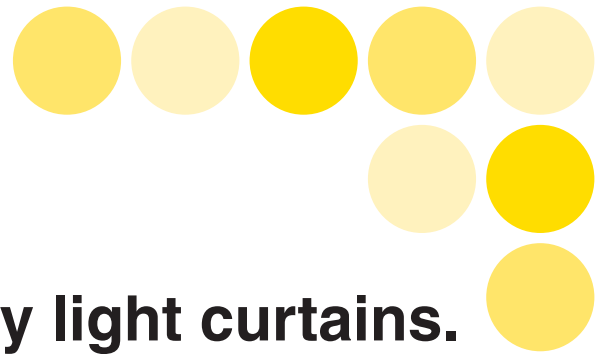


**N E W**

**OMRON**

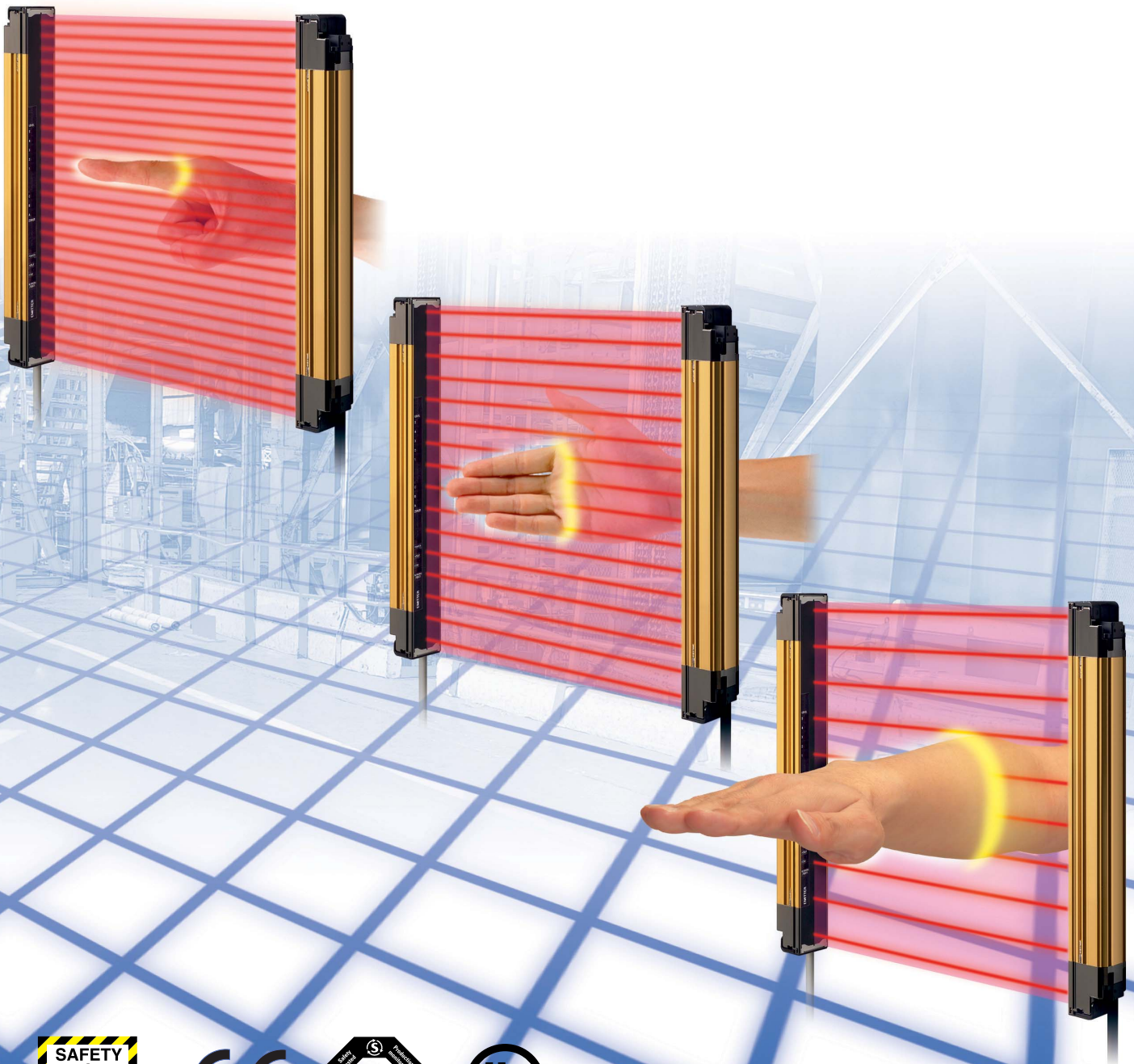
Safety Light Curtain (Type 4)

**F3SJ**



**Simple. Easy to use.**

**The new standard in safety light curtains.**



The beams, shown as red beams of light in the illustrations, are not actually visible.



A large, industrial safety light curtain is shown diagonally across the frame. It has a black body with a silver-colored metal bracket at the top and bottom. The top bracket is attached to a yellow cable. The bottom bracket is attached to a black cable. The body has several labels: 'EMITTER' at the top, 'TEST' below it, 'EDM' below that, 'INTLK' below that, and 'POWER' with a green indicator light below that. At the bottom, there are labels 'A', 'B', and 'C' with arrows pointing to the left. The background is a blurred industrial setting with a worker in the distance.

## Any doubts about the safety of your machinery?

The new easy-to-use F3SJ safety light curtain can provide safety to machinery that previous light curtains were unable to support. Selecting and installing a safety light curtain has never been easier, making the shift from area sensor to safety light curtain a simple task. The F3SJ safety light curtain is as easy to use as a conventional area sensor, so whether you are retrofitting existing equipment or providing safety to newly designed equipment, you can once and for all eliminate any remaining doubt you have about the safety of your machinery.





Type 4 Safety Light Curtain **F3SJ**

## Selecting a device is as easy as 1-2-3.

The F3SJ safety light curtain is a "Type 4" sensor, which makes it suitable for Category 4 safety applications, so you can put your safety concerns to rest. In 3 easy steps, you can select the ideal device for your equipment.

### Step 1 Select the required sensor length.

The F3SJ incorporates the "perfect fit" concept that is the feature of OMRON's other safety light curtains. With a line-up of products in 1-beam increments, you can find the sensor that fits your setup perfectly. Refer to the list of sensor models on pages 10 and 11 to select the minimum sensor length required to cover the area you want to protect.

(Note: We can also manufacture sensors with lengths not included in the list of models. For details, please consult your OMRON sales representative.)

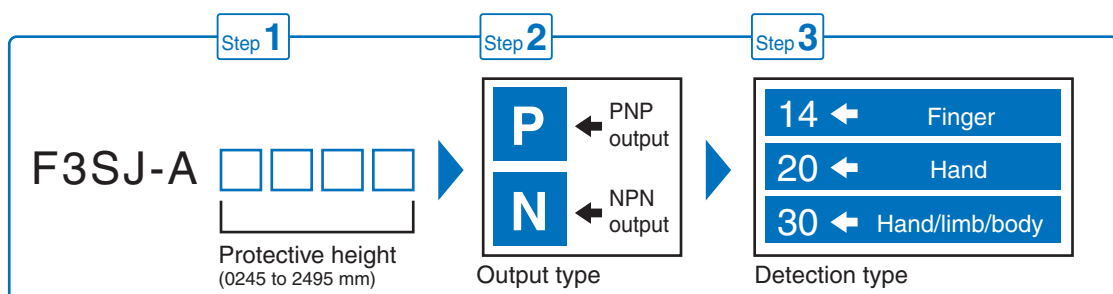
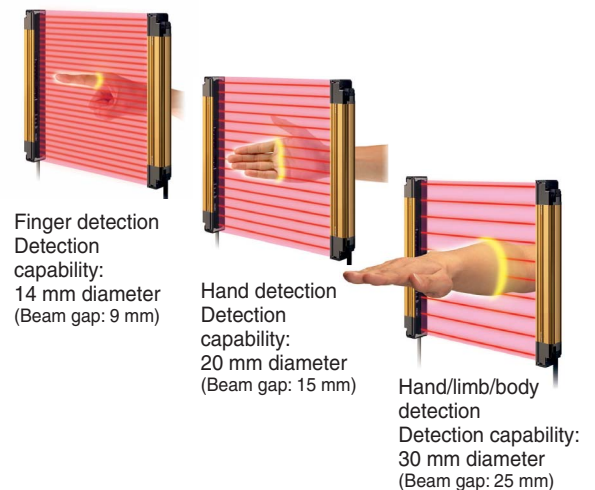


### Step 2 Select the output transistor.

Choose the PNP type when installing in safety system configurations that comply with the Machinery Directive or when using with a dedicated controller (F3SP-B1P or F3SX). NPN types are also available as standard products when replacing existing area sensors.

### Step 3 Select the application.

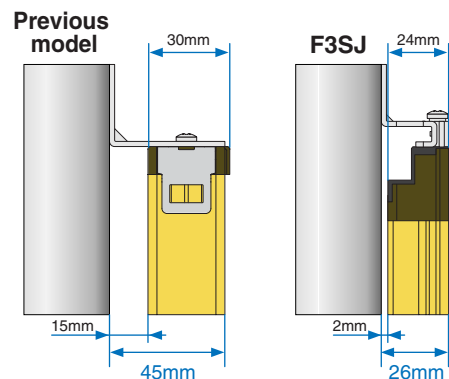
With three types of sensors available, you can select the ideal type to best support your application. Choose from the finger detection model, hand detection model, or hand/limb/body detection model. For areas where there is only a short distance to the source of danger, select the finger detection model. For areas where there is some distance to the source of danger, and where the machinery stops with sufficient time to spare, choose the economical hand/limb/body detection model. (Note: After selecting the type of device, calculate the safety distance described on p.49 and change your selection if necessary.)



# A light curtain that is thin, simple to use, and easy to install.

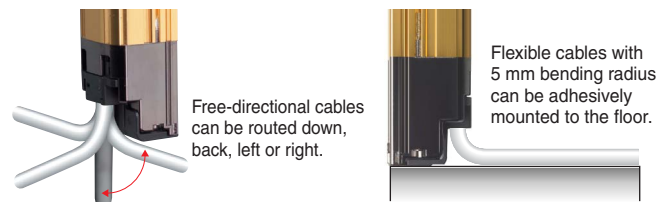
## The thin sensor saves valuable space.

The sensor is 6 mm thinner than our previous models. When you include the newly designed mounting brackets, which also enable beams to be aligned after the sensor is mounted, the total thickness is 26 mm - a reduction of 19 mm compared to previous models. The low profile means the sensor will not get in the way when adding safety applications to existing equipment.



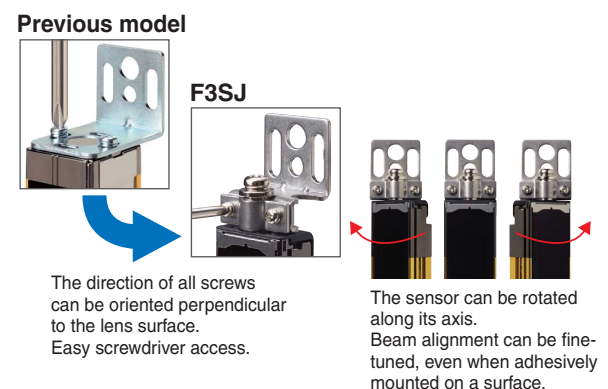
## Flexible cable with a 5 mm bending radius makes wiring a snap.

The F3SJ cables (0.3 m) have M12 connectors and can be routed in any direction. Problems with connector compatibility have been eliminated.



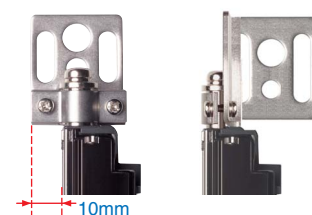
## The included standard mounting brackets are easier than ever to use.

The included mounting brackets, which are suitable for general use, have been redesigned with ease of use in mind. The new design allows easy screwdriver access, even when mounting in tight spaces. Also, after aligning the beams, screws can be tightened while oriented perpendicular to the lens surface, just like the panel mounting screws. On previous models, the carefully adjusted beam angles would sometimes come out of alignment when tightening the final screws. This problem has been solved with the F3SJ, because the screw-tightening direction is different from the angle adjustment direction. The result is reduced installation time.



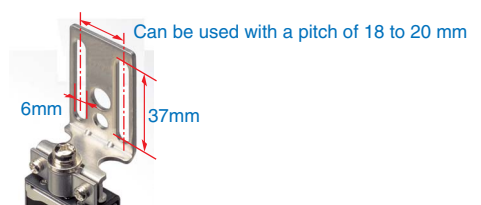
## Side-mounting in tight spaces is simple.

When using standard mounting brackets to mount a sensor on its side, the bracket protrudes outward in front of the lens surface. When this protrusion is of concern, use the F39-LJ2 side-mounting brackets (sold separately).



## Easy to change from previous models.

When replacing your previous standard multi-beam area sensor, use the F39-LJ4 top / bottom mounting bracket B (sold separately), which features enlarged mounting holes.



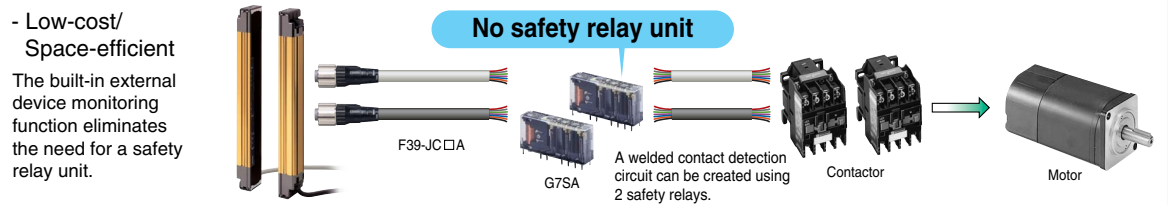
## Type 4 Safety Light Curtain **F3SJ**

# OMRON makes safety circuits simple.

The F3SJ-A safety light curtain is a Type 4 safety sensor that can be used to configure a Category 4 safety circuit. Several suggested setups, which are ideal for a variety of safety needs, are outlined below.

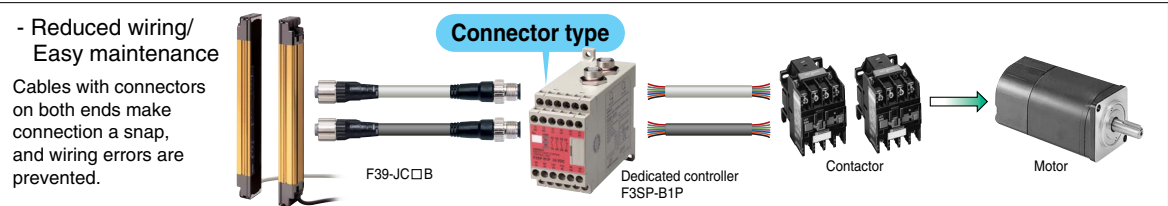
### Space-efficient & low-cost setup

This setup, which only OMRON can provide, features a sensor unit with an output feedback function required for Safety Category 4. Simply by using a single G7SA or a pair of G7S-E safety relays, you can easily and economically configure a Category 4 safety circuit.



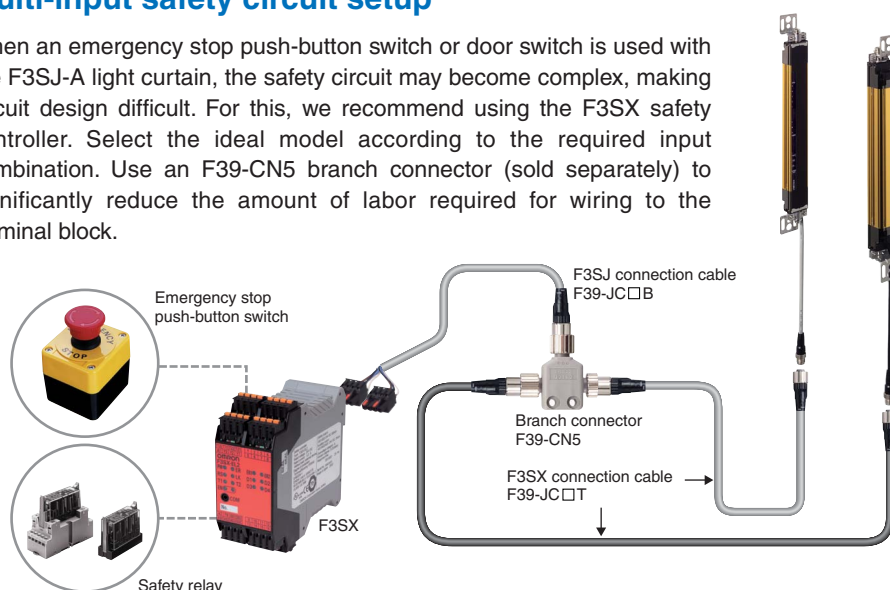
### Wire-saving setup

Using single safety relays requires a lot of labor for wiring. To simplify the connection process, use F39-JC□B two-connector cable and an F3SP-B1P dedicated controller.



### Multi-input safety circuit setup

When an emergency stop push-button switch or door switch is used with the F3SJ-A light curtain, the safety circuit may become complex, making circuit design difficult. For this, we recommend using the F3SX safety controller. Select the ideal model according to the required input combination. Use an F39-CN5 branch connector (sold separately) to significantly reduce the amount of labor required for wiring to the terminal block.

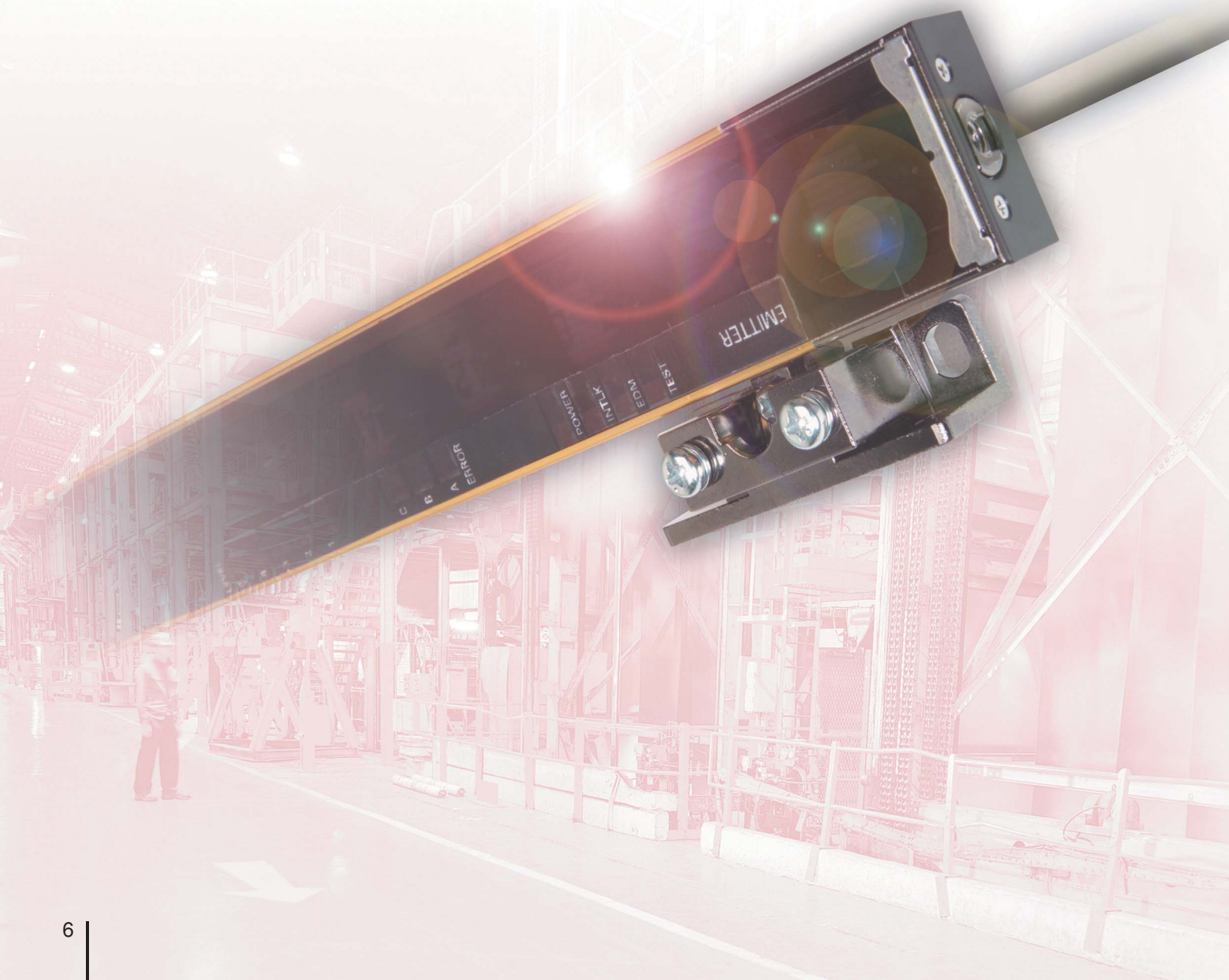






## Are you satisfied with your current safety light curtain?

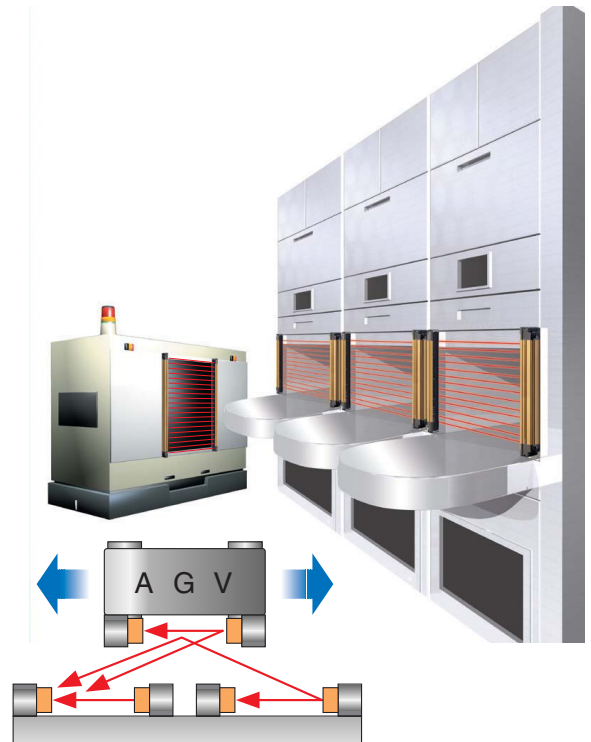
A safety light curtain is absolutely essential when establishing a safety system. However, you might feel that the additional equipment and application requirements of a safety light curtain make it difficult to use with your current production items. Or perhaps you think a safety light curtain would place constraints on your equipment. With a giant leap forward in evolution, the new-concept F3SJ safety light curtain addresses these concerns.



## Type 4 Safety Light Curtain **F3SJ**

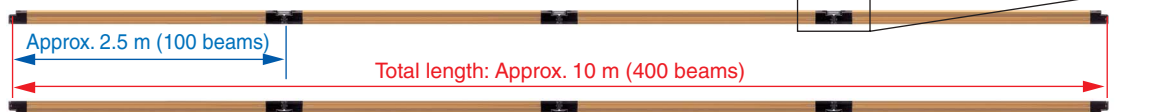
### Resistant to mutual interference. No wiring between sensors and no interference for up to 3 sets.

OMRON has developed a unique interference light prevention algorithm that automatically prevents malfunction, even when light is received from 3 sets. This feature is ideal for applications where it is not possible to perform wiring with an interference sensor, such as between an AGV and installed equipment.



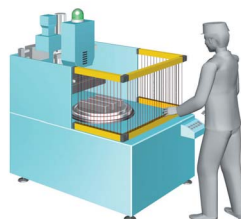
### Maximum protective height of 2495 mm. Series connection is more convenient than ever.

Sensors with protective heights of up to nearly 2.5 meters are available for applications that involve large-sized workpieces. And if you happen to make changes in the future, you can always extend the protective height with series connections. Up to 4 sets, or 400 beams, can be series-connected, and with series connection cables up to 15 meters in length, applications can cover a wide area.

