

# Control Unit F3SP-B1P


CSM\_F3SP-B1P\_DS\_E\_3\_1

## Less Wiring Required with Safety Light Curtain

- Double-Ended Cable allows direct connection to OMRON Safety Light Curtains with PNP outputs.
- Reduces wiring and prevents incorrect connection.
- Conforms to EN standards (TÜV approval).
- DIN rail mounting possible




For the most recent information on models that have been certified for safety standards, refer to your local OMRON website.

 Be sure to read the "Safety Precautions" on page 9.

## Ordering Information

### Main Unit


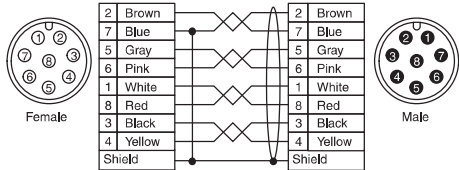
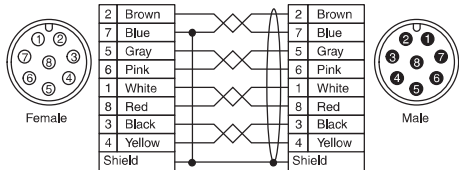
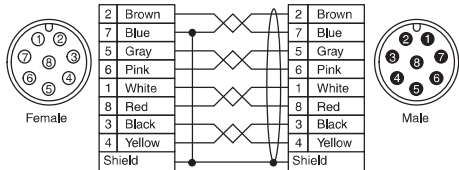
#### Control Unit

Appearance	Main contacts	Auxiliary contact	Light curtain auxiliary output	Model
	3PST-NO	SPST-NC	1PNP	F3SP-B1P

### Accessories (Sold separately)

#### Connecting Cable

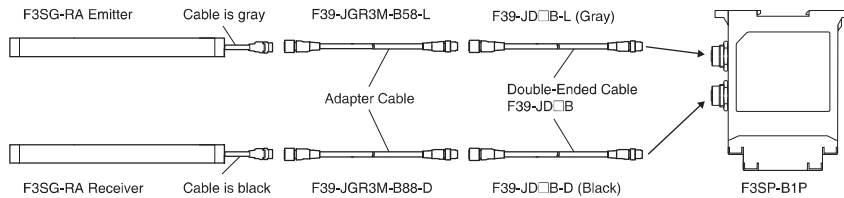
#### Double-Ended Cable (2 cables per set, one for emitter and one for receiver)

Appearance	Cable length	Specifications	Model
	3 m	<p><b>For emitter, M12 connector (8-pin), Color: Gray</b></p> <p>Connected to Power Cable or Double-Ended Cable</p> <p>Connected to Control Unit, or Double-Ended Cable</p> 	F39-JD3B
	7 m	<p><b>For receiver, M12 connector(8-pin) Color: Black</b></p> <p>Connected to Power Cable or Double-Ended Cable</p> <p>Connected to Control Unit, or Double-Ended Cable</p> 	F39-JD7B
	10 m	<p><b>For receiver, M12 connector(8-pin) Color: Black</b></p> <p>Connected to Power Cable or Double-Ended Cable</p> <p>Connected to Control Unit, or Double-Ended Cable</p> 	F39-JD10B

