Weight (g)=(protective height) x 1.5+217				
		Weight (g)=(protective height) x 1.5+217 - F3SJ-A□□□□P25-01TS				
		Weight (g)=(protective height) x 1.45+219				
Weight (packaged)		- F3SJ-A DDDP20-01TS / F3SJ-A DDD	□P25-01TS			
		Weight (g)=(protective height) x 1.5+ α The values for α are as follows:				
		When protective heightis between 245 and 5				
		When protective heightis between 600 and 1 When protective heightis between 1,136 and				
		When protective heightis between 1,660 and	12,180mm, $\alpha = 2400$			
		When protective heightis between 2,195 and				
Accessories			brackets, intermediate mounting brackets (*), error (1)			
		mode label, Quick Installation Manual (QIM) * The number of intermediate mounting brackets depends on the total length of the F3SJ.				
		- F3SJ total length is from 600 to 1,130mm: 1 set for each the emitter and receiver is included - F3SJ total length is from 1,136 to 1,658mm: 2 sets for each the emitter and receiver are included				
		- F3SJ total length is from 1,660 to 2,180mm	n: 3 sets for each the emitter and receiver are included			
A collection of the			n: 4 sets for each the emitter and receiver are included			
Applicable standards			4ESPE (Electro-Sensitive Protective Equipment) 4AOPD (Active Opto-electronic Protective Devices) IEC61508,			
			egory 4, PL e), ISO 13849-1:2015 (Category 4, PL e)			

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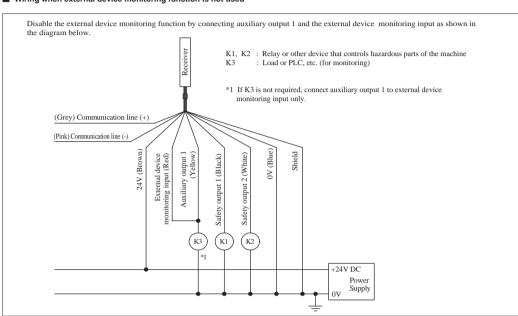
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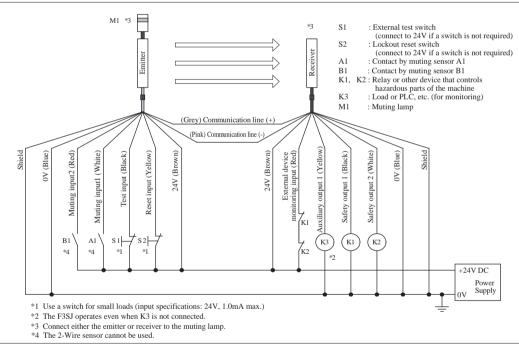
Wiring Diagrams [Basic System] ■Wiring using external device monitoring S1 : External test switch (connect to 24V if a switch is not required) S2 : Lockout reset switch (connect to 24V if a switch is not required) K1,K2 : Relay or other device that controls hazardous parts of the machine : Load or PLC, etc. (for monitoring) *1 Use a switch for micro loads. (Input specifications: 24V, 1.0mA max.) *2 F3SJ can operate even if K3 is not connected. (Grey) Communication line (+) (Pink) Communication line (-) Test Open S1 (K3) (KI (K2) +24V DC Supply

■ Wiring when external device monitoring function is not used



[Muting System]

■Wiring when using muting and external device monitoring functions

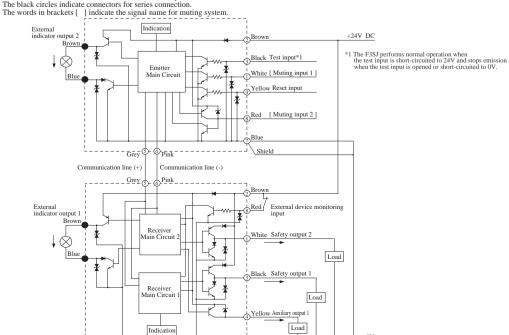


■ Wiring when external device monitoring function is not required
Wiring diagram is the same as that for "Wiring when external device monitoring function is not used" of the basic system.

Input/Output Circuit

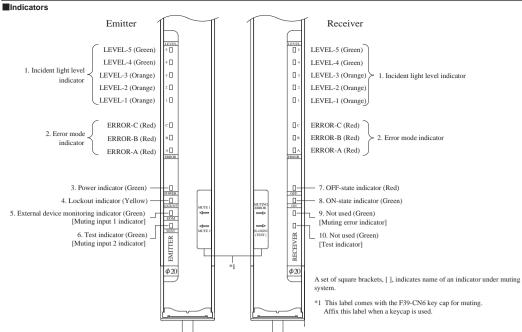
Input/output circuit

The numbers in white circles indicate the connector's pin numbers. The black circles indicate connectors for series connection.