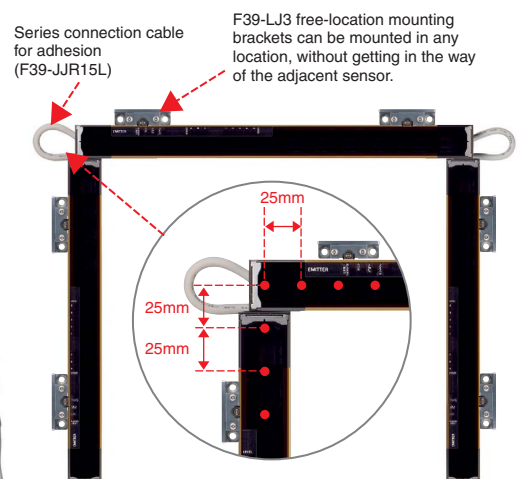


### No bottlenecks in workflow. Free-location brackets make vertical installation easy.

To create "perfect fit" installations with no dead zones or extra space when making series connections in L- or U-shaped configurations, use the F39-LJ3 free-location mounting brackets (sold separately) and F39-JJR15L series connection cables for adhesion.



■ Application example  
U-shaped configuration



■ Keep a 25 mm beam gap in L-shaped installations. The cable (F39-JJR15L) does not get in the way when used in series connections.



## Combine safety and productivity with a controllerless muting function.

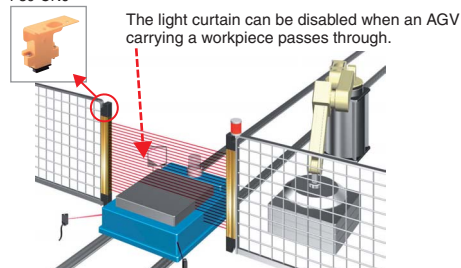
The "muting function" temporarily disables the light curtain when an object must pass through the detection zone, such as when supplying a workpiece to your equipment.

In the past, this function required a dedicated "muting controller", but now it is built into the F3SJ. To use the muting function, purchase the F39-CN6 key cap for muting (sold separately). The muting function is enabled simply by replacing the unit's cap with this key cap. In addition, a muting sensor that determines the muting timing, as well as a muting lamp that communicates the muting status to other operators, should be connected to the F3SJ.

### Built-in muting

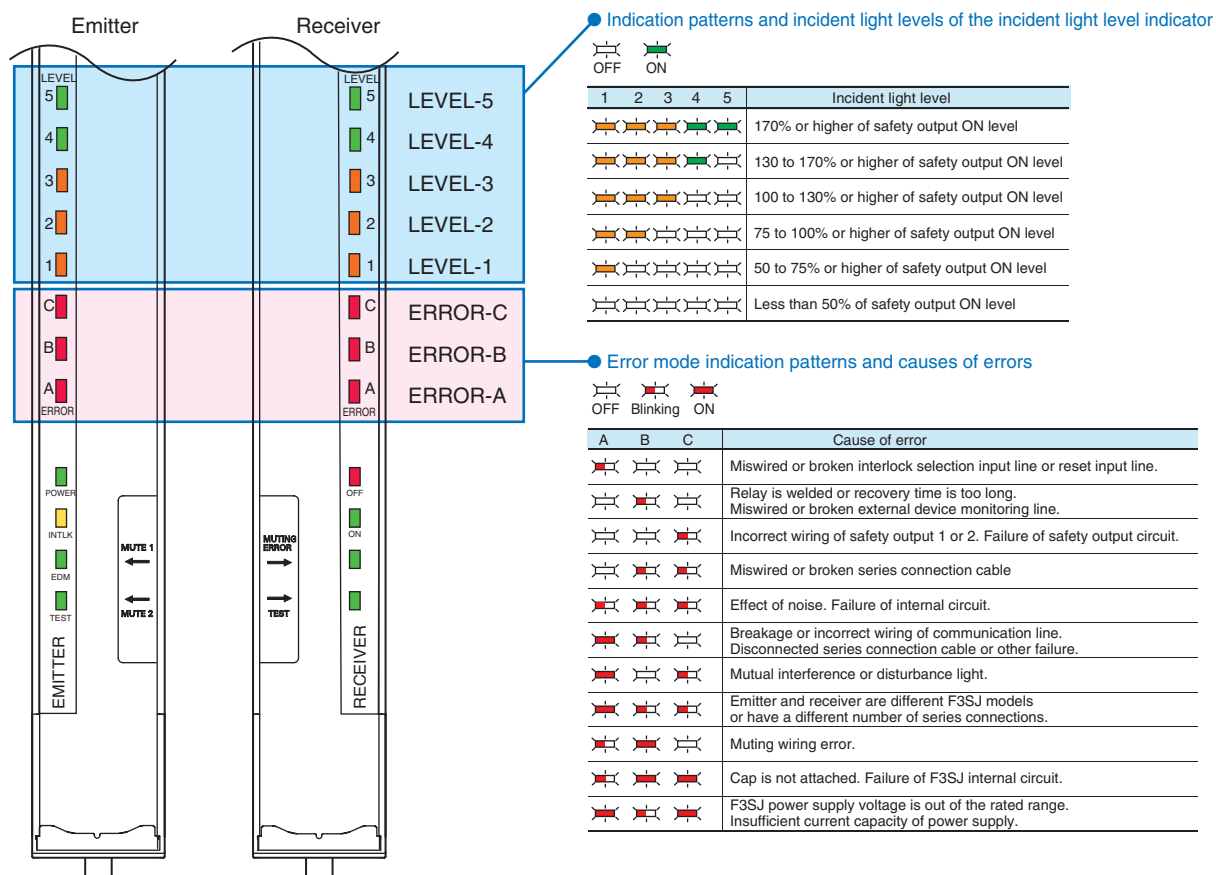
- No controller required.  
Simply attach a cap (sold separately) to the sensor.

Key cap for muting  
F39-CN6



## A new and improved LED indicator.

The incident light level indicator uses orange LED lights for LEVELS 1 to 3, and green LED lights for LEVELS 4 to 5. The green LED lights indicate that a stable amount of light is being received. The error indicator uses a variety of illumination and blinking patterns, enabling more detailed diagnosis results to be communicated via the display.





## Type 4 Safety Light Curtain **F3SJ**

### Safety is not compromised if you forget to connect a series connection cable.

The connectors for series connection feature an intelligent design. With previous models, series-connected sensors would operate independently from others when a series connection cable was accidentally left unconnected, such as when equipment was moved. The F3SJ design addresses this issue. To connect a series connection cable to the F3SJ, remove the key cap that is required when the sensor is used by itself. The sensor does not operate by itself without the key cap, so safety will not be compromised if you happen to forget to connect the cable.

Operates as a single sensor when the cap is attached.



Does not operate without the cap.



### Complies with the latest international safety standards and regulations.

Like previous Category 4 safety light curtains, the F3SJ conforms to the latest required safety standards and regulations. Since the F3SJ also complies with IEC61508, the international standard for functional safety, safety is ensured regardless of where it is used.

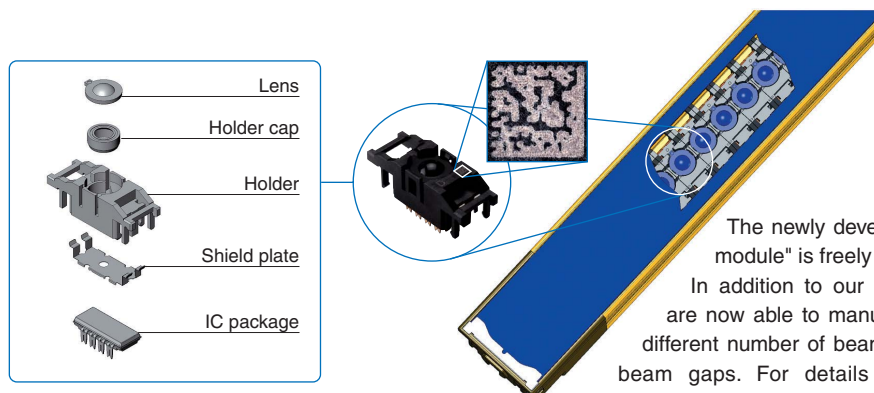
International standards	IEC61496-1, IEC61496-2, IEC61508 1998 (SIL3)
EU legislation EN standards	Machinery Directive, EMC Directive, EN61496-1, prEN61496-2, EN61508 2001 (SIL3)
JIS standards	JIS B9704-1, B9704-2
North American standards	UL61496-1, UL61496-2, UL508, UL1998, CAN/CSA22.2 NO.14, CAN/CSA22.2 NO.0.8

Can also be used with equipment subject to US OSHA standards (29 CFR 1910.212).  
Satisfies the requirements of the ANSI/RIA R15.06-1999 standards for industrial robots.



### New core technology that supports reliability and customizability.

The quality of safety light curtain performance is determined by the quality of the emitter/receiver elements. With previous models, one faulty beam resulted in the malfunction of the entire sensor. However, the F3SJ features a newly developed "1-bit module" that integrates the lens and other optical parts with the emitter IC and receiver IC, which are key devices. With characteristic inspection performed on each beam, as well as a thorough quality traceability system using 2D code, performance is assured.



The newly developed board-free "1-bit module" is freely mounted on flat cable.







In addition to our standard products, we are now able to manufacture devices with a different number of beams, or with a variety of beam gaps. For details about these special products, consult your OMRON sales representative.

# Model/Standard Price

## Main

### Safety light curtain F3SJ-A (type 4)

 Infrared light

Application	Detection Capability	Beam Gap	Appearance	Operating Range		No. of Beams	Protective Height	Model	
								PNP Output	NPN Output
Finger detection	Dia. 14mm	9mm		 0.2 to 9 m		26 to 180	245 to 1631	F3SJ -A□□□□P14	F3SJ -A□□□□N14
Hand detection	Dia. 20mm	15mm		 0.2 to 9 m		16 to 100	245 to 1505	F3SJ -A□□□□P20	F3SJ -A□□□□N20
				 0.2 to 7 m		110 to 166	1655 to 2495		
Hand/limb/body detection	Dia. 30mm	25mm		 0.2 to 9 m		10 to 65	245 to 1620	F3SJ -A□□□□P30	F3SJ -A□□□□N30
				 0.2 to 7 m		70 to 100	1745 to 2495		

\* Connection cables are not included with the products and are to be purchased separately, as needed. You must purchase optional connector cable.

## Safety light curtain model list

Products other than those listed below are also available. Please contact your OMRON sales representative for details.

### F3SJ-A14 series (9mm gap)

Model		No. of Beams	Protective Height (mm)*
PNP Output	NPN Output		
F3SJ-A0245P14	F3SJ-A0245N14	26	245
F3SJ-A0263P14	F3SJ-A0263N14	28	263
F3SJ-A0281P14	F3SJ-A0281N14	30	281
F3SJ-A0299P14	F3SJ-A0299N14	32	299
F3SJ-A0317P14	F3SJ-A0317N14	34	317
F3SJ-A0335P14	F3SJ-A0335N14	36	335
F3SJ-A0353P14	F3SJ-A0353N14	38	353
F3SJ-A0371P14	F3SJ-A0371N14	40	371
F3SJ-A0389P14	F3SJ-A0389N14	42	389
F3SJ-A0407P14	F3SJ-A0407N14	44	407
F3SJ-A0425P14	F3SJ-A0425N14	46	425
F3SJ-A0443P14	F3SJ-A0443N14	48	443
F3SJ-A0461P14	F3SJ-A0461N14	50	461
F3SJ-A0479P14	F3SJ-A0479N14	52	479
F3SJ-A0497P14	F3SJ-A0497N14	54	497
F3SJ-A0515P14	F3SJ-A0515N14	56	515
F3SJ-A0533P14	F3SJ-A0533N14	58	533
F3SJ-A0551P14	F3SJ-A0551N14	60	551
F3SJ-A0569P14	F3SJ-A0569N14	62	569
F3SJ-A0587P14	F3SJ-A0587N14	64	587
F3SJ-A0605P14	F3SJ-A0605N14	66	605

Model		No. of Beams	Protective Height (mm)*
PNP Output	NPN Output		
F3SJ-A0623P14	F3SJ-A0623N14	68	623
F3SJ-A0659P14	F3SJ-A0659N14	72	659
F3SJ-A0695P14	F3SJ-A0695N14	76	695
F3SJ-A0731P14	F3SJ-A0731N14	80	731
F3SJ-A0767P14	F3SJ-A0767N14	84	767
F3SJ-A0803P14	F3SJ-A0803N14	88	803
F3SJ-A0839P14	F3SJ-A0839N14	92	839
F3SJ-A0875P14	F3SJ-A0875N14	96	875
F3SJ-A0911P14	F3SJ-A0911N14	100	911
F3SJ-A0983P14	F3SJ-A0983N14	108	983
F3SJ-A1055P14	F3SJ-A1055N14	116	1055
F3SJ-A1127P14	F3SJ-A1127N14	124	1127
F3SJ-A1199P14	F3SJ-A1199N14	132	1199
F3SJ-A1271P14	F3SJ-A1271N14	140	1271
F3SJ-A1343P14	F3SJ-A1343N14	148	1343
F3SJ-A1415P14	F3SJ-A1415N14	156	1415
F3SJ-A1487P14	F3SJ-A1487N14	164	1487
F3SJ-A1559P14	F3SJ-A1559N14	172	1559
F3SJ-A1631P14	F3SJ-A1631N14	180	1631

\*Protective Height (mm)= Total sensor length



# F3SJ-A20 series (15mm gap)

Model		No. of Beams	Protective Height (mm)*
PNP Output	NPN Output		
F3SJ-A0245P20	F3SJ-A0245N20	16	245
F3SJ-A0275P20	F3SJ-A0275N20	18	275
F3SJ-A0305P20	F3SJ-A0305N20	20	305
F3SJ-A0335P20	F3SJ-A0335N20	22	335
F3SJ-A0365P20	F3SJ-A0365N20	24	365
F3SJ-A0395P20	F3SJ-A0395N20	26	395
F3SJ-A0425P20	F3SJ-A0425N20	28	425
F3SJ-A0455P20	F3SJ-A0455N20	30	455
F3SJ-A0485P20	F3SJ-A0485N20	32	485
F3SJ-A0515P20	F3SJ-A0515N20	34	515
F3SJ-A0545P20	F3SJ-A0545N20	36	545
F3SJ-A0575P20	F3SJ-A0575N20	38	575
F3SJ-A0605P20	F3SJ-A0605N20	40	605
F3SJ-A0635P20	F3SJ-A0635N20	42	635
F3SJ-A0665P20	F3SJ-A0665N20	44	665
F3SJ-A0695P20	F3SJ-A0695N20	46	695
F3SJ-A0725P20	F3SJ-A0725N20	48	725
F3SJ-A0755P20	F3SJ-A0755N20	50	755
F3SJ-A0785P20	F3SJ-A0785N20	52	785
F3SJ-A0815P20	F3SJ-A0815N20	54	815
F3SJ-A0845P20	F3SJ-A0845N20	56	845
F3SJ-A0875P20	F3SJ-A0875N20	58	875
F3SJ-A0905P20	F3SJ-A0905N20	60	905
F3SJ-A0935P20	F3SJ-A0935N20	62	935

# F3SJ-A30 series (25mm gap)

Model		No. of Beams	Protective Height (mm)*
PNP Output	NPN Output		
F3SJ-A0245P30	F3SJ-A0245N30	10	245
F3SJ-A0270P30	F3SJ-A0270N30	11	270
F3SJ-A0295P30	F3SJ-A0295N30	12	295
F3SJ-A0320P30	F3SJ-A0320N30	13	320
F3SJ-A0345P30	F3SJ-A0345N30	14	345
F3SJ-A0370P30	F3SJ-A0370N30	15	370
F3SJ-A0395P30	F3SJ-A0395N30	16	395
F3SJ-A0420P30	F3SJ-A0420N30	17	420
F3SJ-A0445P30	F3SJ-A0445N30	18	445
F3SJ-A0470P30	F3SJ-A0470N30	19	470
F3SJ-A0495P30	F3SJ-A0495N30	20	495
F3SJ-A0520P30	F3SJ-A0520N30	21	520
F3SJ-A0545P30	F3SJ-A0545N30	22	545
F3SJ-A0570P30	F3SJ-A0570N30	23	570
F3SJ-A0595P30	F3SJ-A0595N30	24	595
F3SJ-A0620P30	F3SJ-A0620N30	25	620
F3SJ-A0645P30	F3SJ-A0645N30	26	645
F3SJ-A0670P30	F3SJ-A0670N30	27	670
F3SJ-A0695P30	F3SJ-A0695N30	28	695
F3SJ-A0720P30	F3SJ-A0720N30	29	720
F3SJ-A0745P30	F3SJ-A0745N30	30	745
F3SJ-A0770P30	F3SJ-A0770N30	31	770
F3SJ-A0795P30	F3SJ-A0795N30	32	795
F3SJ-A0820P30	F3SJ-A0820N30	33	820
F3SJ-A0845P30	F3SJ-A0845N30	34	845
F3SJ-A0870P30	F3SJ-A0870N30	35	870
F3SJ-A0895P30	F3SJ-A0895N30	36	895

Model		No. of Beams	Protective Height (mm)*
PNP Output	NPN Output		
F3SJ-A0965P20	F3SJ-A0965N20	64	965
F3SJ-A0995P20	F3SJ-A0995N20	66	995
F3SJ-A1025P20	F3SJ-A1025N20	68	1025
F3SJ-A1055P20	F3SJ-A1055N20	70	1055
F3SJ-A1085P20	F3SJ-A1085N20	72	1085
F3SJ-A1115P20	F3SJ-A1115N20	74	1115
F3SJ-A1145P20	F3SJ-A1145N20	76	1145
F3SJ-A1175P20	F3SJ-A1175N20	78	1175
F3SJ-A1205P20	F3SJ-A1205N20	80	1205
F3SJ-A1235P20	F3SJ-A1235N20	82	1235
F3SJ-A1265P20	F3SJ-A1265N20	84	1265
F3SJ-A1325P20	F3SJ-A1325N20	88	1325
F3SJ-A1385P20	F3SJ-A1385N20	92	1385
F3SJ-A1445P20	F3SJ-A1445N20	96	1445
F3SJ-A1505P20	F3SJ-A1505N20	100	1505
F3SJ-A1655P20	F3SJ-A1655N20	110	1655
F3SJ-A1805P20	F3SJ-A1805N20	120	1805
F3SJ-A1955P20	F3SJ-A1955N20	130	1955
F3SJ-A2105P20	F3SJ-A2105N20	140	2105
F3SJ-A2255P20	F3SJ-A2255N20	150	2255
F3SJ-A2405P20	F3SJ-A2405N20	160	2405
F3SJ-A2495P20	F3SJ-A2495N20	166	2495

\*Protective Height (mm)= Total sensor length


Model		No. of Beams	Protective Height (mm)*
PNP Output	NPN Output		
F3SJ-A0920P30	F3SJ-A0920N30	37	920
F3SJ-A0945P30	F3SJ-A0945N30	38	945
F3SJ-A0970P30	F3SJ-A0970N30	39	970
F3SJ-A0995P30	F3SJ-A0995N30	40	995
F3SJ-A1020P30	F3SJ-A1020N30	41	1020
F3SJ-A1045P30	F3SJ-A1045N30	42	1045
F3SJ-A1070P30	F3SJ-A1070N30	43	1070
F3SJ-A1095P30	F3SJ-A1095N30	44	1095
F3SJ-A1120P30	F3SJ-A1120N30	45	1120
F3SJ-A1145P30	F3SJ-A1145N30	46	1145
F3SJ-A1170P30	F3SJ-A1170N30	47	1170
F3SJ-A1195P30	F3SJ-A1195N30	48	1195
F3SJ-A1220P30	F3SJ-A1220N30	49	1220
F3SJ-A1245P30	F3SJ-A1245N30	50	1245
F3SJ-A1270P30	F3SJ-A1270N30	51	1270
F3SJ-A1295P30	F3SJ-A1295N30	52	1295
F3SJ-A1395P30	F3SJ-A1395N30	56	1395
F3SJ-A1495P30	F3SJ-A1495N30	60	1495
F3SJ-A1620P30	F3SJ-A1620N30	65	1620
F3SJ-A1745P30	F3SJ-A1745N30	70	1745
F3SJ-A1870P30	F3SJ-A1870N30	75	1870
F3SJ-A1995P30	F3SJ-A1995N30	80	1995
F3SJ-A2120P30	F3SJ-A2120N30	85	2120
F3SJ-A2245P30	F3SJ-A2245N30	90	2245
F3SJ-A2370P30	F3SJ-A2370N30	95	2370
F3SJ-A2495P30	F3SJ-A2495N30	100	2495

\*Protective Height (mm)= Total sensor length

## Accessories (Sold separately)


### Single-end connector cable (2 cables per set, for emitter and receiver)

For wiring with safety circuit such as single safety relay, safety relay unit, and safety controller

Appearance	Cable Length	Specifications	Model
	3m	M12 connector (8-pin)	F39-JC3A
	7m		F39-JC7A
	10m		F39-JC10A
	15m		F39-JC15A


### Double-end connector cable (2 cables per set, for emitter and receiver)

For connection with F3SP-B1P control unit, and for extension when series-connected (\*)




Appearance	Cable Length	Specifications	Model
	0.5m	M12 connector (8-pin)	F39-JCR5B
	1m		F39-JC1B
	3m		F39-JC3B
	5m		F39-JC5B
	7m		F39-JC7B
	10m		F39-JC10B
	15m		F39-JC15B
	20m		F39-JC20B

\*To extend the cable length under series connection, use F39-JJR3W and F39-JCB in combination.

### Power cable (included with the main unit. 2 cables per set, for emitter and receiver)

Appearance	Cable Length	Model
	0.3m	F39-JJR3K


### Series connection cable (2 cables per set, for emitter and receiver)

Type	Appearance	Cable Length	Model	Application
Series connection cable		0.3m	F39-JJR3W	For series connection *
Extension cable		0.5m to 15m	F39-JC□B	To change series connection length in combination with F39-JJR3W
Series connection cable for adhesion		0.15m	F39-JJR15L	Dedicated series connection cable with minimum length, used in place of the sensor's cable with connector

\*Total cable length of series connection is 0.6m to connect to connector cable of the main sensor unit.  
For series connection with minimum length, use F39-JJR15L.




Safety controller  
(dedicated PNP output type)\*


Type	Appearance	Specifications	Model	Remarks
F3SX Safety Controller *		- Can connect 2 F3SJ's and emergency stop switch - DC semiconductor safety output	F3SX-EL2	For other models and functions, see the catalog for individual items.
		- Can connect 4 F3SJ's and emergency stop switch - DC semiconductor safety output	F3SX-E-L2L2	
		- Can connect 2 F3SJ's and emergency stop switch - Relay output (2A1B)	F3SX-N-L2R	
		- Can connect 4 F3SJ's and emergency stop switch - Relay output (2A1B)	F3SX-N-L2L2R	

\* F3SJ for NPN output type cannot be connected.