**Adapter Cable**  
For connection with F3SG-RA Series

Appearance	Type	Cable length	Specifications	Model																																																
	For emitter M12 connector	0.3 m	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p><b>Female</b> Connected to Power Cable or Double-Ended Cable of F3SG-RA emitter</p> <table border="1"> <tr><td>+24 VDC</td><td>Brown</td><td>1</td></tr> <tr><td>TEST</td><td>Black</td><td>2</td></tr> <tr><td>0 VDC</td><td>Blue</td><td>3</td></tr> <tr><td>(Not used)</td><td>-</td><td>4</td></tr> <tr><td>(Not used)</td><td>-</td><td>5</td></tr> </table> </div> <div style="text-align: center;"> <p><b>Emitter Adapter Cable</b></p> </div> <div style="text-align: center;"> <p><b>Male</b> Connected to Double-Ended Cable</p> <table border="1"> <tr><td>1</td><td>-</td><td>(Interlock selection input / Muting input 1)</td></tr> <tr><td>2</td><td>Brown</td><td>+24 VDC</td></tr> <tr><td>3</td><td>Black</td><td>Test input</td></tr> <tr><td>4</td><td>-</td><td>(Reset input)</td></tr> <tr><td>5</td><td>-</td><td>(Communication line (+))</td></tr> <tr><td>6</td><td>-</td><td>(Communication line (-))</td></tr> <tr><td>7</td><td>Blue</td><td>0 VDC</td></tr> <tr><td>8</td><td>-</td><td>(F3SJ-A: Auxiliary output 2/ Muting input 2) (F3SJ-B: Not used/ Muting input 2)</td></tr> </table> <p>(Shield)</p> </div> </div>	+24 VDC	Brown	1	TEST	Black	2	0 VDC	Blue	3	(Not used)	-	4	(Not used)	-	5	1	-	(Interlock selection input / Muting input 1)	2	Brown	+24 VDC	3	Black	Test input	4	-	(Reset input)	5	-	(Communication line (+))	6	-	(Communication line (-))	7	Blue	0 VDC	8	-	(F3SJ-A: Auxiliary output 2/ Muting input 2) (F3SJ-B: Not used/ Muting input 2)	F39-JGR3M-B58-L									
+24 VDC	Brown	1																																																		
TEST	Black	2																																																		
0 VDC	Blue	3																																																		
(Not used)	-	4																																																		
(Not used)	-	5																																																		
1	-	(Interlock selection input / Muting input 1)																																																		
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5	-	(Communication line (+))																																																		
6	-	(Communication line (-))																																																		
7	Blue	0 VDC																																																		
8	-	(F3SJ-A: Auxiliary output 2/ Muting input 2) (F3SJ-B: Not used/ Muting input 2)																																																		
	For receiver M12 connector	0.3 m	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p><b>Female</b> Connected to Power Cable or Double-Ended Cable of F3SG-RA receiver</p> <table border="1"> <tr><td>RESET</td><td>Yellow</td><td>1</td></tr> <tr><td>+24 VDC</td><td>Brown</td><td>2</td></tr> <tr><td>(MUTE A)</td><td>-</td><td>3</td></tr> <tr><td>(MUTE B)</td><td>-</td><td>4</td></tr> <tr><td>OSSD 1</td><td>Black</td><td>5</td></tr> <tr><td>OSSD 2</td><td>White</td><td>6</td></tr> <tr><td>0 VDC</td><td>Blue</td><td>7</td></tr> <tr><td>AUX</td><td>Red</td><td>8</td></tr> </table> </div> <div style="text-align: center;"> <p><b>Receiver Adapter Cable</b></p> </div> <div style="text-align: center;"> <p><b>Male</b> Connected to Double-Ended Cable</p> <table border="1"> <tr><td>1</td><td>White</td><td>Safety output 2</td></tr> <tr><td>2</td><td>Brown</td><td>+24 VDC</td></tr> <tr><td>3</td><td>Black</td><td>Safety output 1</td></tr> <tr><td>4</td><td>Yellow</td><td>Auxiliary output 1</td></tr> <tr><td>5</td><td>-</td><td>(Communication line (+))</td></tr> <tr><td>6</td><td>-</td><td>(Communication line (-))</td></tr> <tr><td>7</td><td>Blue</td><td>0 VDC</td></tr> <tr><td>8</td><td>Red</td><td>External device monitoring input</td></tr> </table> <p>(Shield)</p> </div> </div>	RESET	Yellow	1	+24 VDC	Brown	2	(MUTE A)	-	3	(MUTE B)	-	4	OSSD 1	Black	5	OSSD 2	White	6	0 VDC	Blue	7	AUX	Red	8	1	White	Safety output 2	2	Brown	+24 VDC	3	Black	Safety output 1	4	Yellow	Auxiliary output 1	5	-	(Communication line (+))	6	-	(Communication line (-))	7	Blue	0 VDC	8	Red	External device monitoring input	F39-JGR3M-B88-D
RESET	Yellow	1																																																		
+24 VDC	Brown	2																																																		
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7	Blue	0 VDC																																																		
8	Red	External device monitoring input																																																		