Shield

Indicator Display Patterns



■Indicator display patterns for a basic system						
No.	Indicators		ON/Blinking	Description		
1	Incident light level LEVEL-1 to 5 indicator		ON	Indication status of LEVEL-1 to 5 shows the incident light level status of the F3SJ.		
2	Error mode indicator ERROR-A to C		ON/Blinking	Turns ON or blinks only when the F3SJ enters lockout, and the cause of the error is indicated by the status of ERROR-A to C indicators. When F3SJ are series-connected, the error mode indicator lamps turn ON or blink according to the details of each error. Affix the error mode label (included) near the F3SJ to allow for quick trouble shooting when errors occur. For details about error mode, refer to "■ Indication patterns of error mode indicator".		
3	Power indicator	POWER	ON	Turns ON while the power is ON.		
4	Lockout indicator	LOCKOUT	Blinking	Blinks when in lockout.		
5	External device monitoring indicator	EDM	ON	Turns ON when an input is given to external device monitoring input.		
6	Test indicator	TEST	Blinking	Blinks when external test is being performed.		
7	OFF-state indicator OFF		ON	Turns ON when safety outputs are OFF.		
			Blinking	Blinks under lockout.		
8	ON-state indicator	ON	ON	Turns ON when safety outputs are ON.		
9	_	_	_	_		
10	_	_	_	_		

■Indicator display patterns for a muting system (Indicator display different from a basic system are described.)

No.	Indicators		ON/Blinking	Description	
5	Muting input 1 indicator MUTE1		ON	Turns ON when an input is given to muting input 1.	
			Blinking	Blinks under muting/override.	
6	Muting input 2 indicator	uting input 2 indicator MUTE2		Turns ON when an input is given to muting input 2.	
			Blinking	Blinks under muting/override.	
9	Muting error indicator MUTING ERROR		ON	Turns ON during a muting error.	
10	Test indicator TEST		Blinking	Blinks when external test is being performed.	

■Indication patterns of the incident light level indicator

対 ON ■ OFF	-
1 2 3 4 5	Incident light level
五五五五 五	170% or higher of safety output ON level
五 五 五 五 五	From 130 to less than 170% of safety output ON level
以 以 以 山 山 山	From 100 to less than 130% of safety output ON level
以 ゴー ー ー	From 75 to less than 100% of safety output ON level
	From 50 to less than 75% of safety output ON level
	Less than 50% of safety output ON level

Operation is possible with incident light level of 100% or more, but to ensure stability, operate when all incident light level indicators

A B C	Main cause of error
浜 = 浜	Mutual interference or disturbance light.
过美迁	Power supply voltage of F3SJ is out of rated range. Insufficient current capacity of power supply.
1年1月	Breakage, incorrect wiring of communication line, disconnection of series-connection cable, influence of noise, or other errors.
其 其 其	The models of the emitter and receiver in a set are different.
英证证	End cap is not attached. Failure of internal circuit of F3SJ.
<u>- </u>	Relay is welded or recovery time is too long. Incorrect wiring or breakage of external device monitoring line.
X	Incorrect wiring or breakage of reset input line or pin 1 (line color:white) of emitter.
東河=	Incorrect wiring or breakage of reset input line for a muting system.
	Incorrect wiring of safety output 1 or 2. Failure of safety output circuit.
	Incorrect wiring or breakage of series-connection cable.
X = X	Broken series connection cable.

Refer to F3SJ User's manual for details

Response Times/Power Cable Length

■ Response times

Protective height	Number of beams	Response time (ON to OFF)	Response time (OFF to ON)
[mm]		[ms]	[ms]
245	16	10	40
260~440	17~29	11	44
455~635	30~42	12	48
650~830	43~55	13	52
845~1010	56~67	14	56
1025~1205	68~80	15	60
1220~1685	81~112	17.5	70
1700~2165	113~144	20	80
2180~2495	145~166	22.5	90

3SJ-ALLLLP25-01TS						
Protective	Number of	Response time	Response time			
height	beams	(ON to OFF)	(OFF to ON)			
[mm]		[ms]	[ms]			
260~320	13~16	10	40			
340~580	17~29	11	44			
600~840	30~42	12	48			
860~1100	43~55	13	52			
1120~1340	56~67	14	56			
1360~1600	68~80	15	60			
1620~2240	81~112	17.5	70			
2260~2500	113~125	20	80			

For series connections, use the calculations below.
When 2 sets are series-connected
Response time (ON to OFF):
Response time (OF 1 st unit + Response time of 2nd unit -1 (ms)
Response time (OFF to ON):
Response time (OFF to ON):

When 3 sets are series-connected Response time (ON to OFF):

Response time (OFF to ON):
Smaller value of response time (ON to OFF) x 5 (ms) or 200ms

■ Power cable length

Extension of power cable must be the length shown below or shorter: - In case F3SJ is directly connected to external power supply, or connected to G9SA-300-SC

Condition	Single	2 connected	3 connected
Incandescent display lamps are used by auxiliary output	45m	40m	30m
and/or external indicator output			
Incandescent display lamps are not used*	100m	60m	45m

- When connected to F3SP-B1P					
Condition	Single	2 connected	3 connected		
Incandescent display lamps are - used by external indicator output 2	40m	30m	25m		
Incandescent display lamps are - used by external indicator output 1 and/or, - used by auxiliary output 1	60m	45m	30m		
Incandescent display lamps are not used *	100m	60m	45m		

^{*}The F39-A01P□-PAC Dedicated External Indicator Set uses LEDs. Refer to the cable extension lengths for "Incandescent