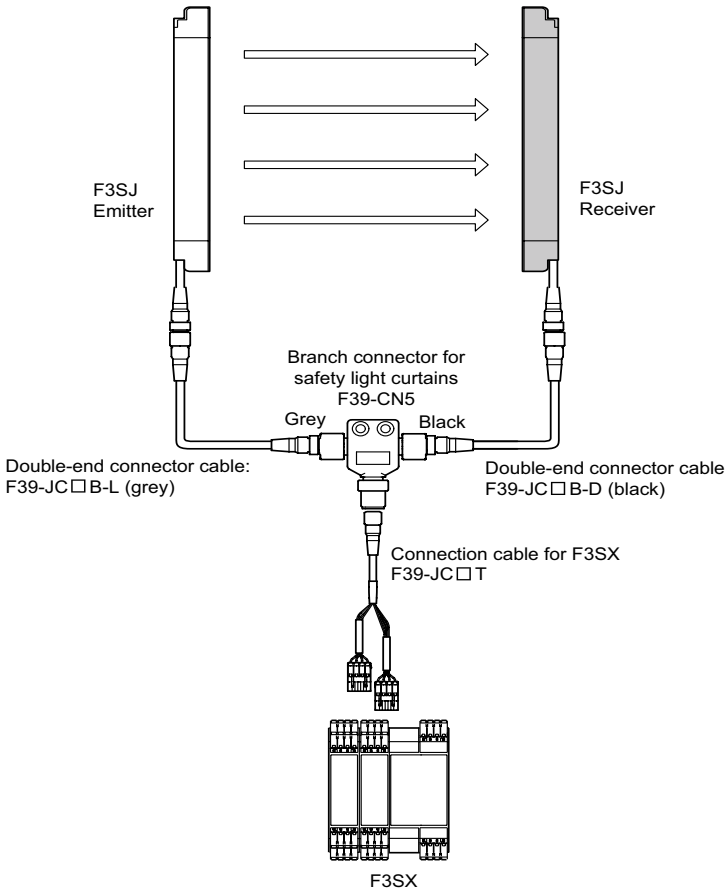
Connection cable for F3SX ( F3SX ↔ F39-CN5)

Appearance	Cable Length	Model
	1m	F39-JC1T
	3m	F39-JC3T
	5m	F39-JC5T
	7m	F39-JC7T
	10m	F39-JC10T
	15m	F39-JC15T



Branch connector for F3SX ( F39-JC□T ↔ F39-JC□B)

Appearance	Model
	F39-CN5

Accessory connection example




## Safety relay

Type	Appearance	Specifications	Model	Remarks
G7SA Safety relay		- Nodes: 4 - Contact type: 2A2B - Rated load for open/close part 250V AC 6A, 30V DC 6A	G7SA-2A2B	For other models and socket types, see the general catalog for safety components.
		- Nodes: 4 - Contact type: 3A1B - Rated load for open/close part 250V AC 6A, 30V DC 6A	G7SA-3A1B	
G7S-E Safety relay		- Nodes: 6 - Contact type: 4A2B - Rated load for open/close part 250V AC 10A, 30V DC 10A	G7S-4A2B-E	
		- Nodes: 6 - Contact type: 3A3B - Rated load for open/close part 250V AC 10A, 30V DC 10A	G7S-3A3B-E	


## Control unit

(dedicated PNP output type)\*

Appearance	Output	Model	Remarks
	Relay, 3a+1b	F3SP-B1P*	For connection with F3SJ-A, use an F39-JC□B double-end connector cable


\* F3SJ for NPN output type cannot be connected.

## Dedicated external indicator set (can be connected to either an emitter or a receiver)

Appearance	Color	Model	Remarks
	Red	F39-A01PR-PAC	Indicator (red), mounting bracket (1 set), and dedicated connection cable (0.1m)
	Green	F39-A01PG-PAC	Indicator (green), mounting bracket (1 set), and dedicated connection cable (0.1m)

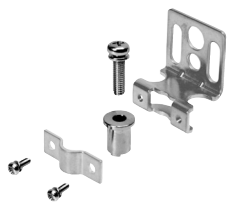




Note. For indication timing (operation mode) see "Rating/Performance" on page 16.

## General external indicator cable


Appearance	Cable Length	Specifications	Model
	3m	Cable to connect top of the main unit and an off-the- shelf external indicator (2-wire)	F39-JJ3N



### Sensor mounting bracket (Sold separately)

Appearance	Specifications	Model	Application	Remarks
	Standard mounting bracket (for top/bottom)	F39-LJ1	(included in the main unit)	2 for emitter, 2 for receiver (total of 4 per set)
	Flat side mounting bracket	F39-LJ2	Use these small-sized brackets when performing side mounting with standard mounting brackets, so that they do not protrude from the detection surface.	2 for emitter, 2 for receiver (total of 4 per set)
	Free-location mounting bracket (to also used as standard intermediate bracket)	F39-LJ3	Use these brackets for mounting on any place without using standard bracket.	1 set with 2 pieces
	Top/bottom mounting bracket B (mounting hole pitch 19mm)	F39-LJ4	Mounting bracket used when replacing existing area sensors (other than F3SN or F3WN) with the F3SJ. For front mounting. Suitable for mounting hole pitch of 18 to 20mm.	2 for emitter, 2 for receiver (total of 4 per set)
	Bracket for replacing short-length F3SN	F39-LJ5	Mounting bracket used when an F3SN with protective height of 300mm or less is replaced by an F3SJ.	2 for emitter, 2 for receiver (total of 4 per set)

### Key cap for muting

Appearance	Model	Remarks
	F39-CN6	Cap attaches to the main unit to enable muting function. Attach it to either an emitter or a receiver.

# Rating/Performance (for details, see instruction manual)

## Main

Model		PNP Output	F3SJ-A□□□□P14	F3SJ-A□□□□P20	F3SJ-A□□□□P30
		NPN Output	F3SJ-A□□□□N14	F3SJ-A□□□□N20	F3SJ-A□□□□N30
Sensor type			Type 4 safety light curtain		
Safety category			Category 4, 3, 2, 1, or B safety applications		
Detection capability			Opaque objects Diameter 14mm	Opaque objects Diameter 20mm	Opaque objects Diameter 30mm
Beam Gap			9mm	15mm	25mm
Number of Beams			26 to 180	16 to 166	10 to 100
Protective Height			245 to 1631mm	245 to 2495mm	245 to 2495mm
Lens Diameter			Diameter 5mm		
Operating Range			0.2 to 9m (protective height 1631mm max.), 0.2 to 7m (protective height 1655mm max.)		
Response Time			ON to OFF: 10ms to 25ms max., OFF to ON: 40ms to 100ms max. (when incidence is stable) For details, see "Response Time" on page 18.		
Startup waiting time			2s max. (2.2s max. for series connection)		
Power voltage			DC24V+/-20%(ripple p-p10% max.)		
Current (no load)	Emitter	Up to 50 beams: 78mA max., 51 to 100 beams: 113mA max., 101 to 150 beams: 140mA max., 151 to 180 beams: 163mA max.			
	Receiver	Up to 50 beams: 66mA max., 51 to 100 beams: 83mA max., 101 to 150 beams: 101mA max., 151 to 180 beams: 118mA max.			
Light Source (Emission LF)			Infrared LED (870nm wavelength)		
Effective Aperture Angle (EAA)			Based on IEC61496-2. Within +/-2.5° for both emitter and receiver when the detection distance is 3m or over		
Safety output (OSSD)	PNP Output	PNP transistor output x 2, load current 300mA max., residual voltage 2V max. (except for voltage drop due to cable extension), allowable capacity load 2.2 micro-F, leak current 1mA max. (This can be different from traditional logic (ON/OFF) because safety circuit is used)			
	NPN Output	NPN transistor output x 2, load current 300mA max., residual voltage 2V max. (except for voltage drop due to cable extension), allowable capacity load 2.2 micro-F, leak current 2mA max. (This can be different from traditional logic (ON/OFF) because safety circuit is used)			
Auxiliary Output 1 (Non-Safety Output)	PNP Output	PNP transistor output x 1, load current 300mA max., residual voltage 2V max. (except for voltage drop due to cable extension), allowable capacity load 2.2 micro-F, leak current 1mA max.			
	NPN Output	NPN transistor output x 1, load current 300mA max., residual voltage 2V max. (except for voltage drop due to cable extension), allowable capacity load 2.2 micro-F, leak current 1mA max.			
External indicator output (Non-Safety Output)			Available indicators - Incandescent lamp: 24VDC, 3 to 7W - LED lamp : Load current 300mA max. Allowable capacity load 2.2 micro-F, leak current 1mA max. (To use an external indicator, an F39-JJ3N universal indicator cable or an F39-A01P□-PAC dedicated external indicator kit is required.)		
Output operation mode	Receiver	Safety outputs 1, 2: ON when receiving light Auxiliary output 1 : Inverse of safety output signals (ON when blocked) External indicator output 1: Inverse of safety output signals for a basic system (ON when blocked) ON (lighted) when muting/override for a muting system			
	Emitter	External indicator output 2: ON (lit) when lock-out for a basic system ON (lit) when muting/override for a muting system			
Input voltage	PNP Output	Test input, interlock selection input, reset input, external device monitor input and muting input are all ON voltage: 9 to 24V (inlet current 3mA max.) OFF voltage : 0 to 1.5V, or open			
	NPN Output	Test input, interlock selection input, reset input, external device monitor input and muting input are all ON voltage: 0 to 1.5V (short-circuit current 3mA max.) OFF voltage : 9 to 24V, or open			

Model	PNP Output	F3SJ-A□□□□P14	F3SJ-A□□□□P20	F3SJ-A□□□□P30
	NPN Output	F3SJ-A□□□□N14	F3SJ-A□□□□N20	F3SJ-A□□□□N30
Internal Indicators	Emitter	Incident light level indicators (green LED x 2, orange LED x 3): ON based on the light intensity Error mode indicators (red LED x 3): Blink to indicate error details Power indicator (green LED x 1): ON while power is on Interlock indicator (yellow LED x 1): ON while under interlock External device monitoring indicator (muting input 1 indicator), test indicator (muting input 2 indicator) (green LED x 2): ON/flash according to function		
	Receiver	Incident light level indicators (green LED x 2, orange LED x 3): ON based on the light intensity Error mode indicators (red LED x 3): Blink to indicate error details OFF output indicator (red LED x 1): ON when safety output is OFF, blinks while under interlock ON output indicator (green LED x 1): ON while safety output is ON muting error indicator, test indicators (green LED x 2: ON/flash according to function)		
Mutual interference prevention function		Interference light prevention algorithm		
Series Connection		Time division emission by series connection - Number of connections: up to 4 sets - Total number of beams: up to 400 beams - Maximum cable length for 2 sets: no longer than 15m (For total cable length, see page 18) - Response time under connection: See page 18		
Test function		- Self test (when power is turned ON and when power is supplied) - External test (emission stop function by test input)		
Safety-related functions		- Start interlock, restart interlock (Unavailable when muting function is used. Only for auto reset mode.) - External device monitor - Muting (Override function included. F39-CN6 key cap for muting is required.)		
Connection type		Connectors (M12, 8-pin)		
Protection circuit		Output short-circuit protection, and power supply reverse polarity protection		
Ambient temperature		During operation: 10 to 55 degrees C (without freezing), During storage: 30 to 70 degrees C		
Ambient humidity		During operation: 35 to 85%RH (no condensation), During storage: 35 to 95%RH		
Operating ambient light intensity		Incandescent lamp: receiving-surface light intensity of 3,000lx max., Sunlight: receiving-surface light intensity of 10,000lx max.		
Insulation resistance		20M ohms or higher (500VDC)		
Dielectric strength voltage		1,000V AC 50/60Hz, 1 min		
Degree of protection		IP65 (IEC60529)		
Vibration resistance		Malfunction: 10 to 55Hz, Multiple amplitude of 0.7mm, 20 sweeps in X, Y, and Z directions		
Shock resistance		Malfunction: 100m/s <sup>2</sup> , 1,000 times each in X, Y, and Z directions		
Connection cable, Series connection cable (F39-JJR15L, F39-JJR3W)		Dia. 6mm 8-wire (0.15mm <sup>2</sup> x 8) with braided shield, allowable bending radius R5mm		
Extension cable (F39-JC□A, F39-JC□B)		Dia. 6.6mm 8-pin (0.3mm <sup>2</sup> x 4P, resistance 0.058 ohm/m), allowable bending radius R36mm (To extend a cable length, use an equivalent or higher-performance cable. Do not place it in the same duct as high-voltage cables or power cables.) For available length for extension (cable extension length), see page 18.		
Material		Casing (including metal parts on both ends): Aluminum, zinc die-cast Cap: ABS resin Optical cover: PMMA resin (acrylic) Cord: Oil resistant PVC		
Weight (packaged)		Calculate using the following equations: (1) For F3SJ-A□□□□P14, weight (g)=(protective height) x 1.7 + a (2) For F3SJ-A□□□□P20/F3SJ-A□□□□P30, weight (g)=(protective height) x 1.5 + a The values for a are as follows: Protected height 245 to 596mm: a = 1,100      protected height 1667 to 2180mm: a = 2,400 Protected height 605 to 1130mm: a = 1,500      protected height 2195 to 2495mm: a = 2,600 Protected height 1136 to 1658mm: a = 2,000		
Accessories		Test rod, instruction manual, top/bottom mounting brackets, intermediate mounting brackets (*), error mode label, User's Manual (CD-ROM) Number of intermediate mounting brackets depends on protective height of F3SJ. - For protective height from 605 to 1130mm: 1 set for each of the emitter and receiver is included - For protective height from 1136 to 1658mm: 2 sets for each of the emitter and receiver are included - For protective height from 1667 to 2180mm: 3 sets for each of the emitter and receiver are included - For protective height from 2195 to 2495mm: 4 sets for each of the emitter and receiver are included		
Applicable standards		IEC61496-1, EN61496-1 type 4ESPE (Electro-Sensitive Protective Equipment) IEC61496-2 type 4 AOPD (Active Opto-electronic Protective Devices) IEC61508 SIL3		



## Response Time

Model	Protected Height (mm)	Number of Beams	Response time ms (ON to OFF)	Response time ms (OFF to ON)
F3SJ-A14 series	245 to 263	26 to 28	11	44
	281 to 389	30 to 42	12	48
	407 to 497	44 to 54	13	52
	515 to 605	56 to 66	14	56
	623 to 731	68 to 80	15	60
	767 to 983	84 to 108	17.5	70
	1055 to 1271	116 to 140	20	80
	1343 to 1559	148 to 172	22.5	90
	1631	180	25	100
F3SJ-A20 series	245	16	10	40
	275 to 425	18 to 28	11	44
	435 to 635	30 to 42	12	48
	665 to 815	44 to 54	13	52
	845 to 995	56 to 66	14	56
	1025 to 1205	68 to 80	15	60
	1235 to 1655	82 to 110	17.5	70
	1805 to 1955	120 to 140	20	80
	2255 to 2495	150 to 166	22.5	90
F3SJ-A30 series	245 to 395	10 to 16	10	40
	420 to 720	17 to 29	11	44
	745 to 1045	30 to 42	12	48
	1070 to 1295	43 to 52	13	52
	1395 to 1620	56 to 65	14	56
	1745 to 1995	70 to 80	15	60
	2120 to 2495	85 to 100	17.5	70

\*Use the following expressions for series connection.

For 2-set series connection:

Response time (ON to OFF): Response time of the 1st unit + Response time of the 2nd unit - 1 (ms)

Response time (OFF to ON): Response time calculated by the above x 4 (ms)

For 3-set series connection:

Response time (ON to OFF): Response time of the 1st unit + Response time of the 2nd unit - 5 (ms)

Response time (OFF to ON): Response time calculated by the above x 5 (ms)

For 4-set series connection:

Response time (ON to OFF): Response time of the 1st unit + Response time of the 2nd unit + Response time of the 3rd unit + Response time of the 4th unit - 8 (ms)

Response time (OFF to ON): Response time calculated by the above x 5 (ms)

## Cable extension length

Total cable extension length, including series connection cables, must be no greater than the lengths described below.

(Unit: m)

Condition	1 set		2 sets		3 sets		4 sets	
	PNP Output	NPN Output	PNP Output	NPN Output	PNP Output	NPN Output	PNP Output	NPN Output
Using incandescent lamp for auxiliary output and external indicator output	45	30	40	30	30	30	20	20
Not using incandescent lamp	100	30	60	30	45	30	30	30

Note. Cable lengths are different when connecting with an F3SP-B1P control unit. For details, see the F3SJ instruction manual.

## Accessories

### Control unit

Item	Model	F3SP-B1P
Applicable sensor		F3SJ-A (Only for PNP output type)*
Source Voltage		DC24V+/-10%
Power Consumption		DC1.7W max. (not including sensor's consumption current)
Operation Time		100ms max. (not including sensor's response time)
Response Time		10ms max. (not including sensor's response time)
Relay Output	Number of contacts	3a+1b
	Rated load	AC25V 5A(cos phi = 1), DC30V 5A L/R = 0ms
	Rated Current	5A
Connection type	Between sensors	M12 connector (8-pin)
	Others	Terminal board
Weight (packaged)		Approx. 280g
Accessories		Instruction manual

\* NPN output type cannot be connected.

### Large indicator set

Item	Model	F39-A01PR-PAC	F39-A01PG-PAC
Applicable sensor		F3SJ-A (Common for PNP/NPN output type. Can be attached to emitters and/or receivers)	
Light Source		Red LED	Green LED
Source Voltage		DC24V+/-10% (supplied by sensor)	
Consumption Current		50mA max. (supplied by sensor)	
Connection type		Dedicated accessory connector cable (Sensor side: Dedicated 10-pin connector, Indicator side: M12 8-pin connector)	
Set contents		Indicator (red), Dedicated connector cable (0.1m), Dedicated mounting brackets (1 for each)	Indicator (green), Dedicated connector cable (0.1m), Dedicated mounting brackets (1 for each)

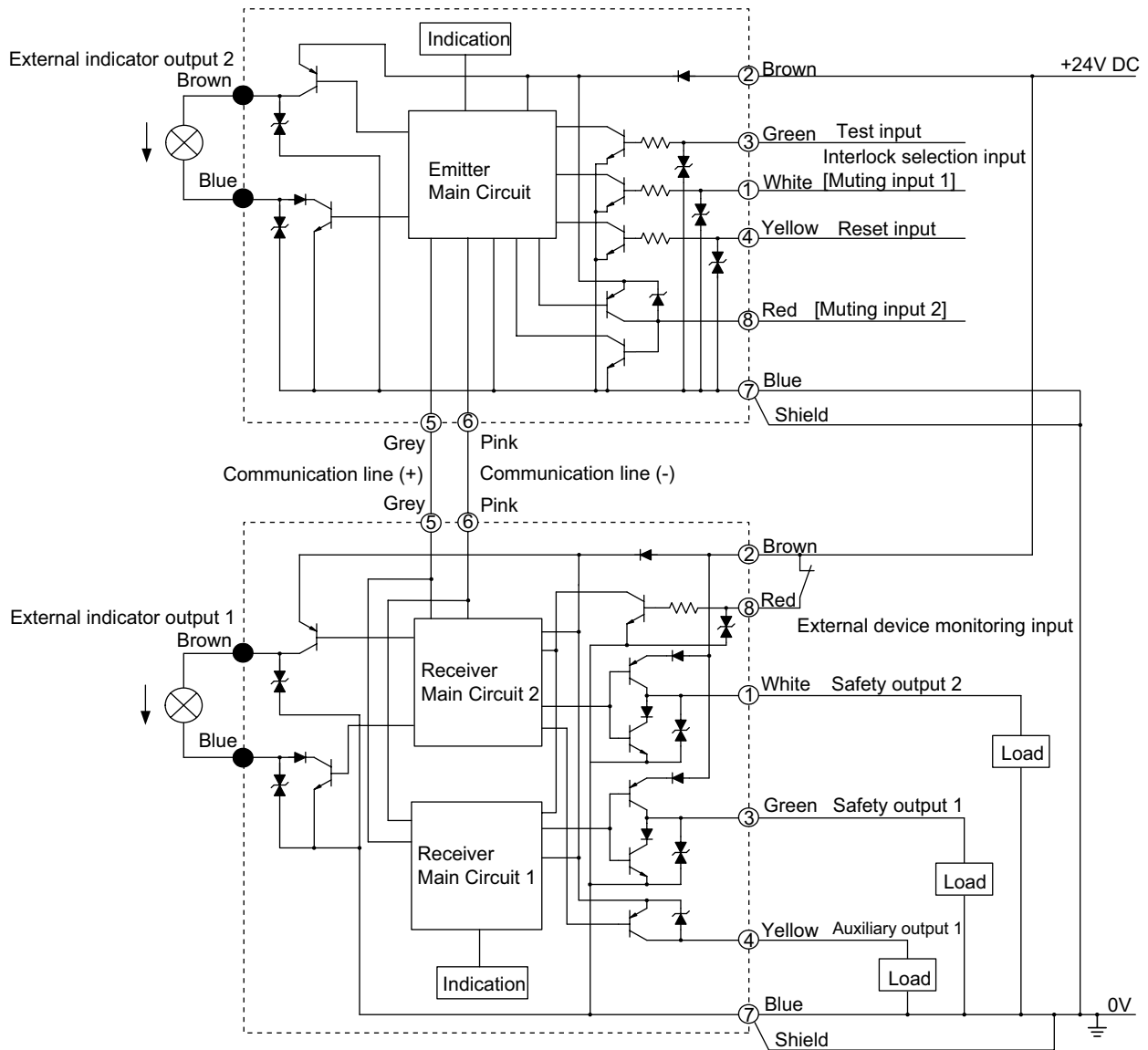
# Input/Output Circuit Diagram

## PNP output type

The numbers in white circles indicate the connector's pin numbers.

The black circles indicate connectors for series connection.

The words in brackets ( [ ] ) indicate the signal name for muting system.



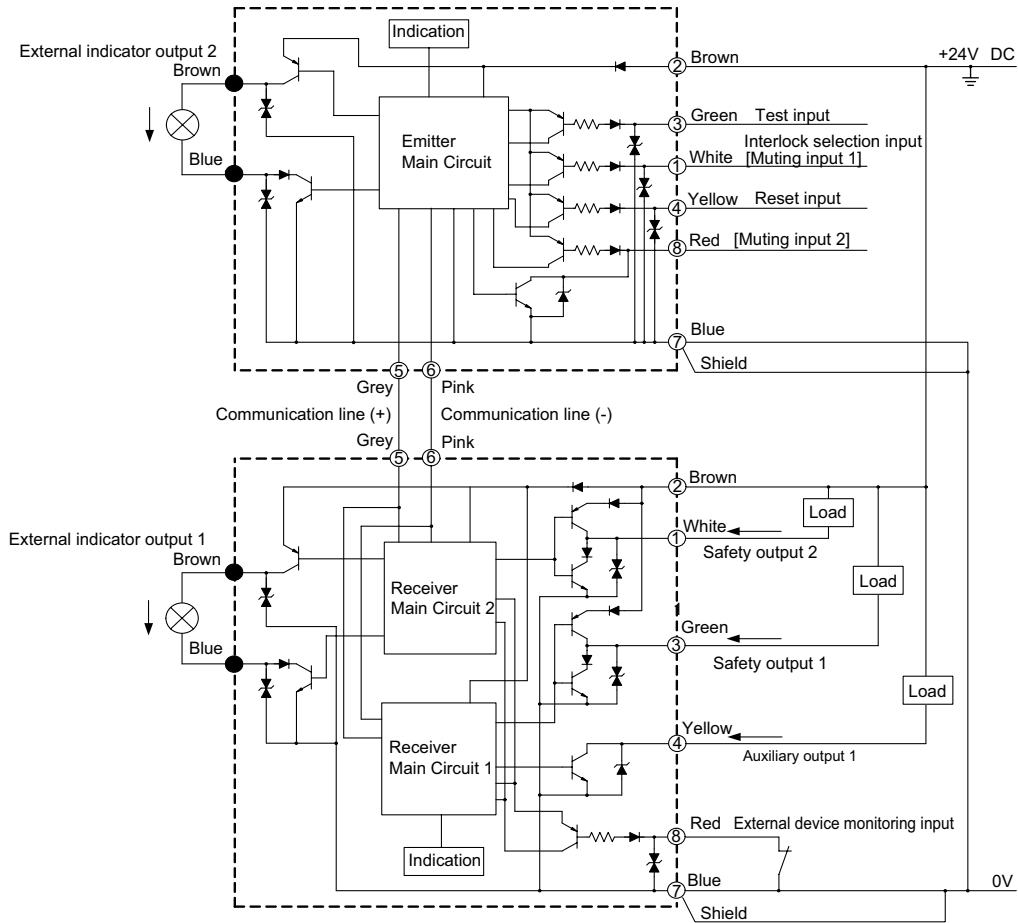


### NPN output type

The numbers in white circles indicate the connector's pin numbers.

The black circles indicate connectors for series connection.

The words in brackets ([ ]) indicate the signal name for muting system.