**Note:** Use the F39-JD□B Double-Ended Cables to connect with the F3SG-RA Series.



## Specifications

### Rating

Input	Rated power consumption		24 VDC
	Operating voltage range		-15% to +10% of rated supply voltage
	Rated supply voltage		1.7 W max. (Exclude sensor power)
Output	UL Listed	Rated load	250 VAC 5 A $\cos\phi=1$ 30 VDC 5A L/R=0ms
		Rated carry current	5 A
		Max. switching voltage	250 VAC 125 VDC
		Max. switching capacity	AC: 1,250 VA DC: 150 W
	EU Directive	Rated load	25 VAC 5 A $\cos\phi=1$ 30 VDC 5 A L/R=0 ms
		Rated carry current	5 A
		Max. switching voltage	25 VAC 60 VDC
		Max. switching capacity	AC: 125 VA DC: 150 W
		Conditional short-circuit current	1,000 A
		Short circuit protective device	Use 5 A fast acting fuse in accordance with IEC 60127

### Characteristics

Operation time	100 ms max. (exclude sensor response time)
Response time	10 ms max. (exclude sensor response time)
Vibration resistance	10 to 55 Hz 0.35 mm single amplitude (0.7 mm double amplitude)
Shock resistance	Destruction: 300 m/s <sup>2</sup> Malfunction: 100 m/s <sup>2</sup>
Ambient temperature	-10 to 55°C
Ambient humidity	35 to 85% RH

### Protection class

Terminals	IP20
Enclosure	IP40

### Pollution degree

External	3
Internal	2

### Isolation specification

Insulation resistance	Between inputs and outputs	100 M $\Omega$ min. (by 500 VDC Megger)
	Between different poles of output	
Dielectric strength	Between inputs and outputs	2,500 VAC 1 minute
	Between different poles of output	

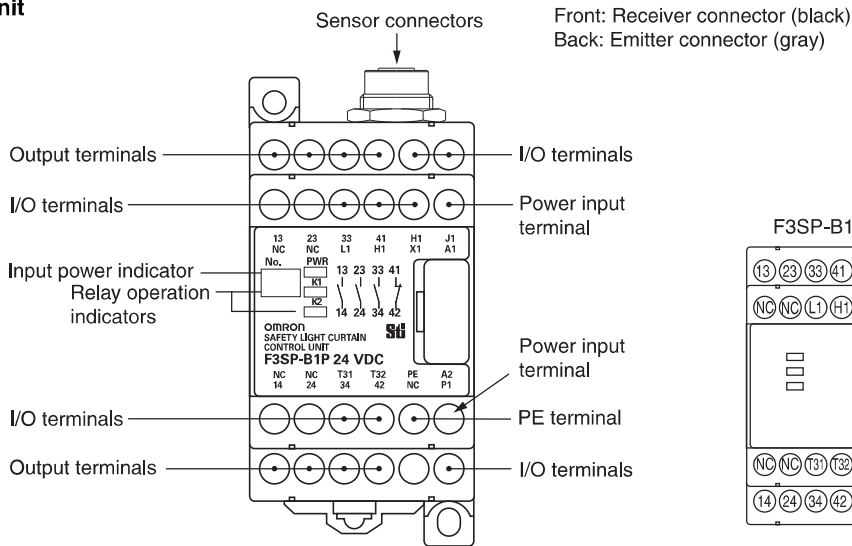
### Life expectancy

Electrical endurance	100,000 operations min. Rated load Switching frequency 1,800 operations/h
Mechanical endurance	5,000,000 operations min. Switching frequency 18,000 operations/h

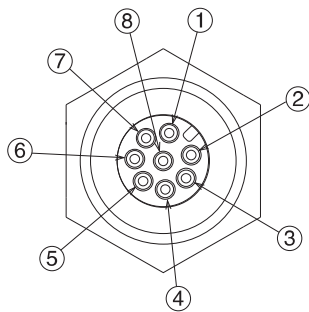
# Connections

## Designation

### Unit



### Connector



Names used when connecting with the F3SJ-A/B

Pin No.	Signal Name	
	Receiver	Emitter
1	OSSD 2	Interlock selection input
2	+24 V	+24 V
3	OSSD 1	Test input
4	Auxiliary output	Reset input
5	RS-485 (A)	RS-485 (A)
6	RS-485 (B)	RS-485 (B)
7	0 V	0 V
8	EDM input	NC