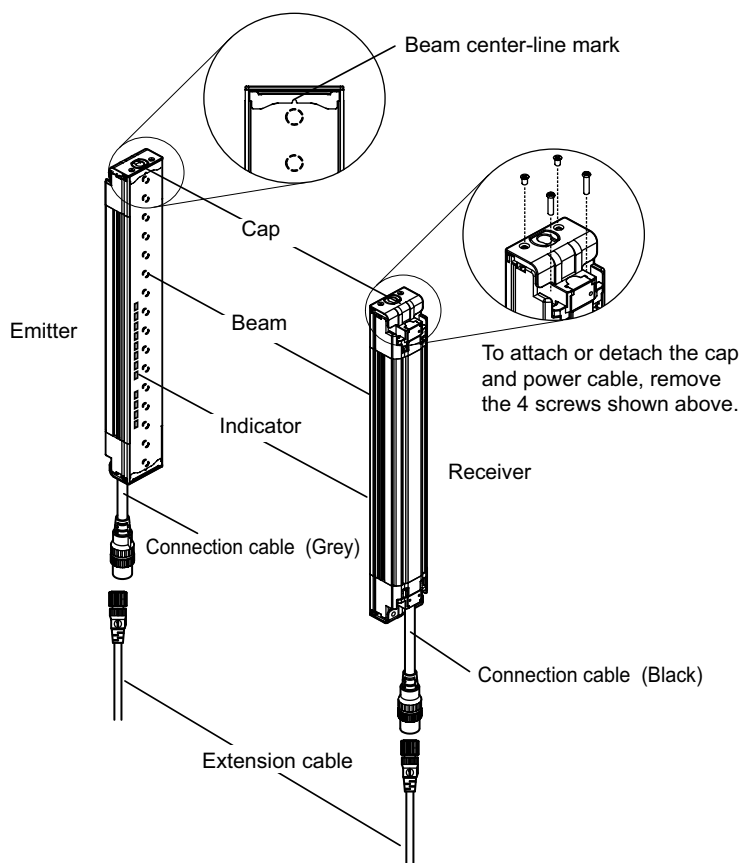
### Single-end connector cable

Model	Internal wiring	Pin No.	Wire color	Signal Name			
				Basic system *		Muting system *	
				Receiver	Emitter	Receiver	Emitter
F39 -JC3A(3m) F39 -JC7A(7m) F39 -JC10A(10m) F39 -JC15A(15m)		(1)	White	Safety output 2	Interlock selection input	Safety output 2	Muting input 1
		(2)	Brown	+24VDC	+24VDC	+24VDC	+24VDC
		(3)	Green	Safety output 1	Test Input	Safety output 1	Test Input
		(4)	Yellow	Auxiliary Output 1	Reset input	Auxiliary Output 1	Reset input
		(5)	Gray	Communication line (+)	Communication line (+)	Communication line (+)	Communication line (+)
		(6)	Pink	Communication line (-)	Communication line (-)	Communication line (-)	Communication line (-)
		(7)	Blue	0V	0V	0V	0V
		(8)	Red	External device monitoring input	N.C	External device monitoring input	Muting input 2

\* Basic system indicates a system with default factory settings.  
Muting system indicates a system attached with a muting keycap (F39-CN6) to enable muting function.

# Name of Parts

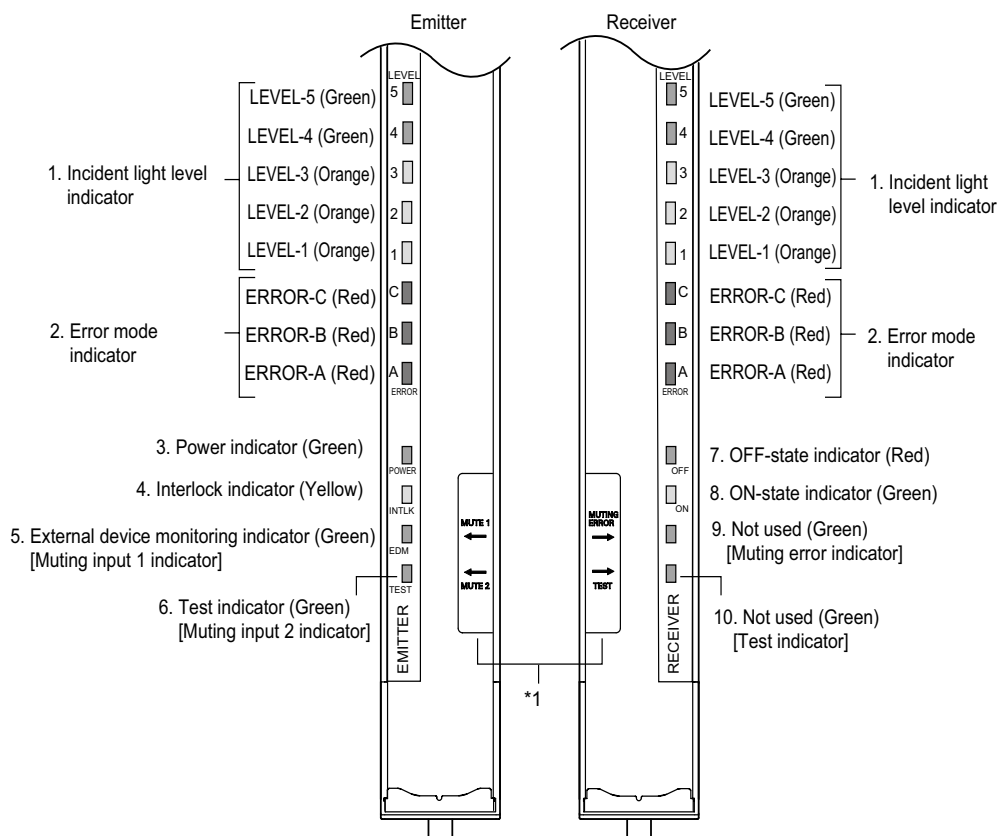
## Main unit and cables



Component		Model	Description
Emitter, receiver		F3SJ-A□□□□P□□ or F3SJ-A□□□□N□□	<p>Select a type name based on the required protective height and detection capability. (Cap and power cable are included) The type name can be understood as follows: F3SJ-A□□□□P□□-□</p> <p style="text-align: center;"> <span style="margin-right: 20px;">1</span> <span style="margin-right: 20px;">2</span> <span style="margin-right: 20px;">3</span> <span>4</span> </p> <p>1: Protective height (mm) 2: Output type (P=PNP output type, N=NPN output type) 3: Diameter of detection capability (mm) 4: L is emitter, D is receiver, and a blank is emitter/receiver set</p>
Extension cable	Single-end connector cable 	F39-JC□A	This extension cable is used to connect to a terminal block controller (e.g. F3SX, G9SA, G9SB, G9SX) or to a safety processing system (e.g. DeviceNet safety).
	Double-end connector cable 	F39-JC□B	This extension cable is used when the length of the connection cable is insufficient, or when connecting to an F3SP-B1P controller. The length can be specified.

# Internal Indicators

## Total view





The words in brackets ([ ]) represent the indicator name for the muting system.































No.	Internal Indicators	Description	
		For basic system	For muting system
1	Incident light level indicator (LEVEL-1 to 5) (refer to 24)	Indication status of LEVEL-1 to 5 shows the incident light level status of the F3SJ.	
2	Error mode indicator (ERROR-A to C) (refer to 24)	Turns ON or blinks only on the sensor where the error occurred when the F3SJ enters lockout. The error mode indicators turn OFF on sensors (emitters or receivers) where an error did not occur, or on other series-connected sensors. The indication status of ERROR-A to C shows the cause of the error. Affix the error mode label (included) near the F3SJ to allow for quick troubleshooting when errors occur.	
3	Power indicator (POWER)	Turns ON while the power is ON.	
4	Interlock indicator (INTLK)	ON	Turns ON when F3SJ is in interlock state.
		Blinking	Blinks when under lockout.
5	External device monitoring indicator (EDM)	ON	Turns ON when an input is given to external device monitoring input.
	Muting input 1 indicator (MUTE1)	Blinking	Not used
6	Test indicator (TEST)	ON	Turns ON when an input is given to muting input 1.
	Muting input 2 indicator (MUTE2)	Blinking	Not used
7	OFF output indicator (OFF)	ON	Turns ON when control output is OFF.
		Blinking	Blinks when under lockout.
8	ON output indicator (ON)	Turns ON when safety output is ON.	
9	Muting error indicator (MUTING ERR)	ON	Turns ON when a muting error occurs.
		Blinking	Not used
10	Test indicator (TEST)	ON	Not used
		Blinking	Blinks when external test is being performed.

\*This label is included with the F39-CN6 key cap for muting. Affix the label when the muting function is used.



## Indication patterns and incident light levels of the incident light level indicator (LEVEL-1 to 5)


































   
 ON OFF

1	2	3	4	5	Incident light level
					170% or higher of safety output ON level
					From 130 to 170% of safety output ON level
					From 100 to 130% of safety output ON level
					From 75 to 100% of safety output ON level
					From 50 to 75% of safety output ON level
					Less than 50% of safety output ON level

Note.Operation is possible with incident light level of 100% or more, but to ensure stability, operate when at least 5 of the indication lamps are ON.

## Error mode indication patterns and cause of errors(ERROR-A to C)

    
 OFF Blinking ON

A	B	C	Cause of error
			Incorrect wiring or breakage of interlock selection input line or reset input line.
			Relay is welded or recovery time is too long. Incorrect wiring or breakage of external device monitoring line
			Incorrect wiring of safety output 1 or 2. Failure of safety output circuit.
			Incorrect wiring or breakage of series connection cable.
			Effect of noise. Failure of F3SJ internal circuit.
			Breakage or incorrect wiring of communication line. Disconnected series connection cable or other failure.
			Mutual interference or disturbance light.
			Emitter and receiver have different F3SJ type names or number of series connections.
			Muting wiring failure.
			Cap is not attached. F3SJ internal circuit failure.
			Power supply voltage of F3SJ is out of the rated range. Insufficient current capacity of power supply.

# Safety-related functions

## Interlock Function

The F3SJ turns the safety outputs OFF when the power is turned ON or when a beam is blocked, and maintains this state until a reset signal is applied. This state is called "interlock".

You can reset this interlock by 2 methods; "auto reset that automatically turns safety output ON when an interrupting object is removed" and "manual reset mode that keeps safety output OFF until a reset signal is provided if the interrupting object is removed".

### Auto Reset

When an interrupting object is removed, safety output automatically turns ON. Auto reset is used on machines where a worker is not able to enter the area between the detection zone and the hazardous part of the machine.

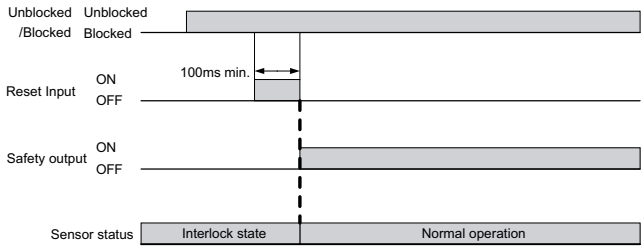
Note.Auto reset is always used when muting function is used.

Auto reset wiring procedure:

For PNP output	For NPN output
1. Open the interlock selection input line, or short-circuit it to 0 to 1.5V (pin 1/white).	1. Open the interlock selection input line, or short-circuit it to 9 to 24V (pin 1/white).
2. Short-circuit the reset input line to 9 to 24V (pin 4/yellow).	2. Short-circuit the reset input line to 0 to 1.5V (pin 4/yellow).
3. Turn ON the power of F3SJ.	3. Turn ON the power of F3SJ.

### Manual reset

When a reset input is given while no interrupting object exists in a detection zone, the safety outputs turn ON. This allows the machine to be manually reset using a reset switch after ensuring safety, preventing unexpected startup.



A sensor enters interlock state when:

- The power is turned ON (start interlock). This is useful if you want to keep the machine stopped until start inspection is completed after the power is turned ON.
- F3SJ is blocked (restart interlock). After F3SJ is blocked and the machine stops, the machine can be restarted after safety is ensured.

Manual reset wiring procedure:

For PNP output	For NPN output
1. Connect the interlock selection input line to 9 to 24V (pin 1/white).	1. Connect the interlock selection input line to 0 to 1.5V (pin 1/white).
2. Connect the reset input line to 9 to 24V via the reset switch (a-contact) (pin 4/yellow)	2. Connect the reset input line to 0 to 1.5V via the reset switch (a-contact) (pin 4/yellow)
3. Keep the reset switch contact open, and turn the power of F3SJ ON.	3. Keep the reset switch contact open, and turn the power of F3SJ ON.

To reset:

For PNP output	For NPN output
1. Apply voltage of 9 to 24V for 100ms or longer to the reset input line, and set it open or to 0 to 1.5V.	1. Apply voltage of 0 to 1.5V for 100ms or longer to the reset input line, and set it open or to 9 to 24V.

Note.Install the reset switch outside the hazardous area, where the operator can clearly see the hazardous area.

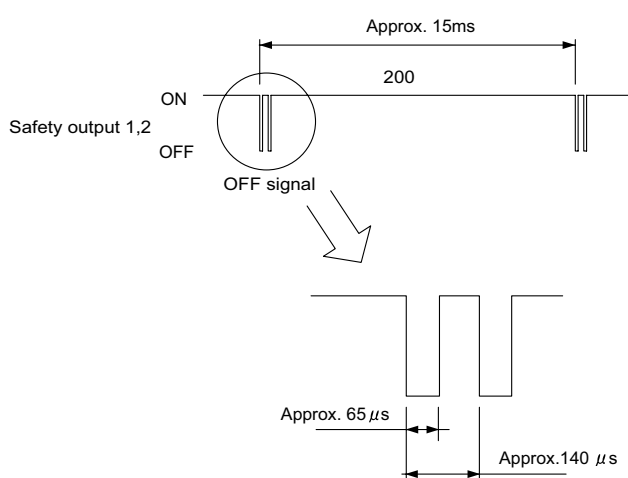
## Diagnosis Function

### Self-Test Function

A self-test is performed to check for errors when the power is turned ON (within 2 seconds / within 2.2 seconds when series connected). Also, the self-test is regularly performed (within the response time) while operating.

### Waveform of safety outputs

When the F3SJ is receiving light, the safety outputs cyclically turn OFF as shown below to test the output circuit. When this OFF signal is fed back, the output circuit is diagnosed as normal. If the output signal does not include an OFF pulse signal, the receiver determines that a failure has occurred with the output circuit or wiring, and enters lockout state. (See table below)



### External Test Function

This function performs a test to ensure that the safety system stops properly when the F3SJ is blocked, by using an external signal to forcibly stop emission.

### Lockout

If an error is found in the self-test, the sensor enters lockout state, keeps the safety output in the OFF state, and indicates the error at the same time.

### Resetting Lockout

When a cause of lockout is removed, you can release the lockout by using either of the following methods.

- Cycle the power back ON
- Reset input (except for lockout due to a communication error or wiring failure)

[For PNP output]

After manual reset, apply voltage of 9 to 24V for 100ms or longer to the reset input line, and set it open or apply 0 to 1.5V. After auto reset, apply voltage of 0 to 1.5V for 100ms or longer to the reset input line, and set it open or apply 9 to 24V.

[For NPN output]

After manual reset, apply voltage of 0 to 1.5V for 100ms or longer to the reset input line, and set it open or apply 9 to 24V. After auto reset, apply voltage of 9 to 24V for 100ms or longer to the reset input line, and set it open or apply 0 to 1.5V.

### External device monitoring function

This function detects malfunctions, such as welded contacts in external relays (or contactors) that control the hazardous area of a machine.

This function constantly monitors that a specified voltage is applied to the receiver's external device monitoring input line, and enters lockout state when an error occurs. The relay's operational delay can be up to 300ms without being evaluated as an error.

For example, if a specified voltage is not applied to the external device monitoring line because the normally closed (NC) contact is not closed within 300ms after the safety outputs turn from ON to OFF, it is evaluated as an error and enters a lockout state.

To utilize this function properly, use safety relays and contactors that have forcibly guided or mechanically linked contact structure.

## Other functions

### Auxiliary Output (Non-Safety Output)

The auxiliary output is used to monitor the status of the F3SJ. This output can be connected to a device such as a relay, indication lamp, programmable controller, etc.

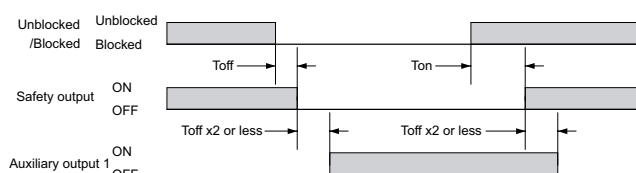
Its operation mode is inverse of safety output signals

### Warning

Do not use the auxiliary output or external indicator output for safety applications.

Failure of these outputs may result in serious injury.

Note1. Auxiliary output 1 is load current 300mA max.  
2. Timing is shown in the diagram below.



Toff: Response time of safety output's ON to OFF, Ton: Response time of safety output's OFF to ON



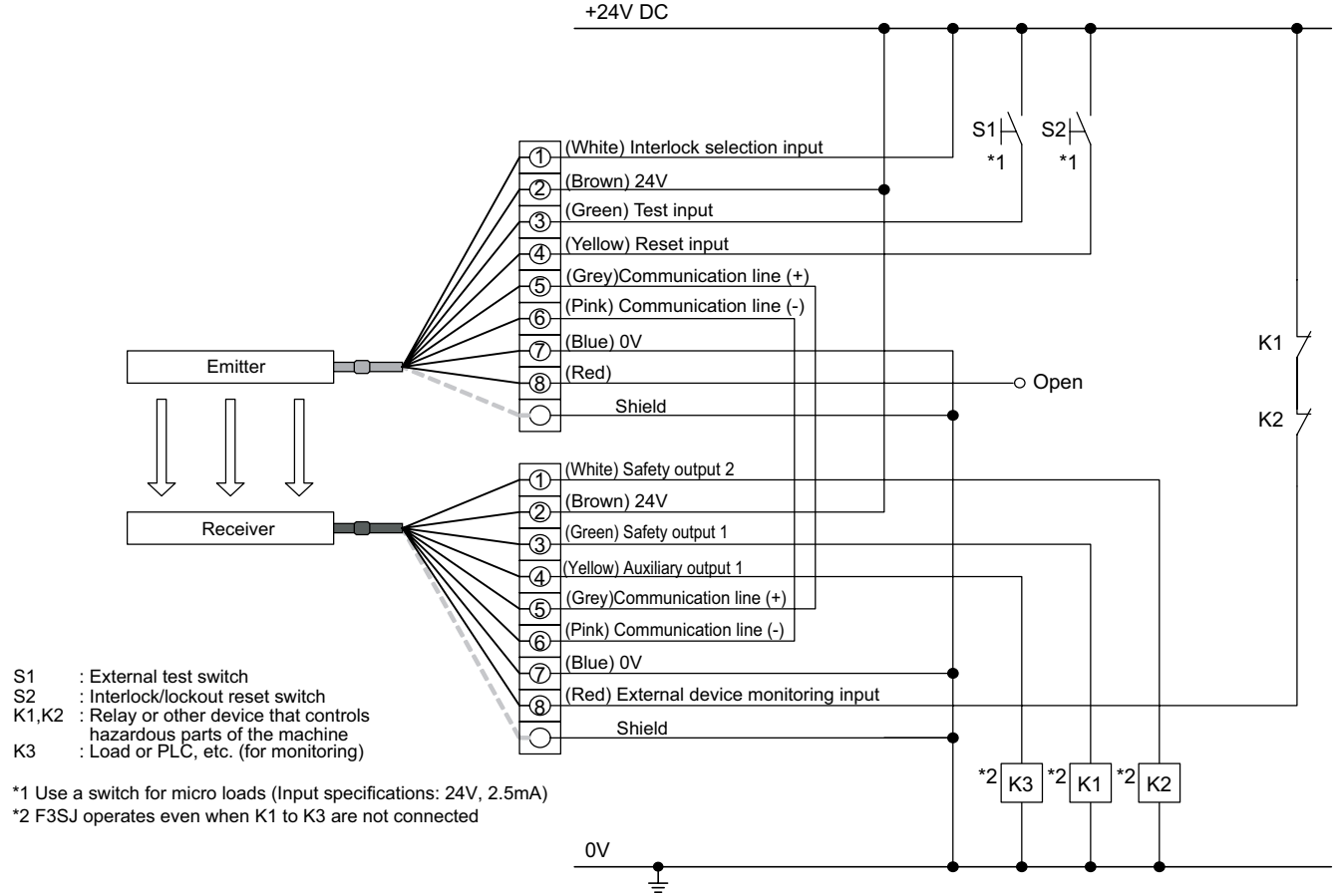
# System Configuration and Connection (Basic System)

"Basic system" refers to the F3SJ with its default factory settings. The basic system provides basic safety light curtain functions. Most functions can be used without performing additional configuration.

## Basic Connection

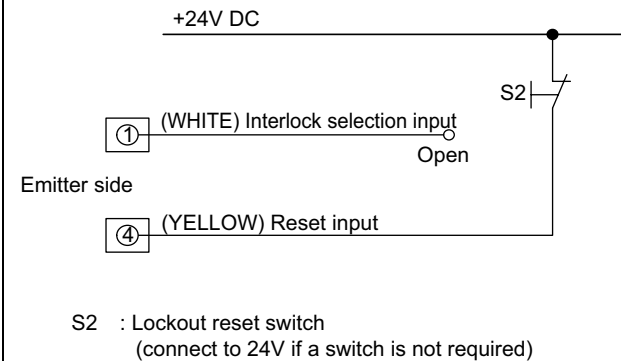
For PNP output (See page 29 for NPN output wiring.)

Wiring when using manual reset mode, external device monitoring

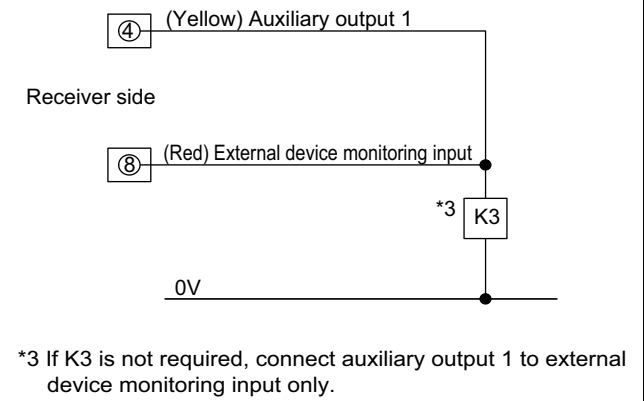


### Wiring for auto reset mode

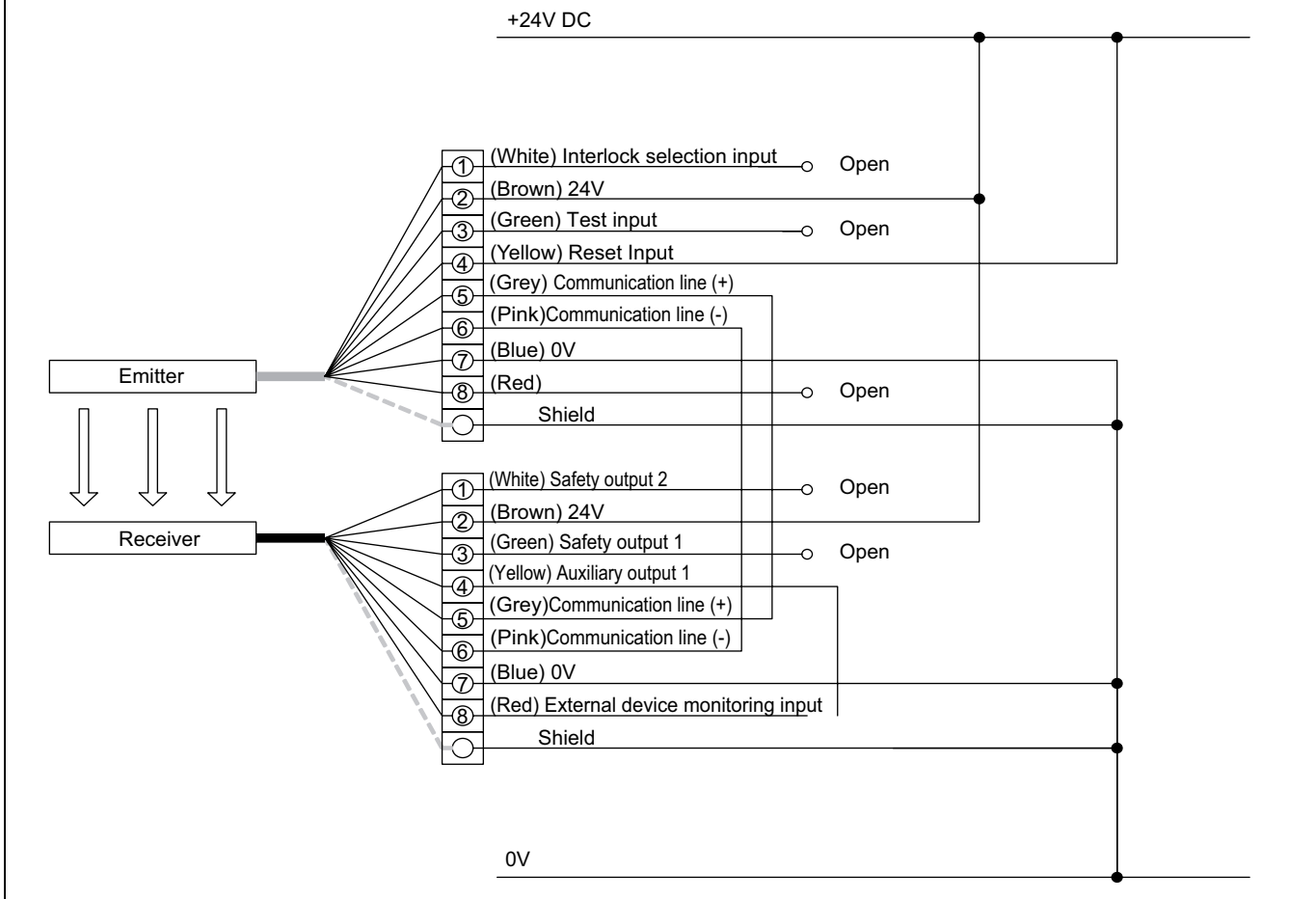
Wiring the emitter's circuit as shown below provides auto reset mode.



Wiring when external device monitoring function is not used  
Disable the external device monitoring function by connecting auxiliary output 1 and the external device monitoring input as shown in the diagram below.

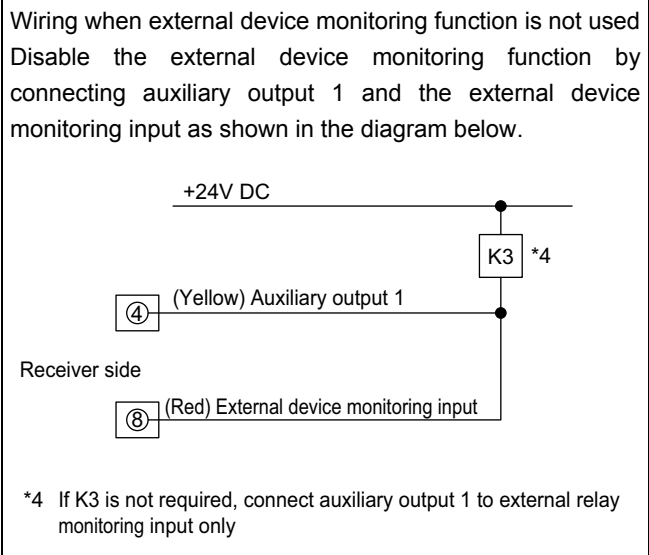
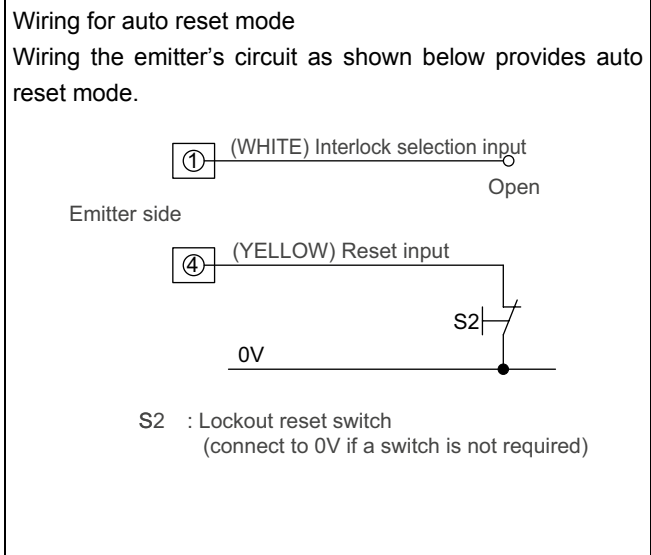
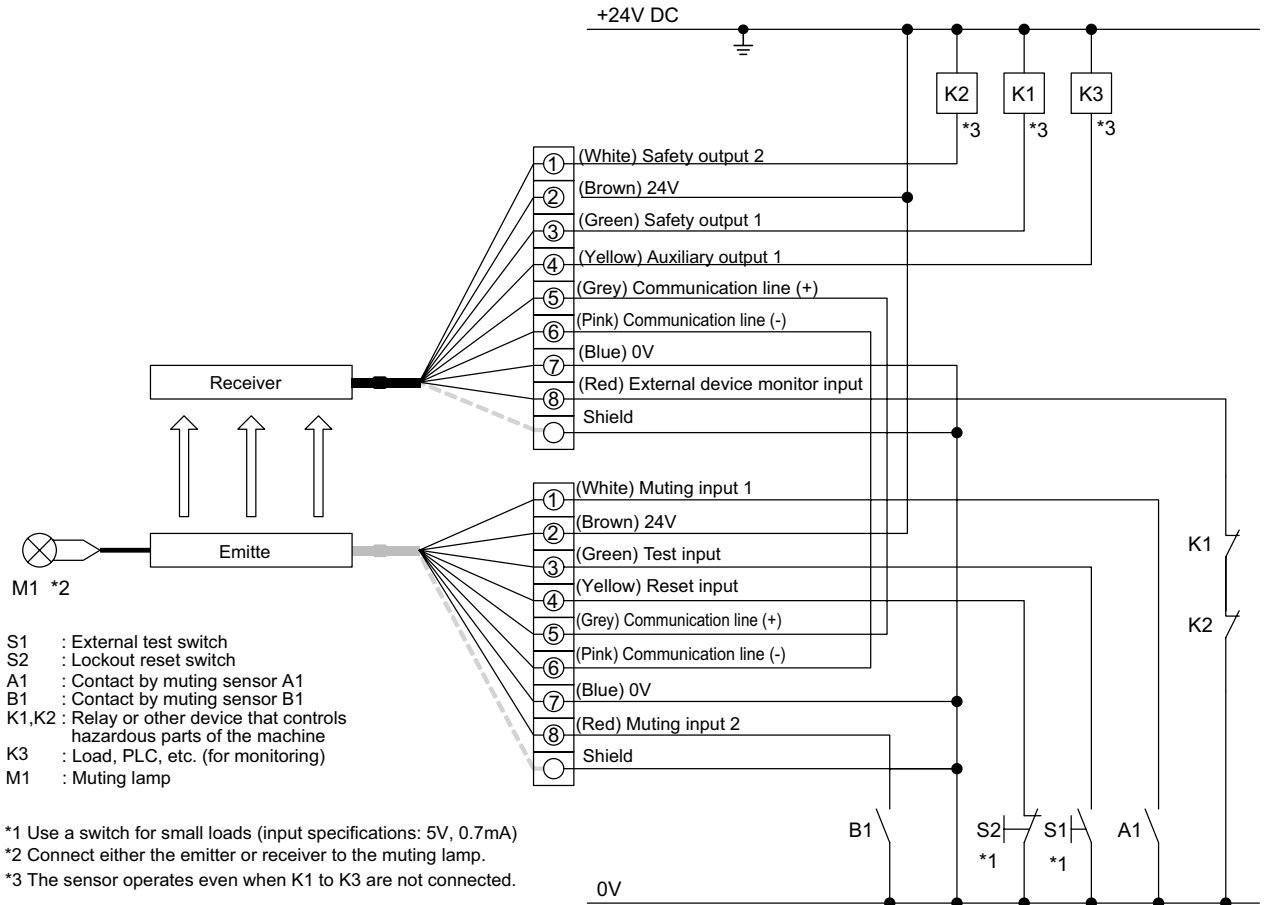


Ref.: Minimum wiring required to check the operation of the F3SJ  
(Wiring for auto reset mode and deactivated external device monitoring)



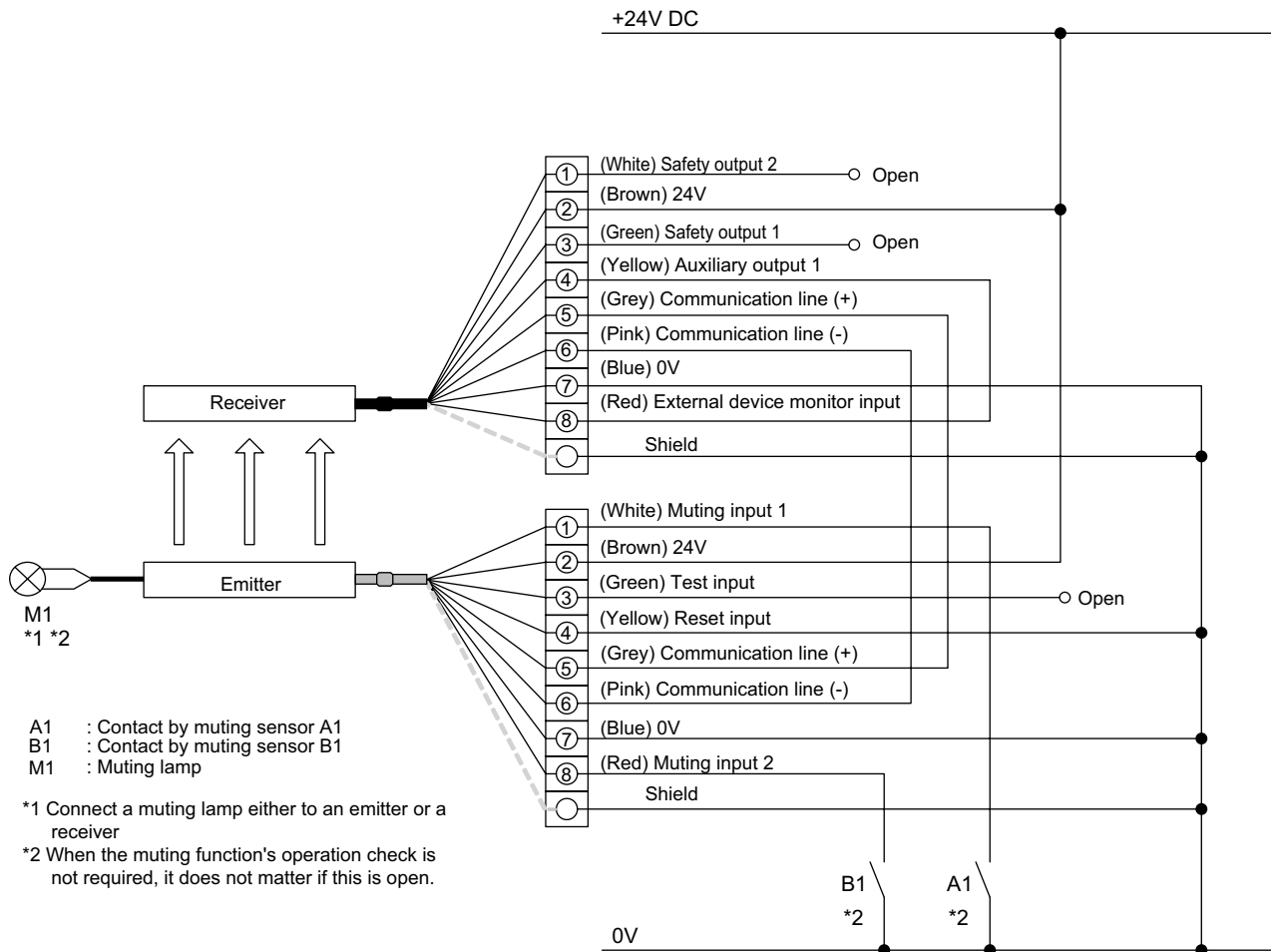
For NPN output (See page 27 for PNP output wiring.)

Wiring when using manual reset mode, external device monitoring



Ref.: Minimum wiring required to check the operation of the F3SJ

(Wiring for auto reset mode and deactivated external device monitoring)



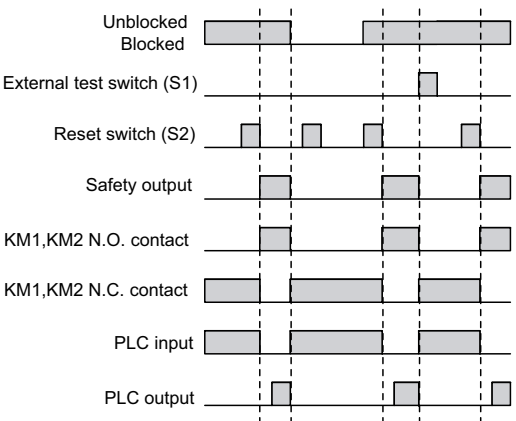
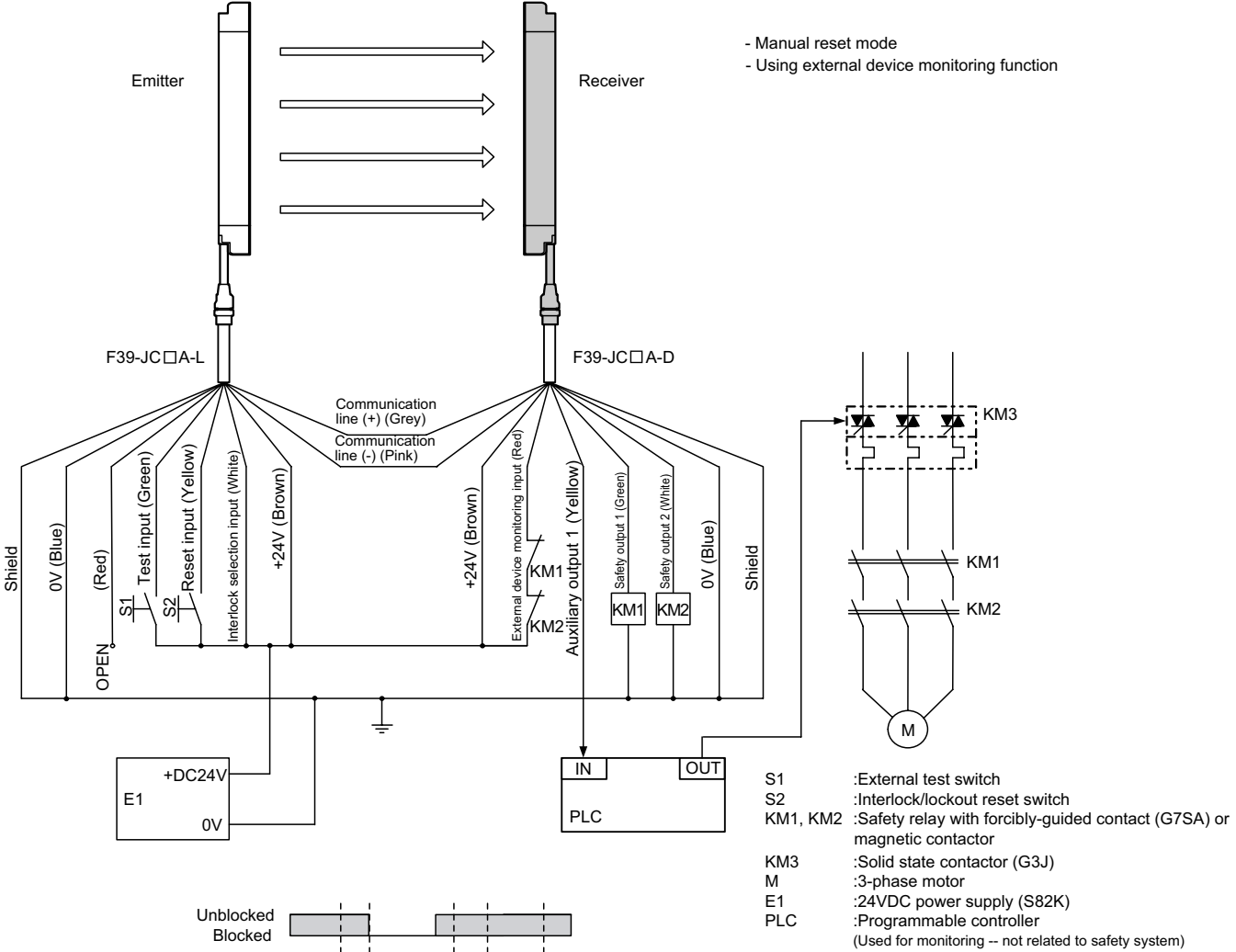


# Examples of Safety Circuits

For PNP output (See page 36 for NPN output wiring.)

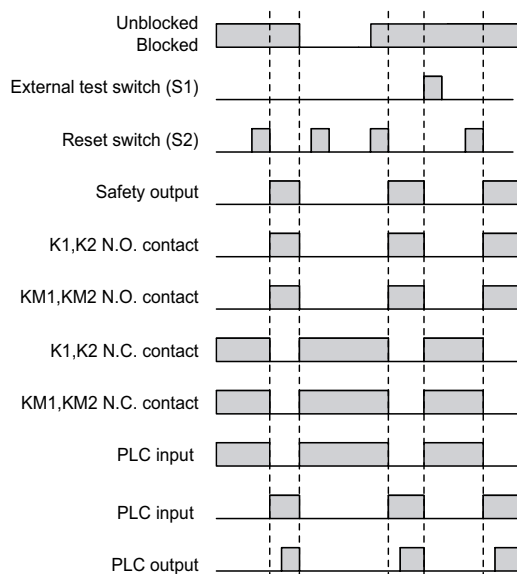
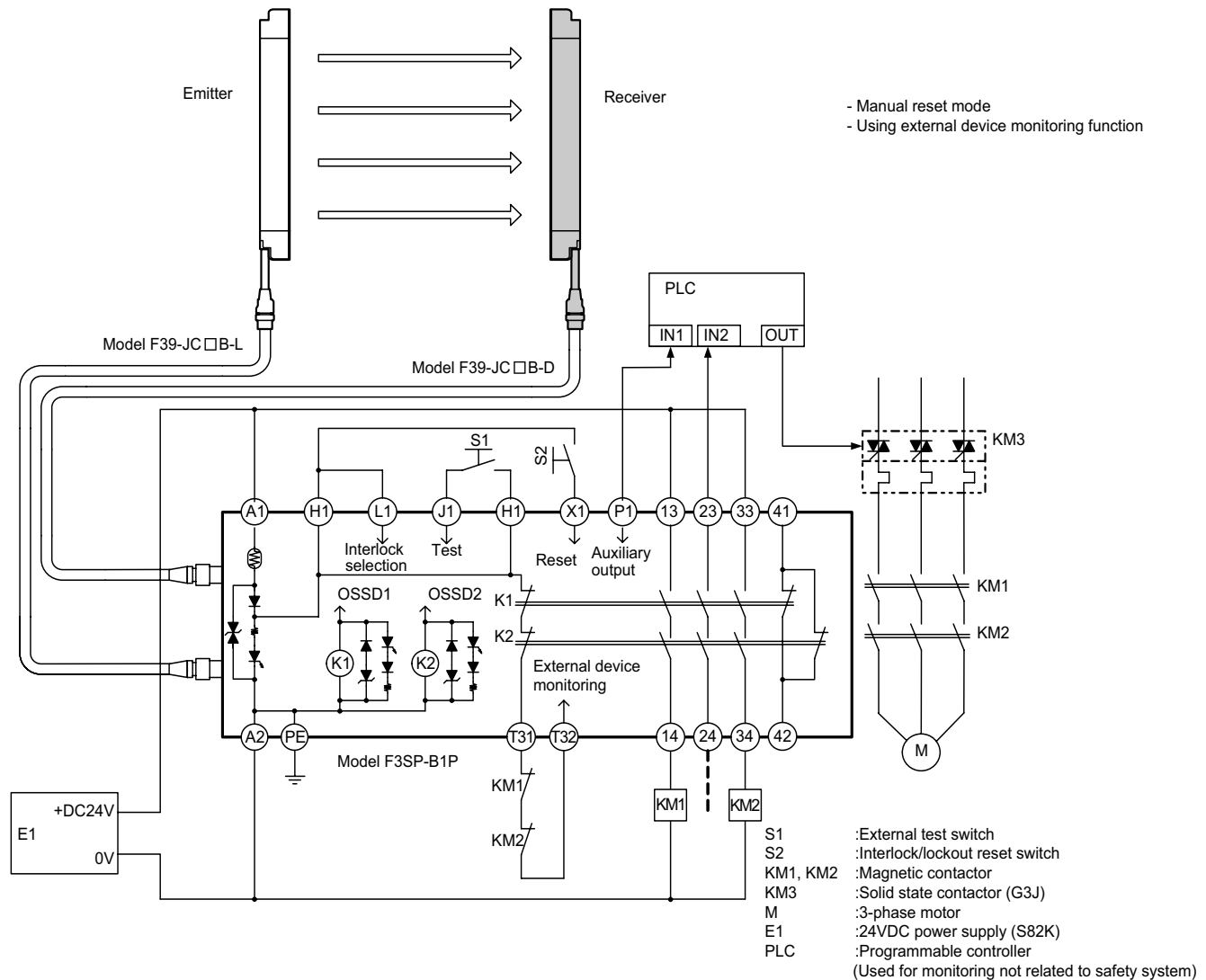
Wiring for single F3SJ application (category 4)

- F3SJ can detect welded relays by itself
- Use of welded relay contact detection and interlock is possible without a controller or relay unit



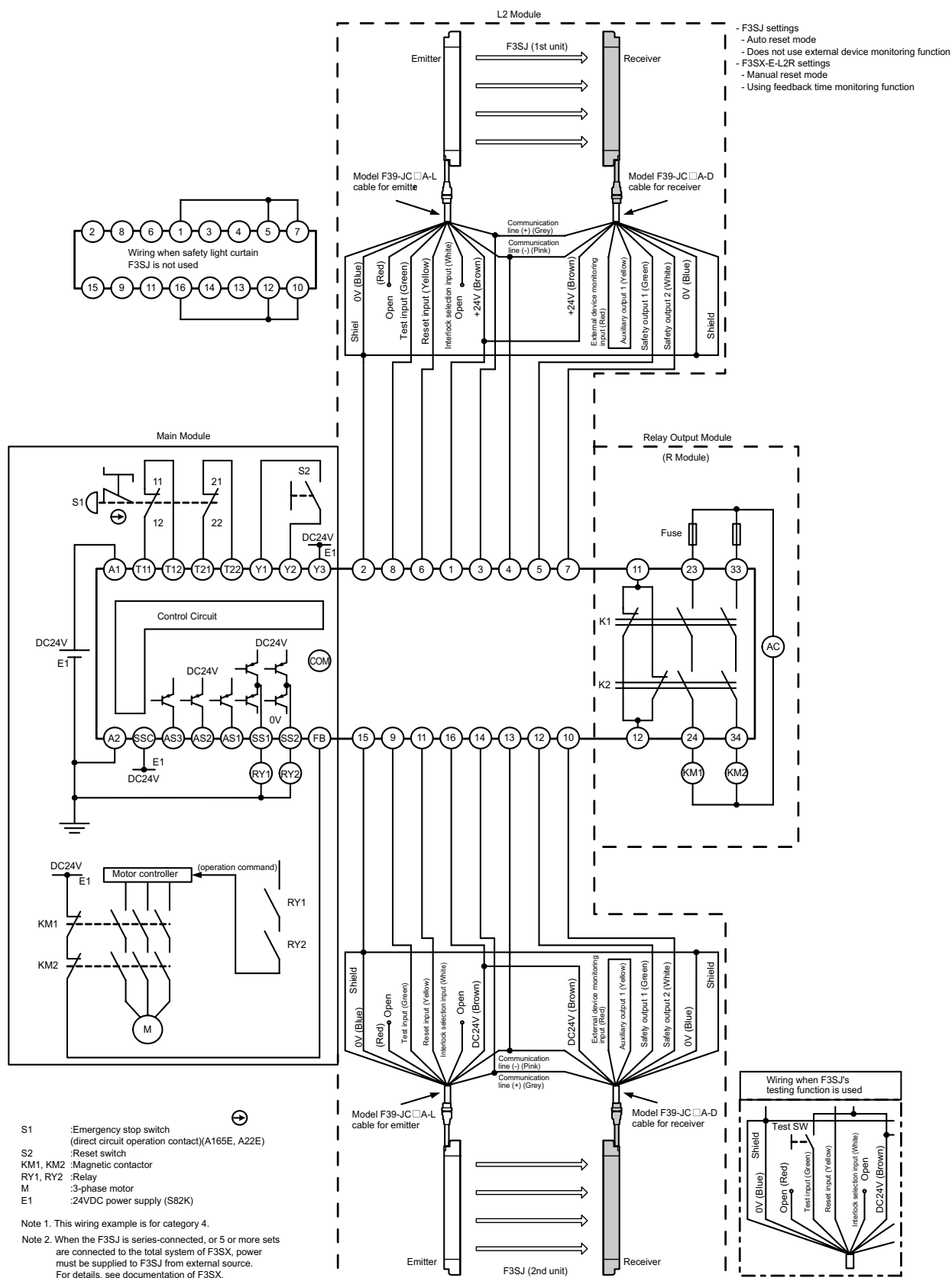
# Wiring for connection with a controller F3SP-B1P (category 4)