Names used when connecting with the F3SG-RA

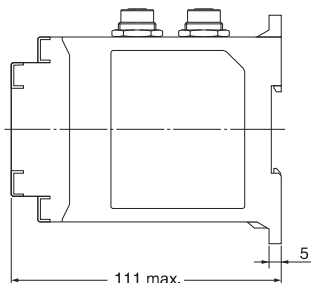
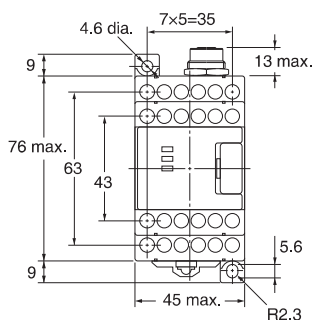
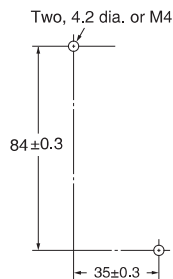
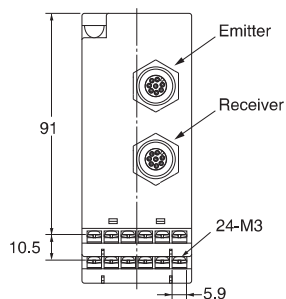
Pin No.	Signal Name	
	Receiver	Emitter
1	OSSD 2	NC
2	+24 V	+24 V
3	OSSD 1	Test input
4	Auxiliary output	NC
5	NC	NC
6	NC	NC
7	0 V	0 V
8	Reset input	NC

# Dimensions

## Main Unit

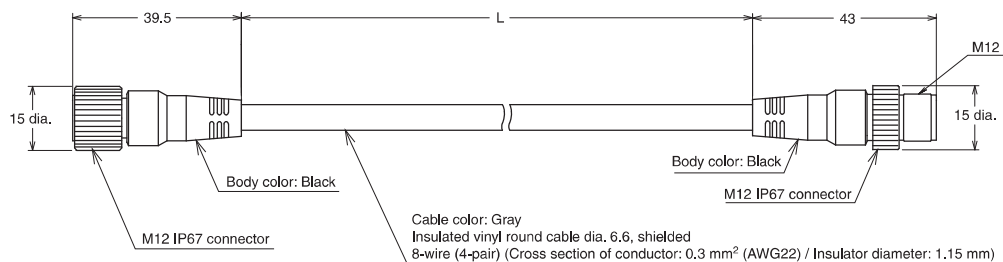
### Control Unit (F3SP-B1P)

### Mounting holes

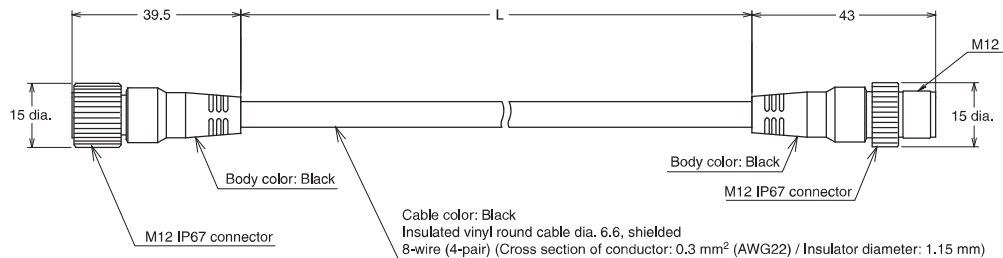


## Accessories (Sold separately)

### Double-Ended Cable for Emitter (F39-JD□B-L, sold separately)

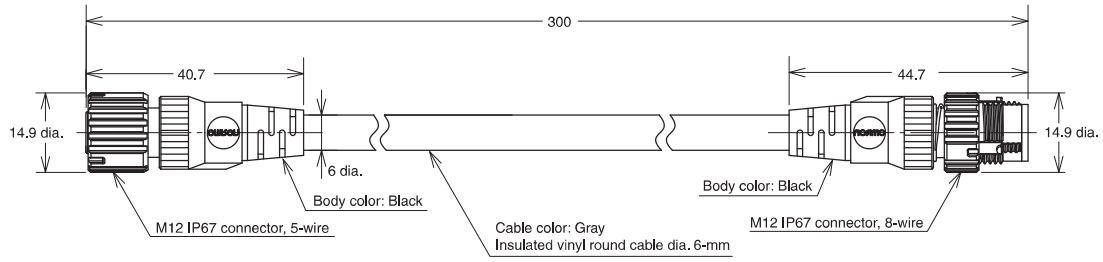


### Double-Ended Cable for Receiver (F39-JD□B-D, sold separately)

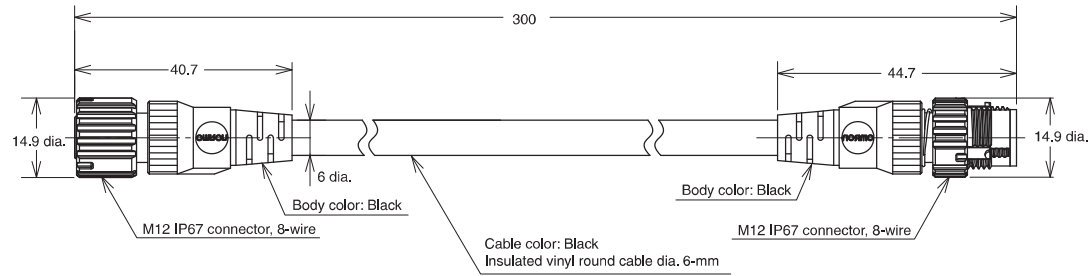


Emitter cable (Gray)	Receiver cable (Black)	L (m)
F39-JD3B-L	F39-JD3B-D	3
F39-JD7B-L	F39-JD7B-D	7
F39-JD10B-L	F39-JD10B-D	10

**Emitter Adapter Cable (F39-JGR3M-B58-L, sold separately)**



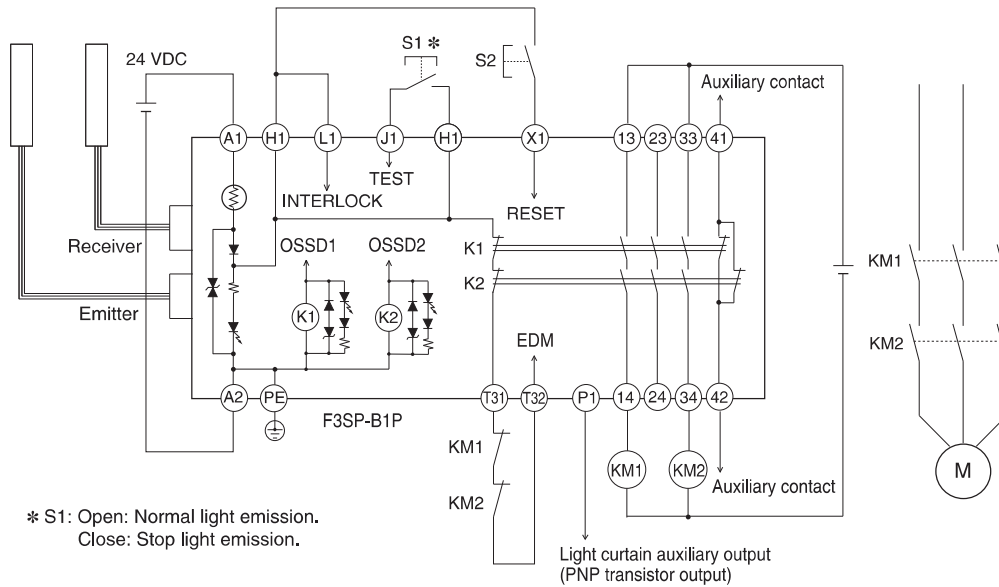
**Receiver Adapter Cable (F39-JGR3M-B88-D, sold separately)**



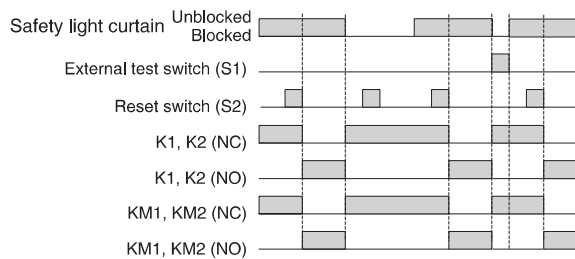
# Application Examples

## When in combination with the F3SJ

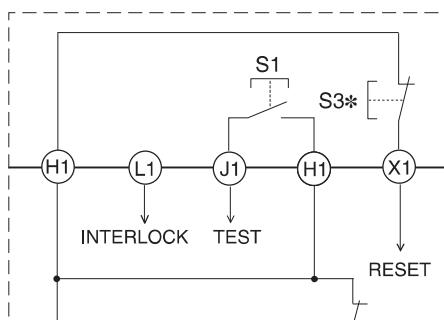
Wiring for the Manual reset mode and the EDM function enabled.