- Reduced wiring due to connector connection
- Safety relay included



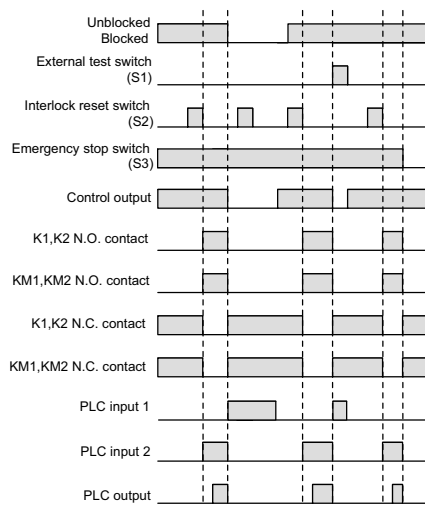
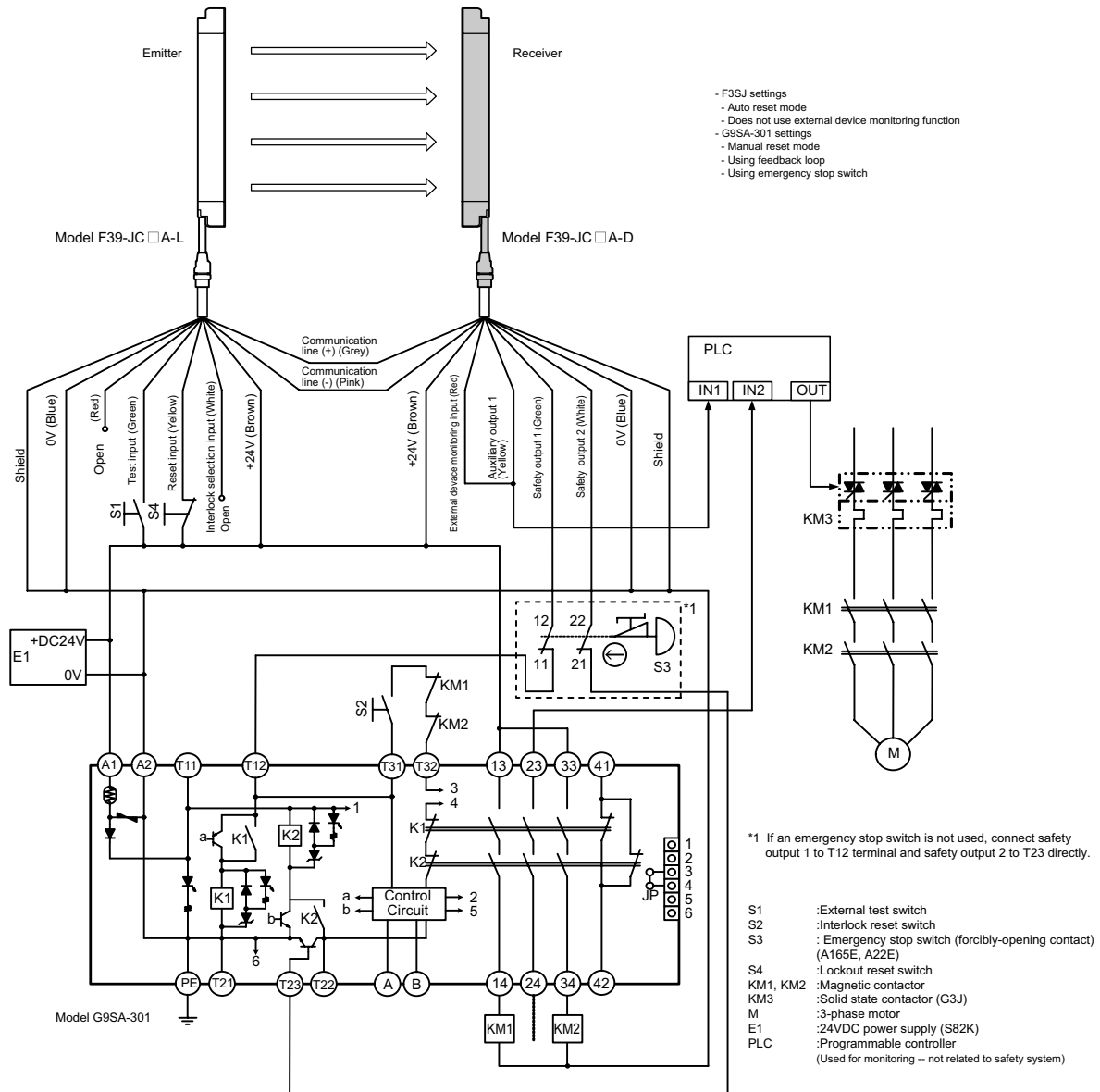
# Wiring for connection with a controller F3SX-E-L2R (category 4)

- Emergency stop switch can be connected
- Door switch, two hand control, single beam, or relay unit can be used in combination with F3SX
- Various settings can be changed and input/output terminals can be monitored using the setting support software for F3SX



## Wiring for connection with a controller G9SA-301 (category 4)

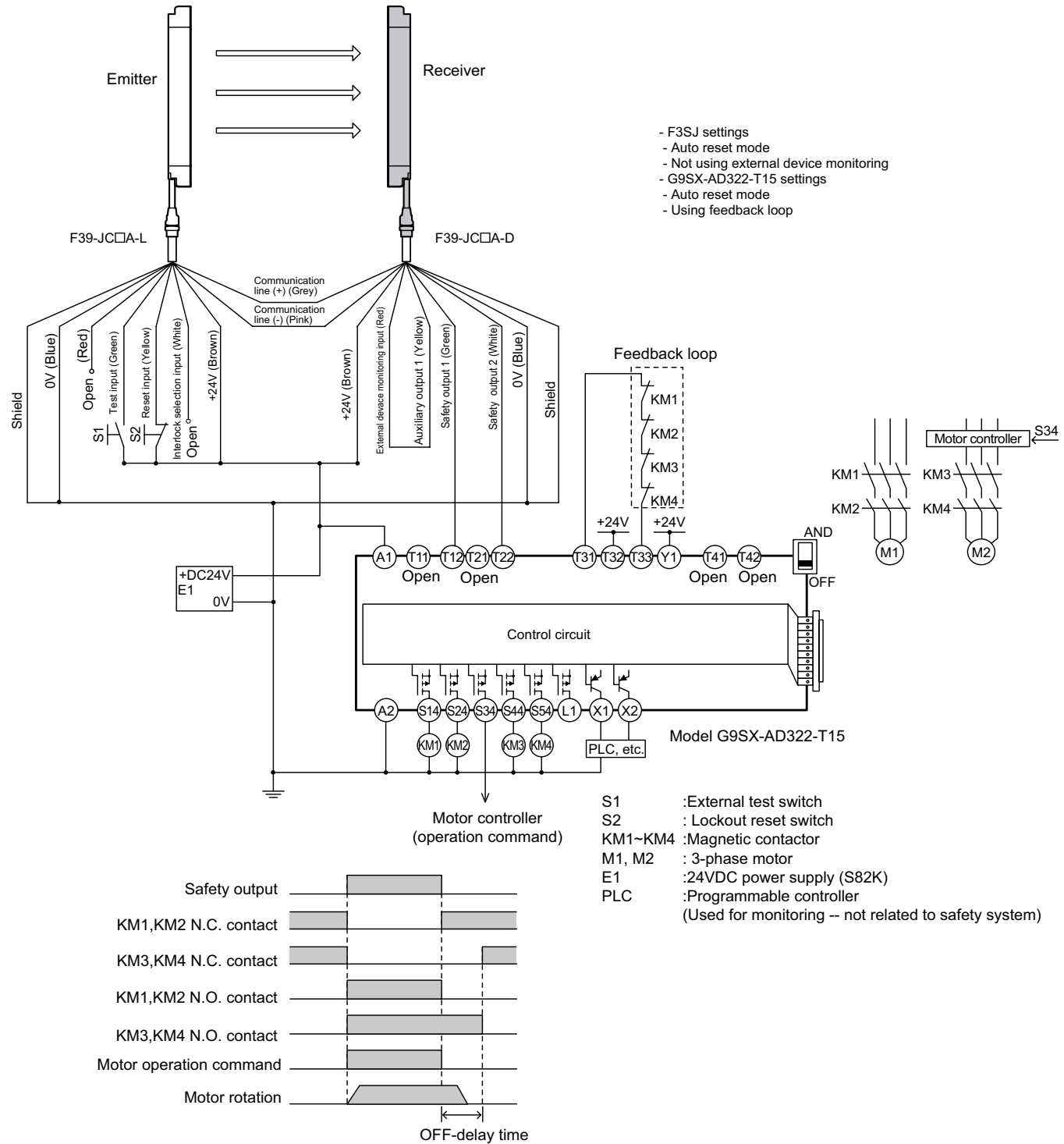
- Emergency stop switch can be connected





Wiring for connection with a controller G9SX-AD322-T15 (category 4)

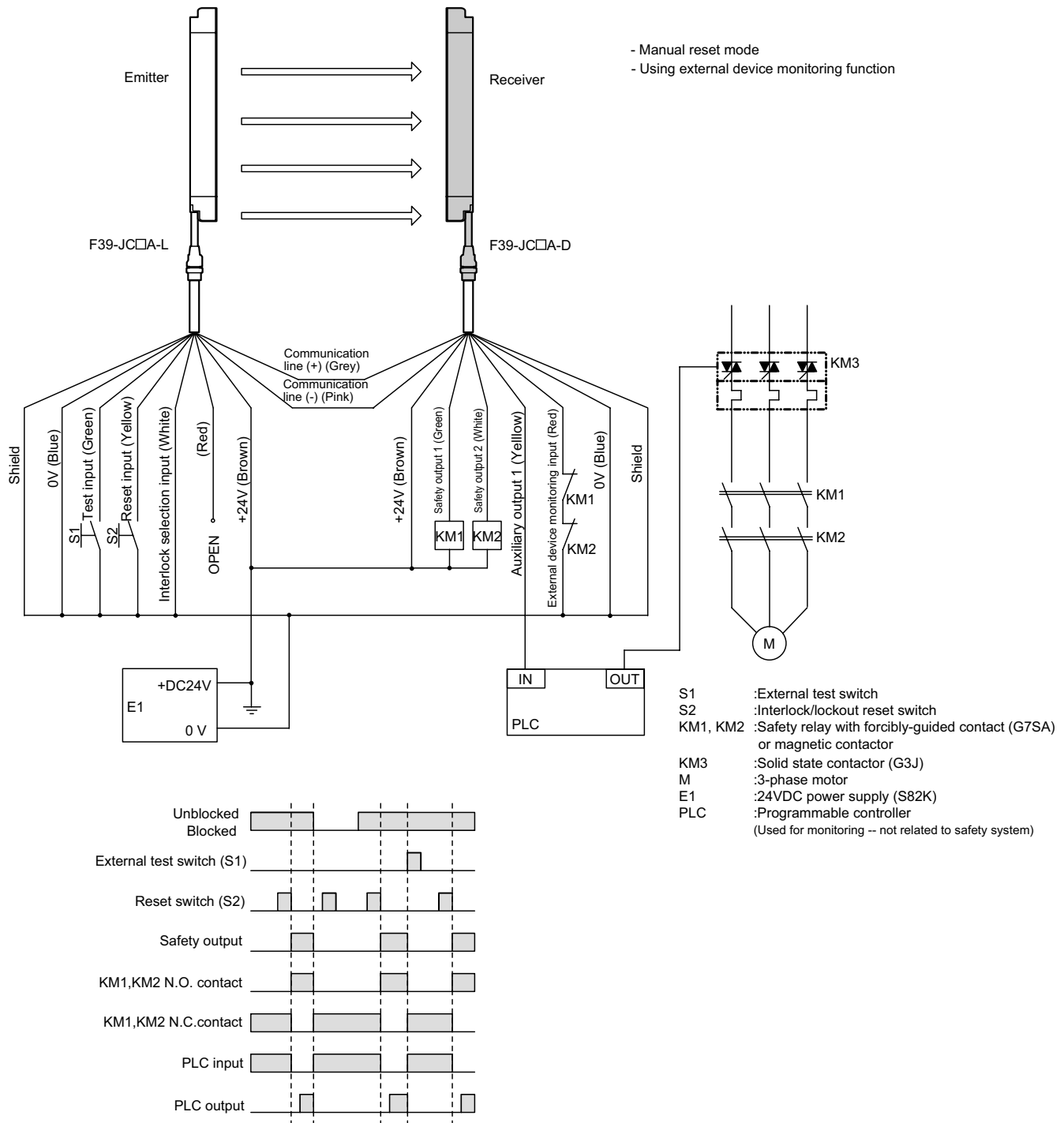
- Can be configured for partial control and total control
- Can be extended to connect a door switch or a relay unit



For NPN output (See page 31 for PNP output wiring.)

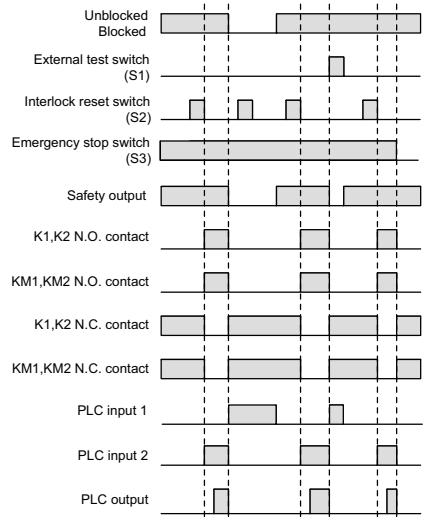
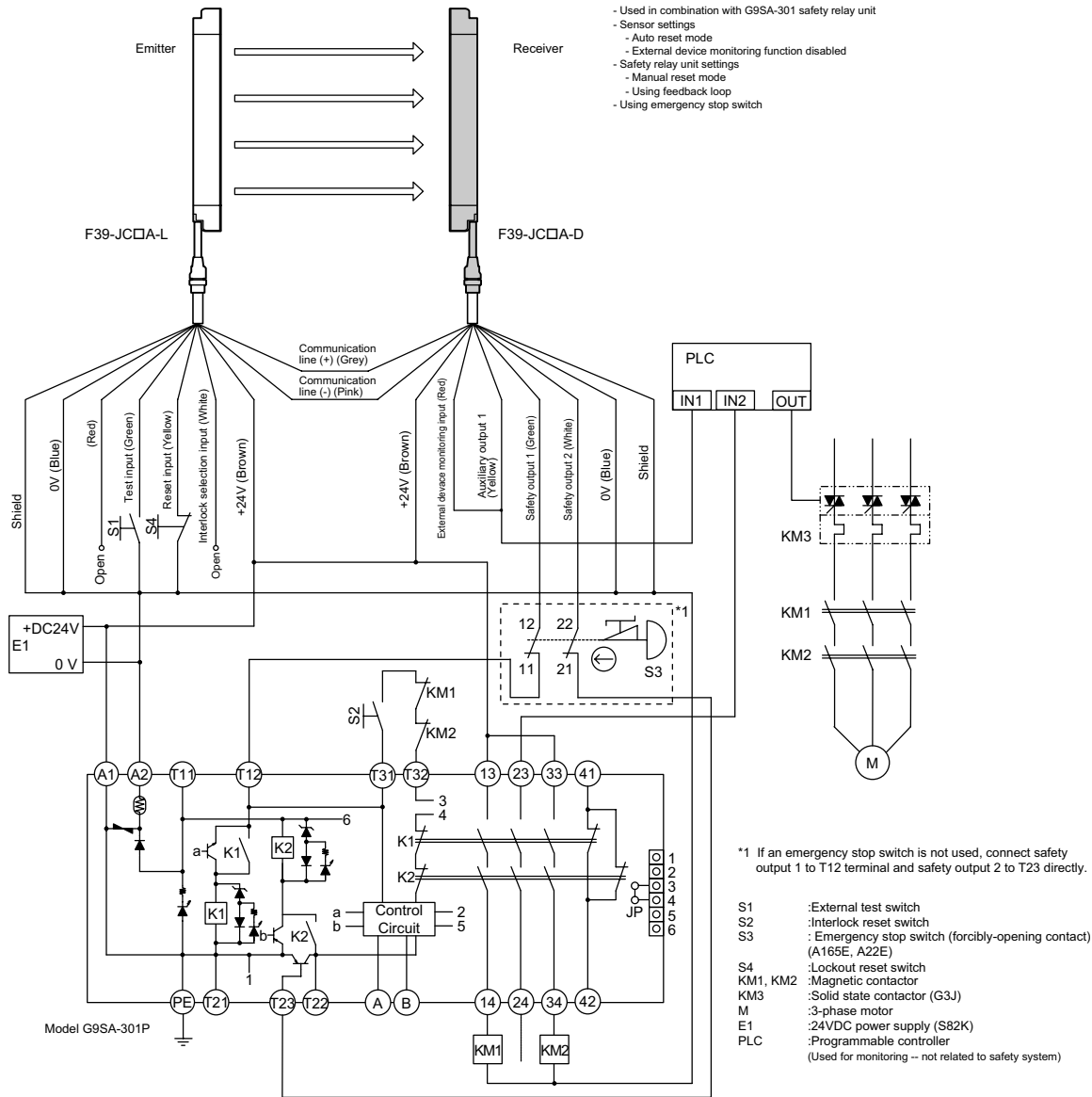
Wiring for single F3SJ application (category 4)

- F3SJ can detect welded relays by itself
- Use of relay welded relay contact detection and interlock is possible without a controller or relay unit



# Wiring for connection with a controller G9SA-301-P (category 4)

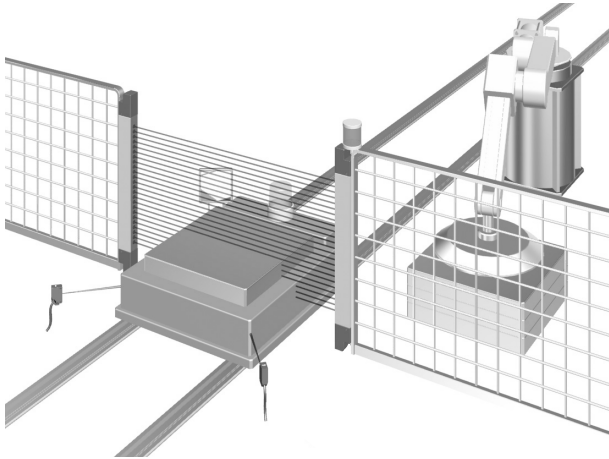
- Emergency stop switch can be connected
- Application is exclusive for lines or equipment that use a positive ground.



## System Configuration and Connection (Muting System)

### Muting system

The muting function temporarily disables the safety function of the F3SJ, keeping the safety outputs ON even if beams are blocked. This makes it possible to install safety light curtains for AGV passage, enabling both safety and productivity. When muting, the muting lamp (external indicator) turns ON to notify people in the surrounding area that the safety functions are disabled.



### Warning

The muting and override functions disable the safety functions of the device. Additional safety measures must be taken to ensure safety while these functions are working.

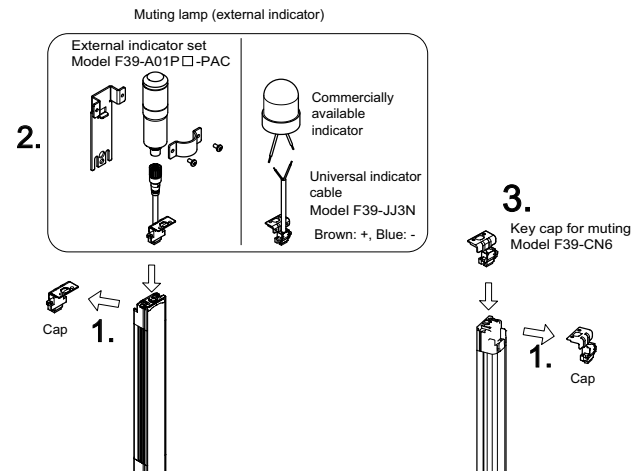
Install muting sensors so that they can distinguish between the object that is being allowed to pass through the detection zone and a person.

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.

### Upgrading F3SJ for Muting System

1. Remove the caps of the emitter and receiver.  
(A screwdriver is included with the key cap for muting.)
2. Install a muting lamp (external indicator) on either the emitter or receiver.
3. Attach the key cap for muting to the emitter/receiver on which the muting lamp (external indicator) was not installed.



### Muting sensor

The muting sensor is the sensor that is the trigger for temporarily disabling the safety functions of F3SJ. You can use a photoelectric switch of transmission or reflective types, proximity switch, or limit switch. (Omron's E3Z series, E2E series, and D4N series sensors are recommended.) For the PNP type F3SJ, use a sensor with PNP transistor outputs or N.O type contacts. For the NPN type F3SJ, use a sensor with NPN transistor outputs or N.O type contacts. For NPN type F3SJ, use a sensor with NPN transistor outputs or N.O type contacts.

For the muting sensor, use the same power supply as that for the light curtain. If a different power supply is used, the power supply for the light curtain may not shut down when required.

### Muting lamp (external indicator)

To notify workers that the muting function is working, external lamp(s) must be installed. Use the F39-A01P□-PAC external indicator set or an F39-JJ3N universal indicator cable with a commercially available external indicator.



# Muting Timing Diagram

## Start conditions

If both of the following 2 conditions are present, muting is activated.

1. No interrupting object is found in the F3SJ's detection zone, and safety output is ON.
2. After muting input 1 is turned ON (connected to 9 to 24V), muting input 2 is turned ON (connected to 9 to 24V) within the muting input time limit T1 (0.03 to 3s).

When condition 1 is satisfied but time condition of 2 is not, a muting sequence error occurs and receiver's muting error indicator turns ON.

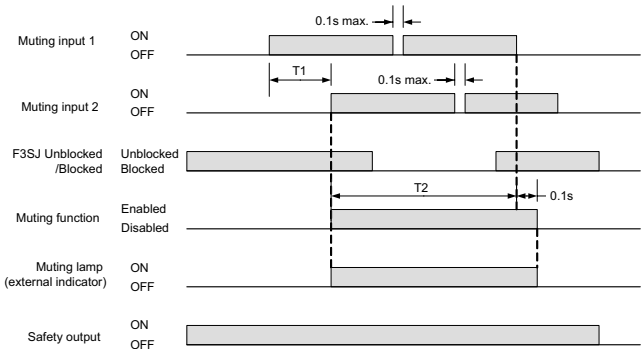
A muting error is released when either of the following occurs:

- When muting is started using a proper procedure
- When power is turned on while muting inputs 1 and 2 are OFF

## End conditions

If either of the following conditions are satisfied, the muting state is released.

1. Muting input 1 or 2 turns OFF for 0.1s or longer.
2. The muting continuation time exceeds the muting time limit of 60s.



T1: Muting input time limit (0.03 to 3s)

T2: Muting time limit (60s)

\* Muting state can be released even when the system enters lockout.

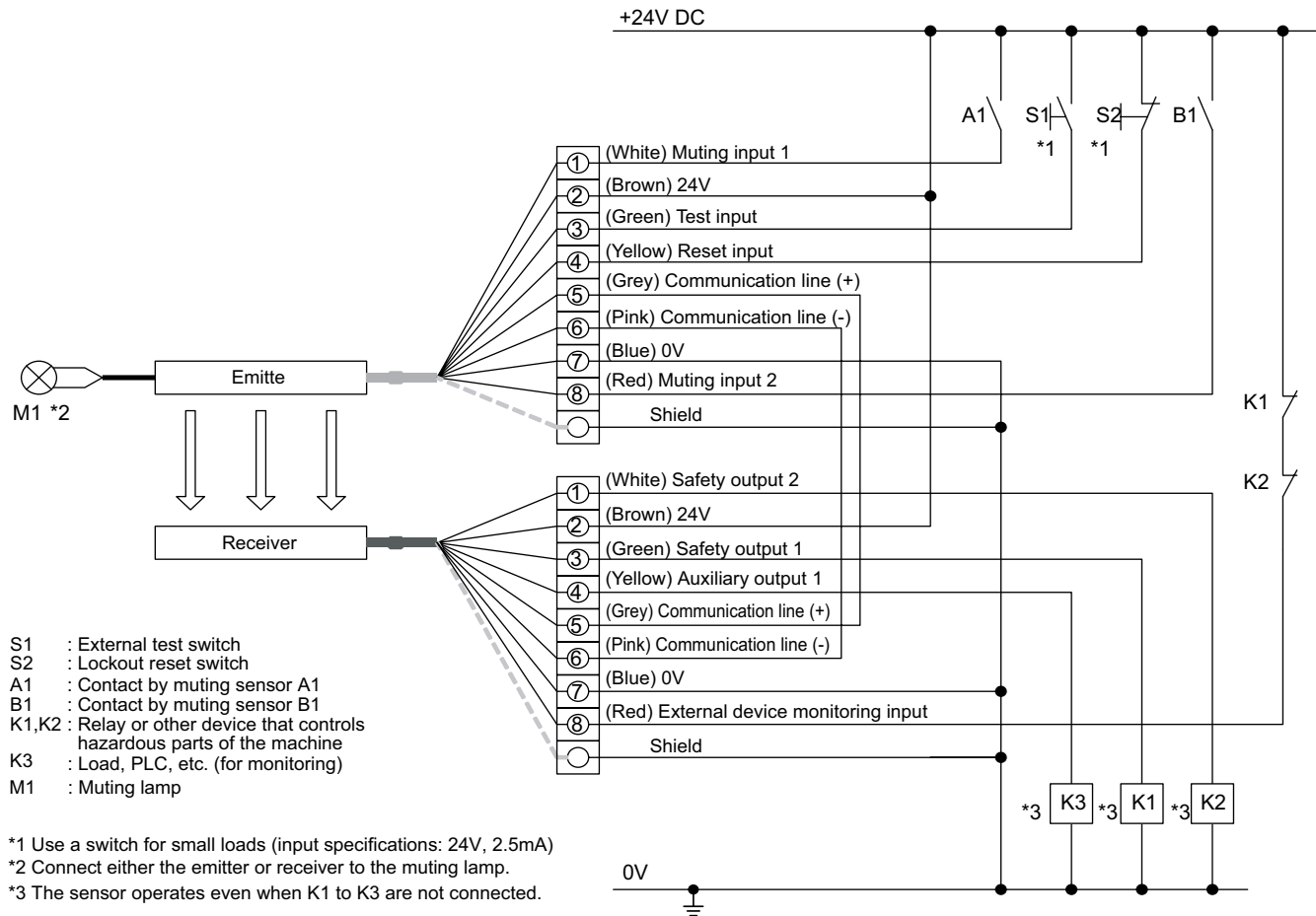
# Installation standard for muting sensors

- Set the muting sensors so that they can detect all of the passing detection objects (palettes, automobiles, etc.). Do not install in a position so that only the front or rear end of the detection object is detected.
- Set the muting sensors so that they detect the objects even when they are loaded on palettes or other transport devices.
- Install the F3SJ and muting sensors so that each object passes through all muting sensors before the next object arrives at the first muting sensor. Also, install all F3SJ and muting sensors so that no person is able to accidentally enter the hazardous area while the muting function is enabled.
- For a muting sensor installation example, see the instruction manual.
- For details about the override function, see the instruction manual.

## Basic connection for muting system

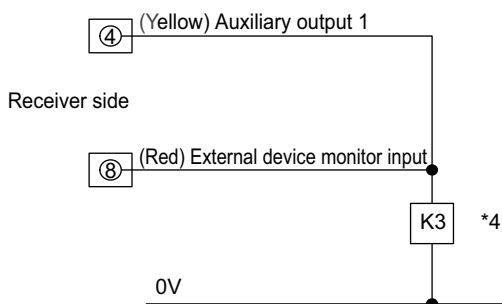
For PNP output (See page 42 for NPN output wiring.)

Wiring when using muting and external device monitoring functions



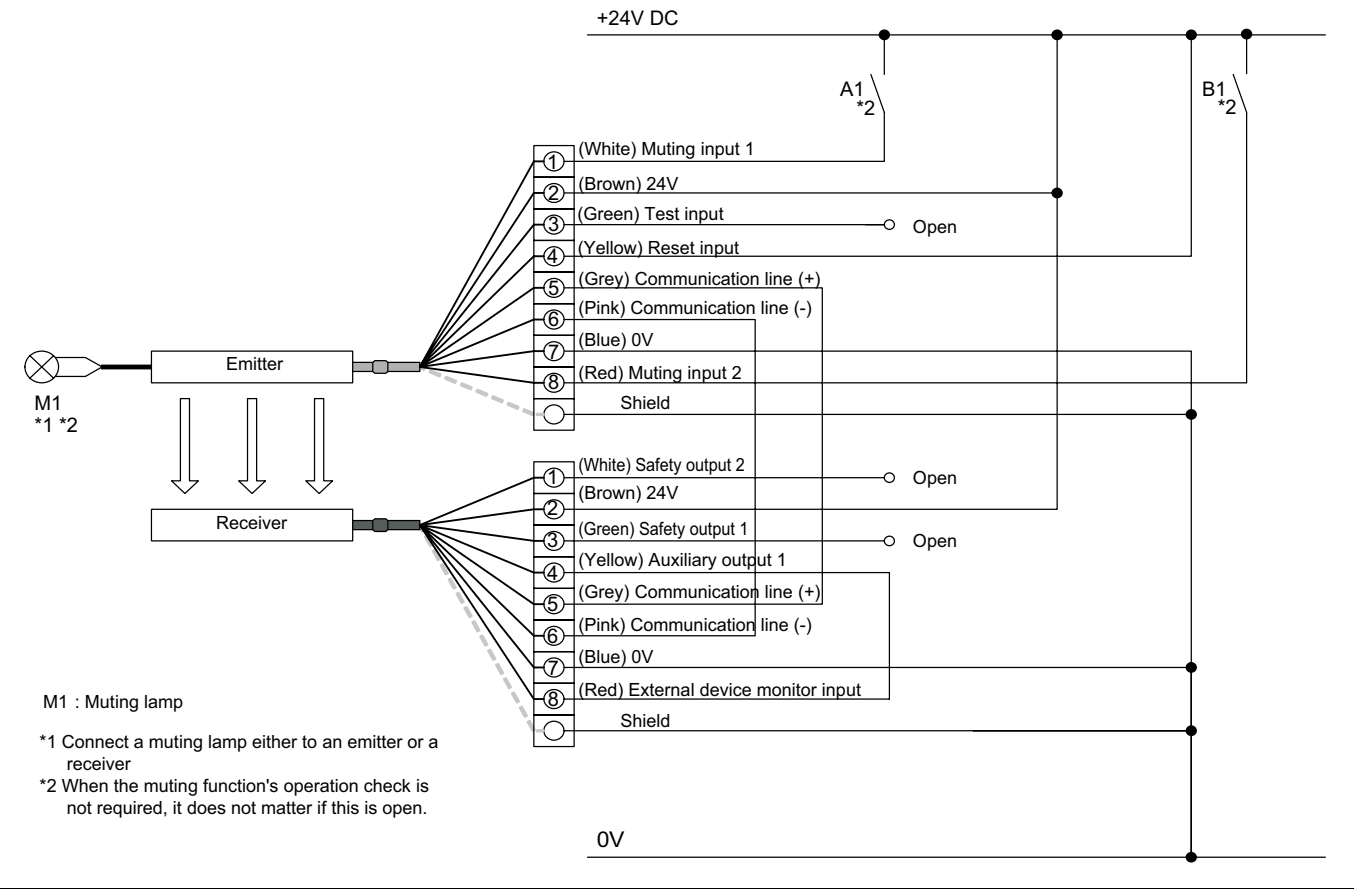
### Wiring when external device monitoring function is not required

Disable the external device monitoring function by connecting auxiliary output 1 and the external device monitoring input as shown in the diagram below.



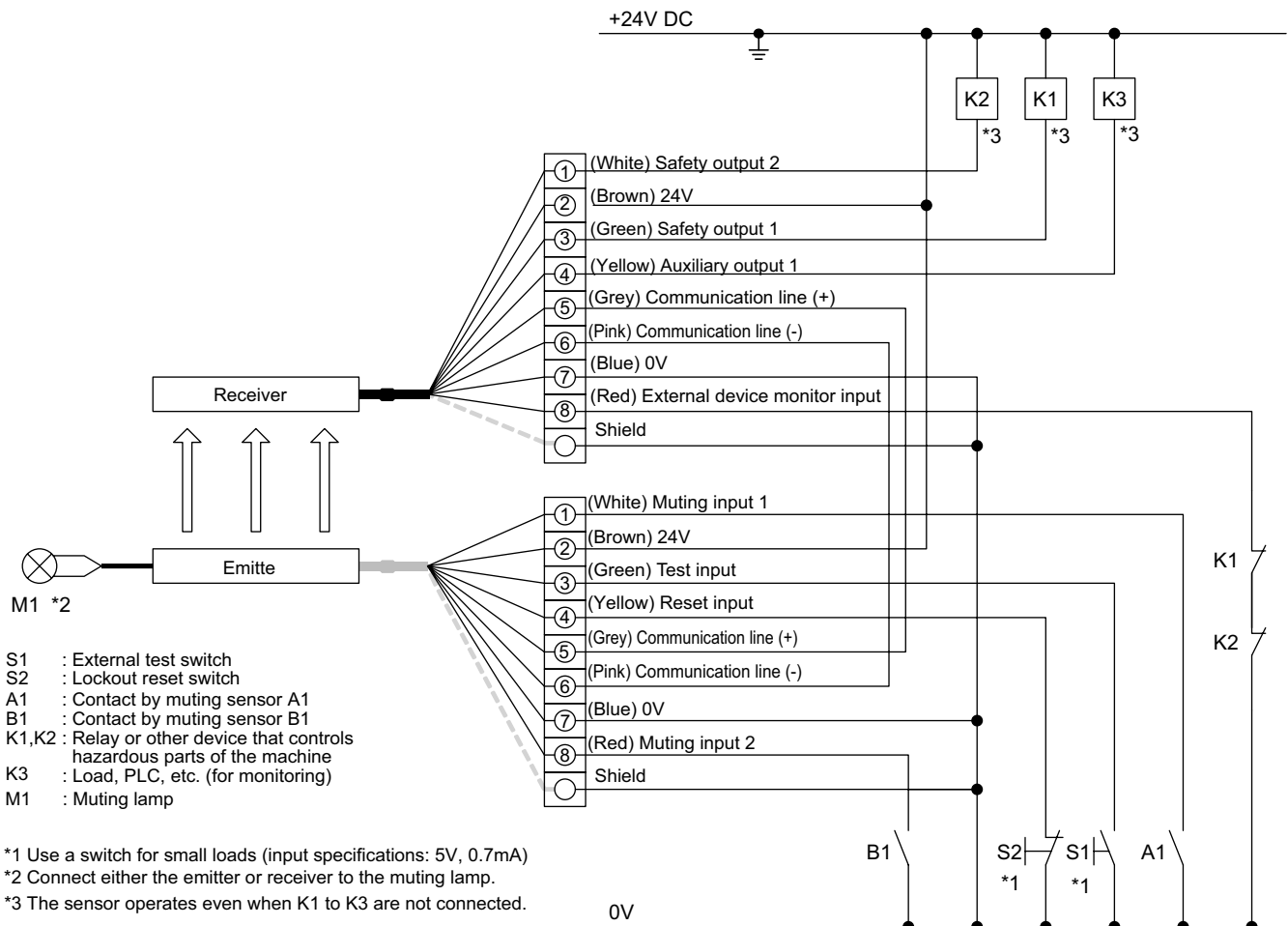
\*4 If K3 is not required, connect auxiliary output 1 to external device monitoring

Ref.: Minimum wiring required to check the operation of the F3SJ when using the muting function  
(Wiring that does not use the external device monitoring function)

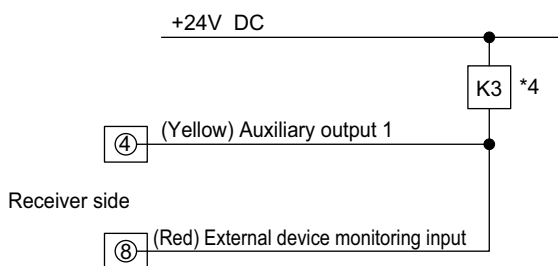


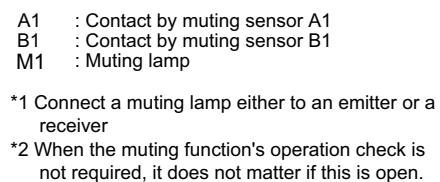
For NPN output (See page 40 for PNP output40.)

Wiring when using muting and external device monitoring functions



Wiring when external device monitoring function is not required  
Disable the external device monitoring function by connecting auxiliary output 1 and the external device monitoring input as shown in the diagram below.





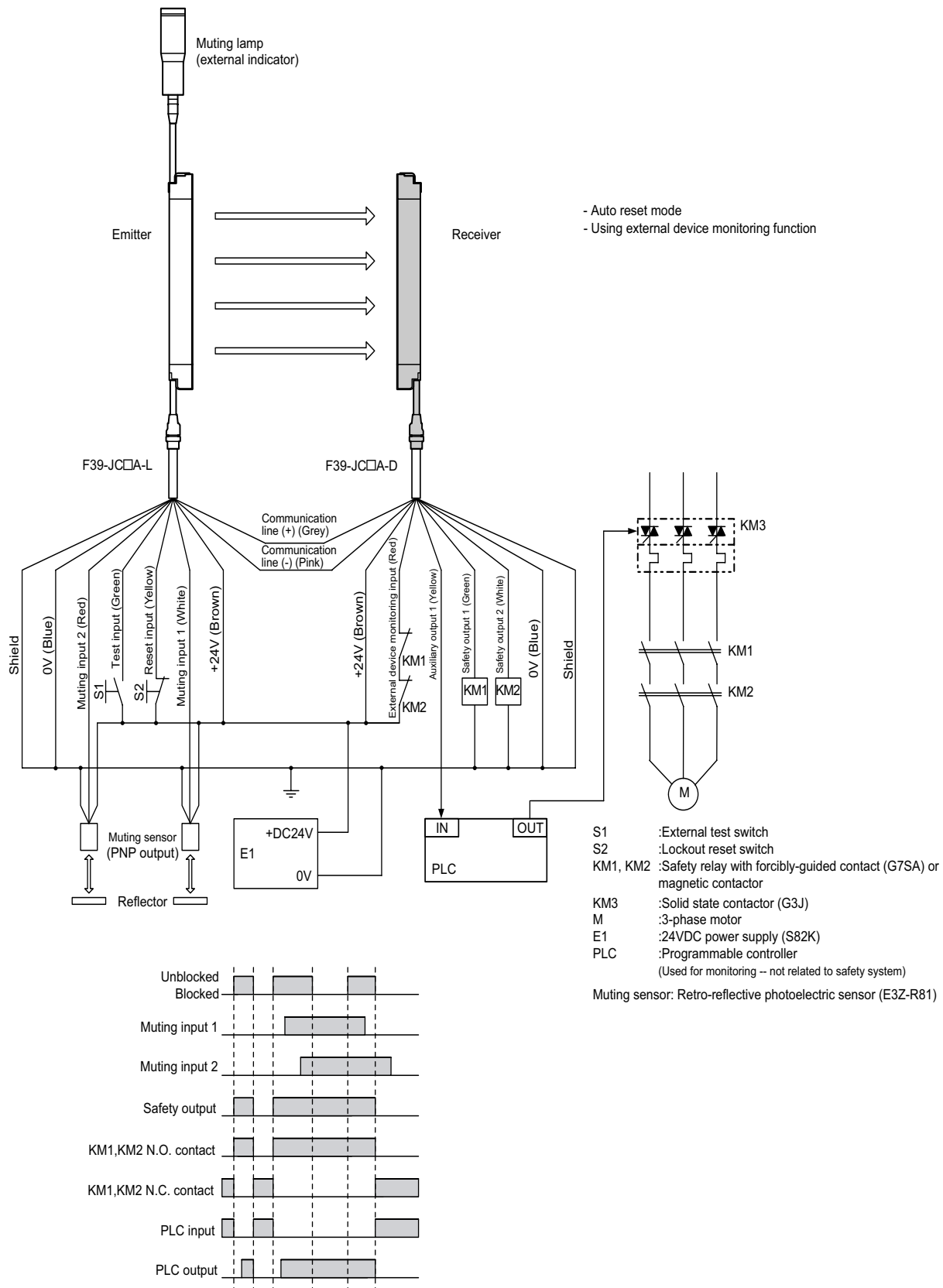


## Safety circuit example for muting system

### For PNP output

Wiring for muting function with single F3SJ application (category 4)

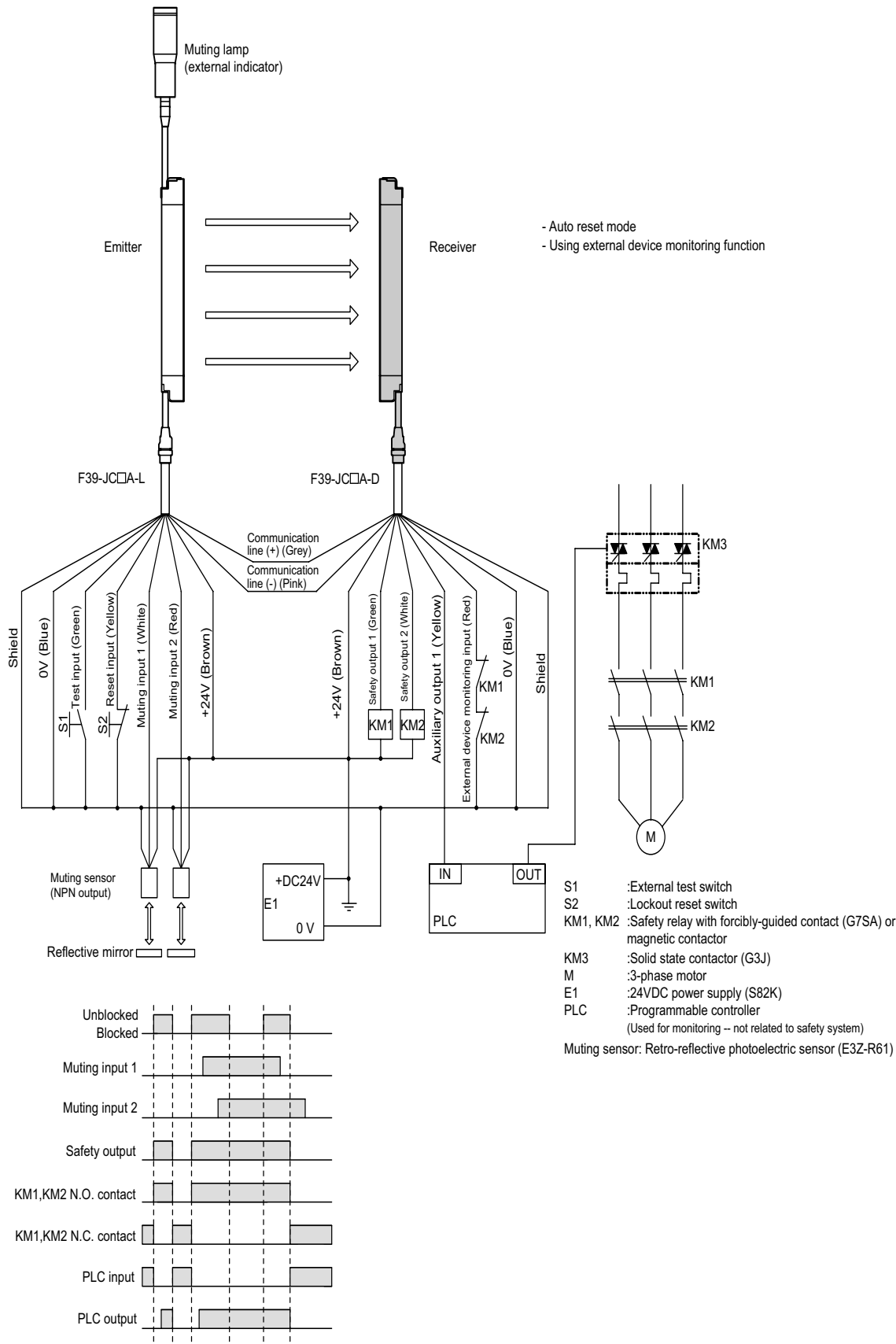
- Attaching a keycap for muting (F39-CN6) enables the muting function to be used



For NPN output

Wiring for muting function with single F3SJ application (category 4)

- Attaching a key cap for muting (F39-CN6) enables the muting function to be used



## For proper use:

The description below is intended only as a guideline for choosing a safety sensor. To ensure proper use of the product, thoroughly read and understand the instruction manual included with the product.

### Legislation and Standards

1. Application of a F3SJ-A 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-A 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-A is electro-sensitive protective equipment (ESPE) in accordance with European Union (EU) Machinery Directive Index Annex IV, B, Safety Components, Item 1.

3. The F3SJ-A complies with the following legislation and standards:

- (1) EC legislation  
Machinery Directive 98/37/EC  
EMC Directive 89/336/EEC
- (2) European Standards  
EN61496-1 (type 4 ESPE),  
prEN61496-2 (type 4 AOPD),  
EN61508-1 to -7 (SIL3)
- (3) International Standards  
IEC61496-1 (type 4 ESPE),  
IEC61496-2 (type 4 AOPD),  
EN61508-1 to -7 (SIL3)
- (4) JIS standards  
JIS B 9704-1 (type 4 ESPE),  
JIS B 9704-2 (type 4 AOPD)

4. The F3SJ-A received the following approvals from the EU accredited body, TUV-PS:

- EC type test based on machinery directive  
Type 4 ESPE (EN61496-1),  
Type 4 AOPD (prEN61496-2)
- EMC Competent Body Certificate (Test power supply:  
Omron's S82K)
- TUV-PS type approval  
Type 4 ESPE (EN61496-1),  
Type 4 AOPD (prEN61496-2),  
EN61508-1 to -7 (SIL1, 2, 3)  
Application: EN954-1 categories B, 1, 2, 3, 4

5. The F3SJ-A has received certificates of UL listing for US and Canadian safety standards from the Third Party Assessment Body UL.

- Type 4 ESPE (UL61496-1),  
Type 4 AOPD (UL61496-2)

6. The F3SJ-A 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, prEN691, EN692, EN693
- US Occupational Safety and Health Administration: OSHA 29 CFR 1910.212
- US Occupational Safety and Health Administration: OSHA 29 CFR 1910.217
- American National Standard Institute: ANSI B11.1 to B11.19
- American National Standard Institute ANSI/RIA 15.06
- Canadian Standards Association CSA Z142, Z432, Z434
- SEMI standard SEMI S2
- Japanese Ministry of Health, Labour and Welfare Announcement: "Guidelines for Comprehensive Safety Standards of Machinery" Announcement No.501, June 1, 2001

Precautions for Safe Use



Indication and meaning for safe use

Meanings of Signal Words

To ensure safe use of the F3SJ-A, signal words and alert symbols are used in this instruction manual to indicate safety-related instructions. Because these instructions describe details very important to your safety, it is extremely important that you understand and follow the instructions. The signal words and alert symbols used in this manual are shown below.


 <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>CAUTION</b>	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage.