- S1: External test switch  
(This line is open if the switch is not required)
- S2: Interlock / Lockout reset switch
- S3: Lockout reset switch
- KM1, KM2: Magnet contactor
- M: 3-phase motor

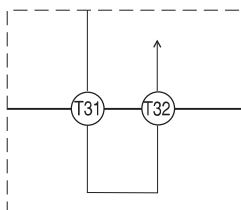


### Wiring for Auto-reset mode



\* S3 If the switch is not necessary, connect between X1 and H1.

### Wiring when the EDM is not used



## When in combination with the F3SG-RA

Wiring for the Manual reset mode and the EDM function enabled.

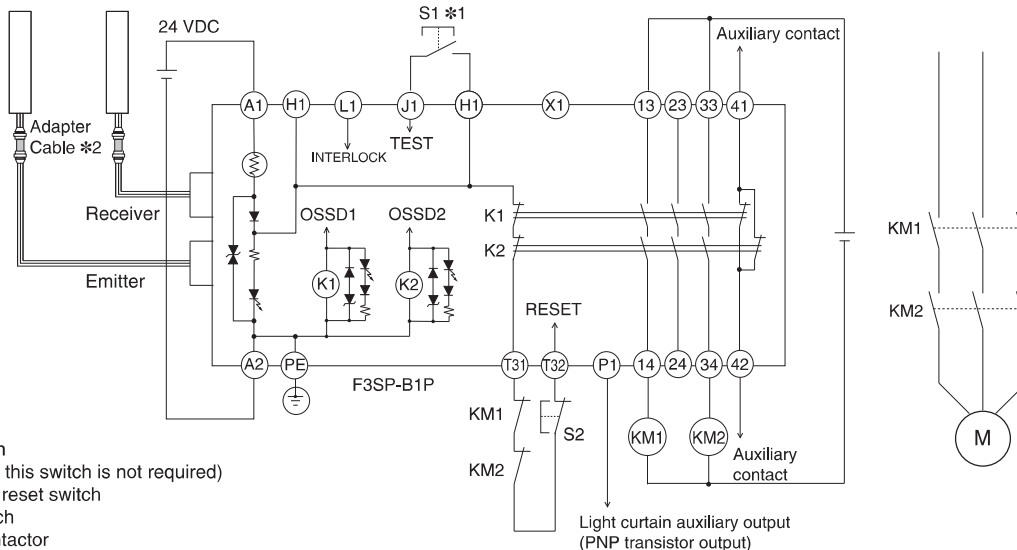
DIP Switch settings of F3SG-RA

	Function	DIP-SW1	DIP-SW2
Receiver	EDM Enable	2 <input type="checkbox"/> ON	2 <input type="checkbox"/> ON
	Manual Reset	3 <input type="checkbox"/> ON	3 <input type="checkbox"/> ON
		4 <input type="checkbox"/> ON	4 <input type="checkbox"/> ON
	PNP (factory default setting) *1	7 <input type="checkbox"/> ON	7 <input type="checkbox"/> ON
Emitter	External test: 24 V Active (factory default setting) *2	4 <input type="checkbox"/> ON	

\*1. "NPN output" can not be used.

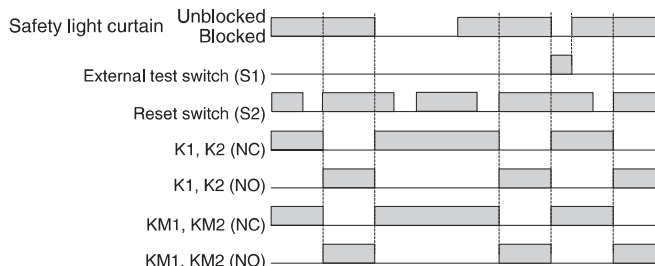
: Indicates a switch position

\*2. "OV Active" can not be



- S1: External test switch  
(This line is open if this switch is not required)
- S2: Interlock / Lockout reset switch
- S3: Lockout reset switch
- KM1, KM2: Magnet contactor
- M: 3-phase motor
- \*1. S1 Open: Normal light emission.  
Close: Stop light emission.
- \*2. Use the Adapter Cable of F3SG-RA's optional accessory.

Model	Remark
F39-JGR3M-B58-L	For emitter
F39-JGR3M-B88-D	For receiver



Wiring for Auto-reset mode.

DIP Switch settings of F3SG-RA

	Function	DIP-SW1	DIP-SW2
Receiver	EDM Enable	2 <input type="checkbox"/> ON	2 <input type="checkbox"/> ON
	Auto Reset (factory default setting)	3 <input type="checkbox"/> ON	3 <input type="checkbox"/> ON
		4 <input type="checkbox"/> ON	4 <input type="checkbox"/> ON
	PNP (factory default setting) *1	7 <input type="checkbox"/> ON	7 <input type="checkbox"/> ON
Emitter	External test: 24 V Active (factory default setting) *2	4 <input type="checkbox"/> ON	

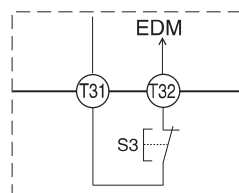
: Indicates a switch position

Note: There is no difference in wiring between Auto and Manual reset modes.

\*1. "NPN output" can not be used.

\*2. "OV Active" can not be used.

Wiring when the EDM function is not used.



Note: Even if the monitor of EDM is not used, set the DIP Switch of F3SG-RA to EDM enable.


\* S3 If the switch is not necessary, connect between T31 and T32.





## Safety Precautions

Be sure to read the Common Precautions for Safety Warning at the following URL: <http://www.ia.omron.com/>.

### Meanings of Signal Words

 <b>WARNING</b>	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.
<b>Precautions for Safe Use</b>	Supplementary comments on what to do or avoid doing, to use the product safely.
<b>Precautions for Correct Use</b>	Supplementary comments on what to do or avoid doing, to prevent failure to operate, malfunction or undesirable effect on product performance.

### Meanings of Alert Symbols

	Used for general prohibitions for which there is no specific symbol.
	Used for general mandatory action precautions for which there is no specified symbol.

### **WARNING**

**Serious injury may possibly occur due to breakdown of safety outputs.**  
**Do not connect loads beyond the rated value to the safety outputs.**



**Serious injury may possibly occur due to loss of required safety functions.**  
**Wire F3SP-B1P properly so that supply voltages or voltages for loads do NOT touch the safety inputs accidentally or unintentionally.**



### **Precautions for Safe Use**

1. When ready for wiring, the power source should be disconnected first. Further, at operating this unit, the terminal cover should be closed correctly in order to prevent an electrical shock.
2. Do not wire in case threat of Lightning, otherwise an electric shock may occur.
3. Do not apply any excessive voltage or current to the input or output circuit the F3SP-B1P.  
Doing so may result in damage to the F3SP-B1P or cause a fire.
4. Do not apply any variable voltage, otherwise F3SP-B1P may malfunction.
5. Do not connect any overload to the output circuit, otherwise the F3SP-B1P in operation will generate excessive heat and the output elements of the F3SP-B1P may short-circuit or fire may result.
6. The lifetime of F3SP-B1P depends on the conditions of switching of its outputs. Be sure to conduct its test operation under actual operating conditions in advance and use it within appropriate switching cycles.
7. Do not operate the F3SP-B1P with flammable or explosive gas. An arc with operation and the heat of relay will cause a fire or an explosion.
8. Do not disassemble, repair, or modify the F3SP-B1P, otherwise an electric shock may occur or the F3SP-B1P may malfunction.
9. Use protective device (Fuse etc) for short-circuit protection and ground fault protection, otherwise a fire may occur or the F3SP-B1P may malfunction.
10. Be sure to wire correctly. The sensor connector is the same both the emitter and the receiver.
11. Do not dismantle, repair, or modify F3SP-B1P. It may lead to loss of its safety functions.

### **Precautions for Correct Use**

1. For malfunctions in case that the power supply picks up gradually. Malfunctions in case that the power supply picks up gradually. In case that the input circuits close before the power supplies, internal logic may malfunction.
2. Handling  
Do not drop the F3SP-B1P or shock or vibrate the F3SP-B1P excessively. Doing so may result in damage to the F3SP-B1P or cause F3SP-B1P to malfunction.
3. For adhesion of solvent  
Adhesion of solvent, likely Alcohol, Thinner, Trichloroethane, Gasoline, on the product should be prohibited. Such solvent cause erasing the marking and being inferior of the parts.
4. Take appropriate and sufficient countermeasures when installing systems in the following locations. Inappropriate and insufficient measures may result in malfunction.
  1. Locations subject to static electricity or other forms of noise.
  2. Locations subject to possible exposure to radioactivity.
  3. Locations close to power supplies.
5. Wiring
  1. Use the following to wire the F3SP-B1P.
    - Stranded wire (Flexible wire): 0.75 to 1.5mm<sup>2</sup>
    - Solid wire: 1.0 to 1.5 mm<sup>2</sup>
  2. The F3SP-B1P may malfunction or generate heat.
    - Tighten each screw to a torque of 0.78 to 1.18 N·m
  3. PE is a protective earth terminal. When machine is grounded at the positive, the PE terminal should not be grounded.
  4. NC terminals do not have any function. Do not wire them.
6. Mounting multiple units  
When mounting multiple units close to each other, the rated current will be 3 A.  
Do not apply a current higher than 3 A.
7. Operating and Storage Environment  
Do not operate or store the F3SP-B1P under the following conditions. Doing so may result in damage to the F3SP-B1P or cause the F3SP-B1P to malfunction.
  1. The places with direct sunlight.
  2. The places with ambient temperature ranges not within -10 to 55°C.
  3. The places with rapid temperature changes resulting in condensation or relative humidity ranges not within 35 to 85% RH.
  4. The places with atmospheric pressure out of the range 86 to 106 kpa.
  5. The places with corrosive or inflammable gas.
  6. The places with water, oil, or chemical sprayed on the F3SP-B1P.
  7. The places with vibration or shock affecting the F3SP-B1P.
  8. The places with atmosphere containing dusts, saline or metal powder.
8. DC power supply units  
In order to conform to IEC61496-1 and UL508, DC power supply unit must satisfy all the conditions mentioned in the instruction manual the sensor.
9. Installation
  1. Cabinet of F3SP-B1P should meet IP54 protection.
  2. The F3SP-B1P is exclusively for F3SJ-A□□□□P□□, F3SJ-B□□□□P25, F3SG-□RA□□□□-□□ (\*) series.
    - \* When in combination with the F3SG-RA,
      - "F3SG-RA with PNP output" can only be connected.
      - Adapter Cable of F3SG-RA's optional accessory is required.
  3. The following functions are set with two short pieces when delivered. Change wirings depending on necessary functions.
    - H1-X1 short: Auto reset mode.
    - T31-T32 short: EDM function is inactive.
 \* These combinations of wiring and function are for the use with the F3SJ.  
 When using with the F3SG-RA, refer to *Application Examples* on page 8 and following.

10. For feedback purpose use devices with contacts capable of switching micro loads of 24 VDC, 5 mA.
11. This is a class A product. In residential areas it may cause radio interference, in which case the user may be required to take adequate measures to reduce interference.

### **Applicable Safety Category (ISO 13849-1)**

The F3SP-B1P can construct the condition conforming to cat. 4 / PL e or cat. 2 / PL c requested by EN ISO 13849-1 with combination as follows:

- Category 4 / PL e: Type F3SJ-A□□□□P□□ or F3SJ-B□□□□P25 or F3SG-4RA□□□□-□□ (set to PNP output)
- Category 2 / PL c: Type F3SG-2RA□□□□-□□ (set to PNP output)

This evaluation, however, is based on circuit configuration examples proposed by OMRON. The standard may not apply in some operating conditions. The applicable performance level and safety category are determined from the whole safety control system. Make sure that the whole safety control system meets ISO 13849-1 requirements.

### **Certified Standards**

EN ISO 13849-1:2015 PL e Category 4,  
EN 61496-1:2013,  
UL 508,  
CSA C22.2 No. 0.8, C22.2 No. 14

## Terms and Conditions Agreement

### 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.

### Warranties.

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