Definition of Symbols

	Prohibited Indicates a prohibited action.
	Mandatory Indicates a mandatory action.


Warning Labels

For users

 **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.


For machines

 **Warning**

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 reaches the hazardous part, resulting in serious injury.

Do not use the auxiliary output or external indicator output for safety applications. Failure of the F3SJ may cause a person to go undetected, resulting in serious injury.

For mounting

 **Warning**

The muting and override functions disable the safety functions of the device. Additional safety measures must be taken to ensure safety while these functions are working.

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.

Use a "hold-to-run" switch, such as a spring-return key switch, to activate the override function, and install it in a location that provides a clear view of the entire hazardous area and where it cannot be activated from within the hazardous area. Make sure that nobody is in the hazardous area before activating the override function.

Install 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 to step into the hazardous area of a machine and remain behind the F3SJ's detection zone, configure the system with an interlock function that prevents the machine from being restarted. Otherwise it may result in heavy injury.

Install the interlock reset switch in a location that provides a clear view of the entire 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).

Make sure that the F3SJ is securely mounted and its cables and connectors are properly connected.

Make sure that no foreign material, such as water, oil or dust, enters the inside of the F3SJ while the cap is removed.

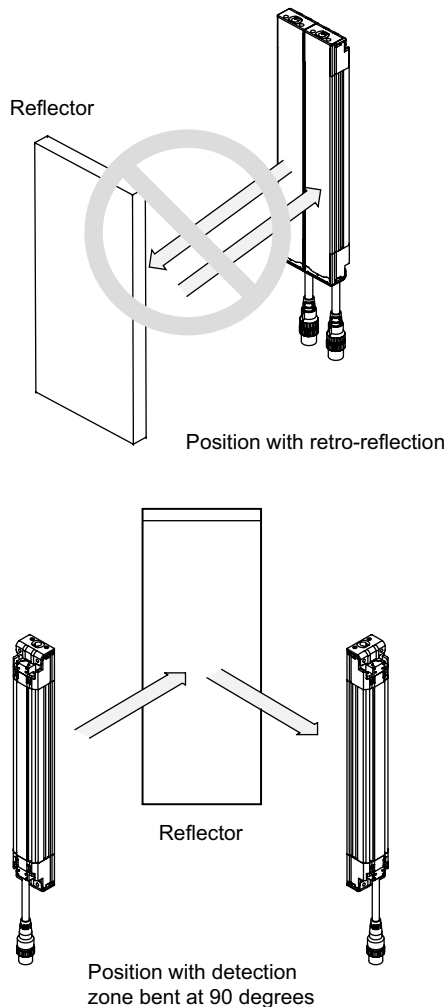
Make sure to secure the safety distance between the F3SJ and the hazardous parts. Otherwise, the machine may not stop before a person reaches the hazardous part, resulting in serious injury.

Install the sensor system so that it is not affected by reflective surfaces. Failure to do so may hinder detection, resulting in serious injury.

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

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.

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



When using series connections, perform inspection of all connected F3SJs as instructed in the User's Manual.

#### For wiring

#### ⚠ Warning

For PNP output, connect the load between the output and 0V line. For NPN output, connect the load between the output and +24V line. Connecting the load between the +24V and 0V lines results in a dangerous condition because the operation mode is reversed to "ON when blocked".

[For PNP output]

Do not short-circuit an output line to +24V line. Otherwise, the output is always ON. Also, 0V of the power supply must be grounded so that output should not turn ON due to grounding of the output line.

[For NPN output]

Do not short-circuit an output line to 0V line. Otherwise, the output is always ON. Also, the +24V line 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 higher than  $24V+20\%$ . Also, do not connect to an AC power supply. Failure to do so may result in electric shock.

For 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 rated power voltage ( $24VDC+20\%$ )
- 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 enhanced insulation must be applied between the primary and 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 EMC, laws, and regulations of a country or a region where F3SJ is used. (Ex: In EU, the power supply must comply with EMC Low Voltage Directive.)

Double or enhanced insulation from hazardous voltage must be applied to all input and output lines. Failure to do so may result in electric shock. The cable extension length must be no greater than the specified length. Otherwise, the safety functions may fail to work properly, resulting in danger.

#### Others

#### ⚠ Warning

To use the F3SJ in PSDI mode (restart of cycle operation by the sensor), 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 are 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.



## Installation Conditions

### Operating Range and Approach

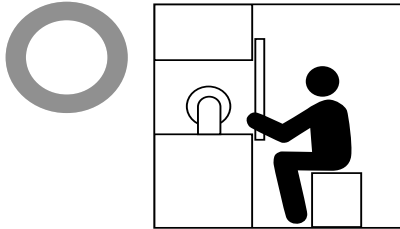
#### ⚠ Warning

Install 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.

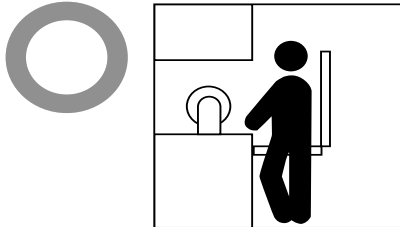
If a person is able to step into the hazardous area of a machine and remain behind the F3SJ's detection zone, configure the system with an interlock function that prevents the machine from being restarted. Otherwise it may result in heavy injury.

#### Correct installation

The hazardous area of a machine can be reached only by passing through the sensor's detection zone.

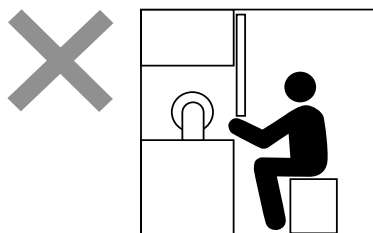


While working, a person is inside the sensor's detection zone.

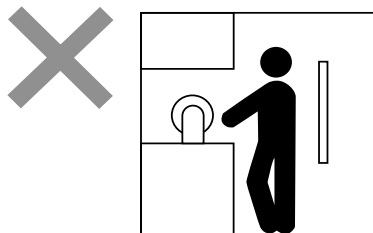


#### Incorrect installation

It is possible to reach the hazardous area of a machine without passing through the sensor's detection zone.

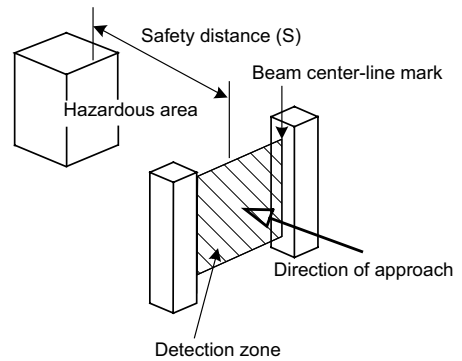


A person is between the sensor's detection zone and the hazardous area of a machine.



### Safety Distance

The safety distance is the distance that must be set between the F3SJ and a machine's hazardous part to stop the hazardous part before a person or object reaches it. The safety distance varies according to the standards of each country and the individual specifications of each machine. In addition, the calculation of the safety distance differs if the direction of approach is not perpendicular to the detection zone of the F3SJ. Always refer to relevant standards.



#### ⚠ Warning

Make sure to secure the safety distance (S) between the F3SJ and the hazardous part. Otherwise, the machine may not stop before a person reaches the hazardous part, resulting in serious injury.

Note: The response time of a machine is the time period from when the machine receives a stop signal to when the machine's hazardous part stops. Measure the response time on the actual system. Also, periodically check that the response time of the machine has not changed.

\* How to calculate the safety distance specified by European standard EN999 (reference)

If a person approaches the detection zone of the F3SJ perpendicularly, calculate the safety distance as shown below.

$$S = K \times T + C \dots \text{Eq. (1)}$$

- S: Safety distance
- K: Approach speed to the detection zone
- T: Total response time of the machine and F3SJ
- C: Additional distance calculated by the detection capability of the F3SJ

•System that has detection capability of 40mm max.

Use  $K = 2,000\text{mm/s}$  and  $C = 8 \times (d - 14\text{mm})$  in equation (1) for the calculation.

$$S = 2,000\text{mm/s} \times (T_m + T_s) + 8 \times (d - 14\text{mm})$$

- S = Safety distance (mm)
- $T_m$  = Machine's response time (s)
- $T_s$  = Response time of the F3SJ from ON to OFF (s)
- d = Size of F3SJ's detection capability (mm)

[Calculation example]

When  $T_m = 0.05\text{s}$ ,  $T_s = 0.01\text{s}$ , and  $d = 14\text{mm}$ :

$$S = 2,000\text{mm/s} \times (0.05\text{s} + 0.01\text{s}) + 8 \times (14\text{mm} - 14\text{mm}) = 120\text{mm} \dots \text{Eq. (2)}$$

If the result is less than 100mm, use  $S = 100\text{mm}$ .

If the result exceeds 500mm, use the following equation where  $K = 1,600\text{mm/s}$ .

$$S = 1,600\text{mm/s} \times (T_m + T_s) + 8 \times (d - 14\text{mm}) \dots \text{Eq. (3)}$$

If the result of this Eq. (3) is less than 500mm, use  $S = 500\text{mm}$ .

\* How to calculate the safety distance specified by American standard ANSI B11.19 (Ref.)

If a person approaches the detection zone of the F3SJ perpendicularly, calculate the safety distance as shown below.

$$S = K \times (T_s + T_c + T_r + T_{bm}) + D_{pf}$$

•S: Safety distance

•K: Approach speed to the detection zone (the value recommended by OSHA standard is  $1,600\text{mm/s}$ )

Approach speed K is not specified in the ANSI B.11.19 standard. To determine the value of K to apply, consider all factors, including the operator's physical ability.

• $T_s$  = Machine's stop time (s)

• $T_r$  = Response time of the F3SJ from ON to OFF (s)

• $T_c$  = Machine control circuit's maximum response time required to activate its brake (s)

• $T_{bm}$  = Additional time (s)

If a machine has a brake monitor, " $T_{bm}$  = Brake monitor setting time - ( $T_s + T_c$ )". If it has no brake monitor, we recommend using 20% or more of ( $T_s + T_c$ ) as additional time.

• $D_{pf}$  = Additional distance

According to ANSI's formula,  $D_{pf}$  is calculated as shown below:

$D_{pf} = 3.4 \times (d - 7.0)$ : Where d is the detection capability of the F3SJ (unit: mm)

[Calculation example]

When  $K = 1,600\text{mm/s}$ ,  $T_s + T_c = 0.06\text{s}$ , brake monitor setting time =  $0.1\text{s}$ ,  $T_r = 0.01\text{s}$ ,  $d = 14\text{mm}$ :

$$T_{bm} = 0.1 - 0.06 = 0.04\text{s}$$

$$D_{pf} = 3.4 \times (14 - 7.0) = 23.8\text{mm}$$

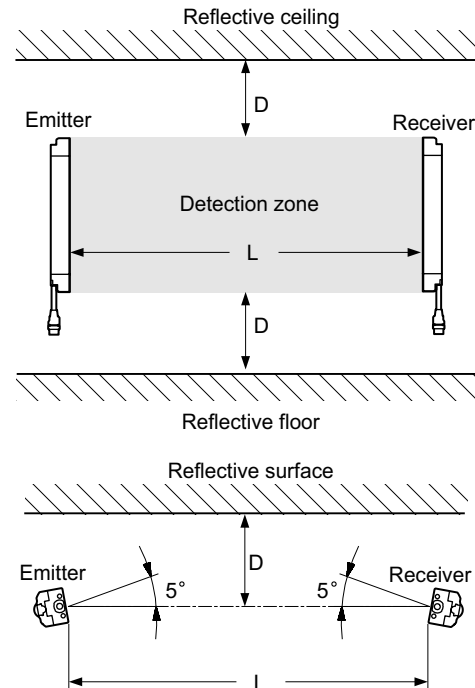
$$S = 1,600 \times (0.06 + 0.01 + 0.04) + 23.8 = 199.8\text{mm}$$

## Distance from Glossy Surface

### Warning

Install the sensor system so that it is not affected by reflection from a glossy surface. Failure to do so may hinder detection, resulting in serious injury.

Install the sensor system at distance D or further from highly reflective surfaces such as metallic walls, floors, ceilings, or workpieces, as shown below.



Distance between emitter and receiver (Detection Distance)	Allowable installation distance D
For 0.2 to 3m	0.13m
For 3m or more	$L/2 \times \tan 5 \text{ deg.} = L \times 0.044 \text{ (m)}$

Prevention of Mutual Interference

Do not use a sensor system in a reflective configuration.

Doing so may hinder detection.

Mirrors can be used change the optical route.



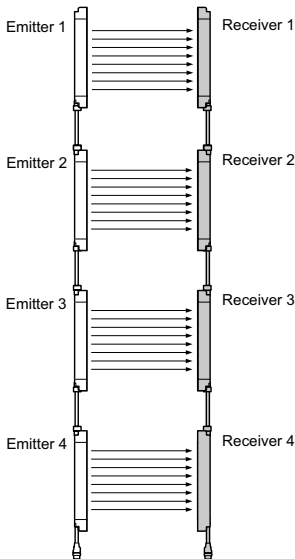
When using more than 1 set of F3SJ, install them so that mutual interference does not occur, such as by configuring series connections or using physical barriers between adjacent sets.



Mutual interference from other F3SJ is prevented in up to 3 sets without series connection.

\* For series connection

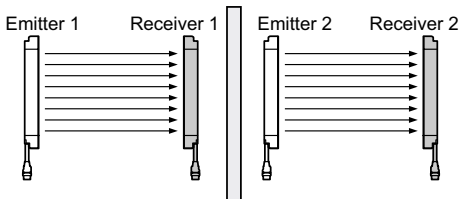
Series connection can prevent mutual interference when multiple sensors are used. Up to 4 sets, 400 beams, can be connected. The emission of series-connected F3SJ is time-divided, so mutual interference does not occur and safety is ensured.



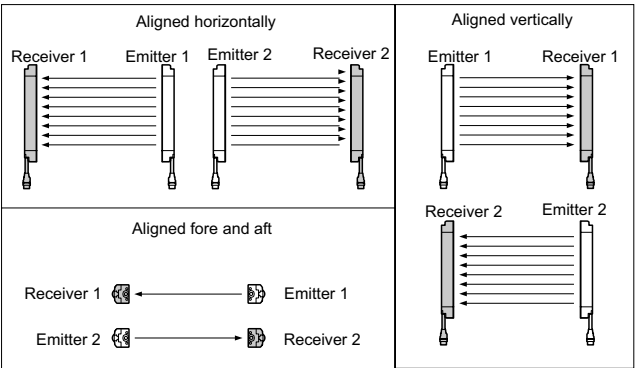
\* For no series connection

An interference light prevention algorithm prevents mutual interference in up to 3 unconnected sets. If 4 or more sets of F3SJ are installed and are not connected to each other, arrange them so that mutual interference does not occur. If 2 sets are installed near each other, reflection from the surface of the F3SJ may cause mutual interference. When mutual interference occurs, the F3SJ enters lockout. Combining countermeasures 1 to 3 below is effective.

1. Install a physical barrier

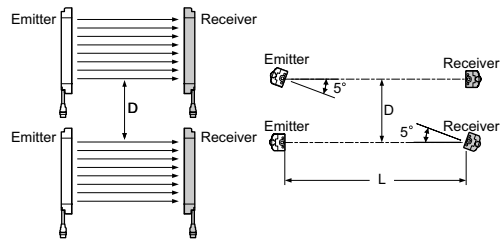


2. Alternate the direction of emission (alternation)



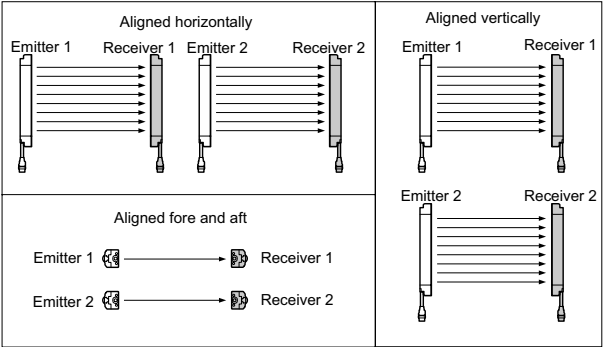
If sensors of 2 sets are installed too close to each other, mutual interference may occur due to reflection by the surface.

3. Keep sufficient distance between them



Distance between emitter and receiver (Detection Distance)	Allowable installation distance D
For 0.2 to 3m	0.26m
For 3m or more	$L \times \tan 5 \text{ deg.} = L \times 0.088 \text{ (m)}$

The installations shown below may cause mutual interference. When mutual interference occurs, the F3SJ enters lockout.



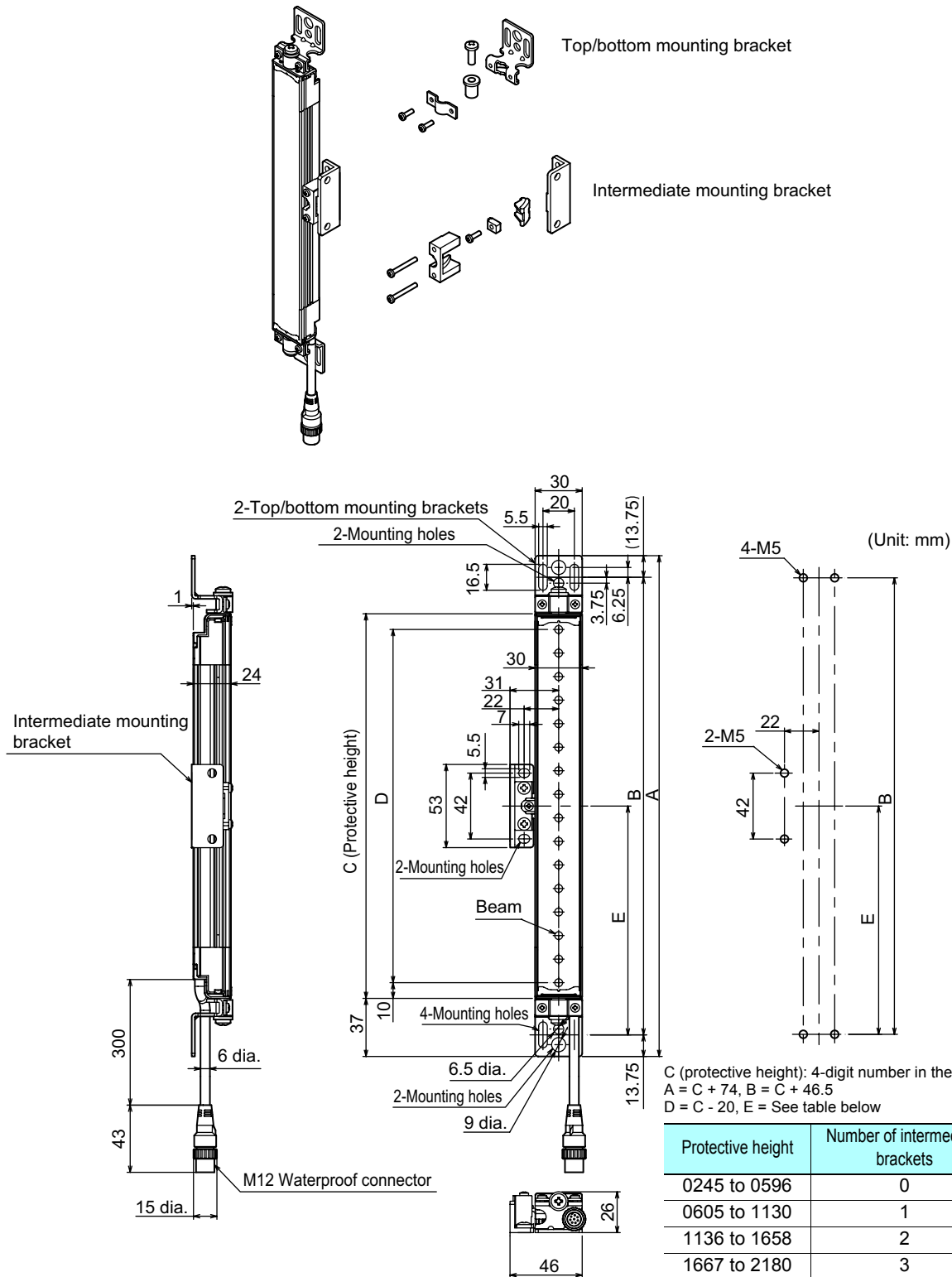
# External dimensions

(Unit: mm)

## Main

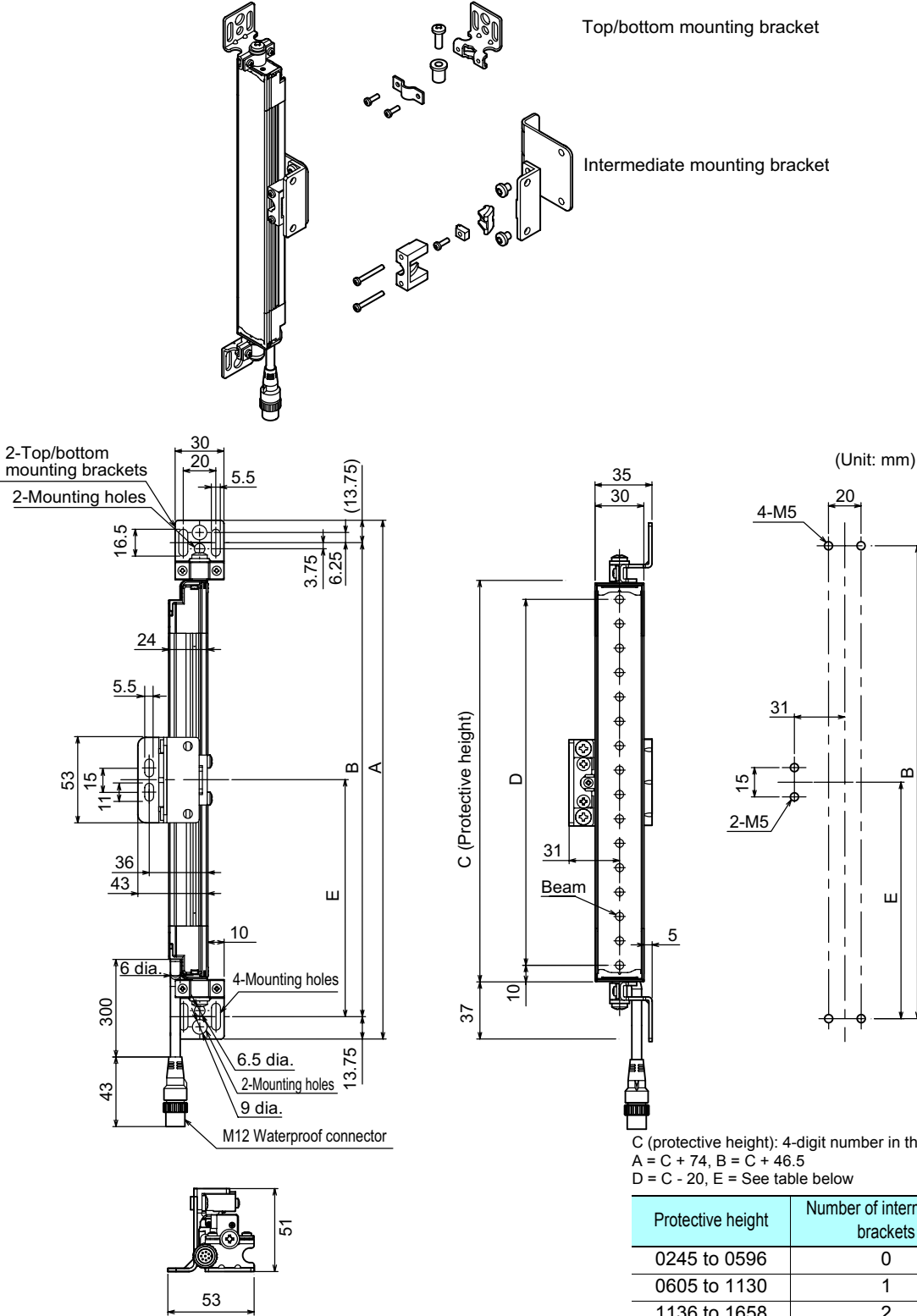
### When Using Standard Mounting Brackets

#### Backside mounting



\*IUse E = 530 or less when none of the E values shown above are used.

Side mounting

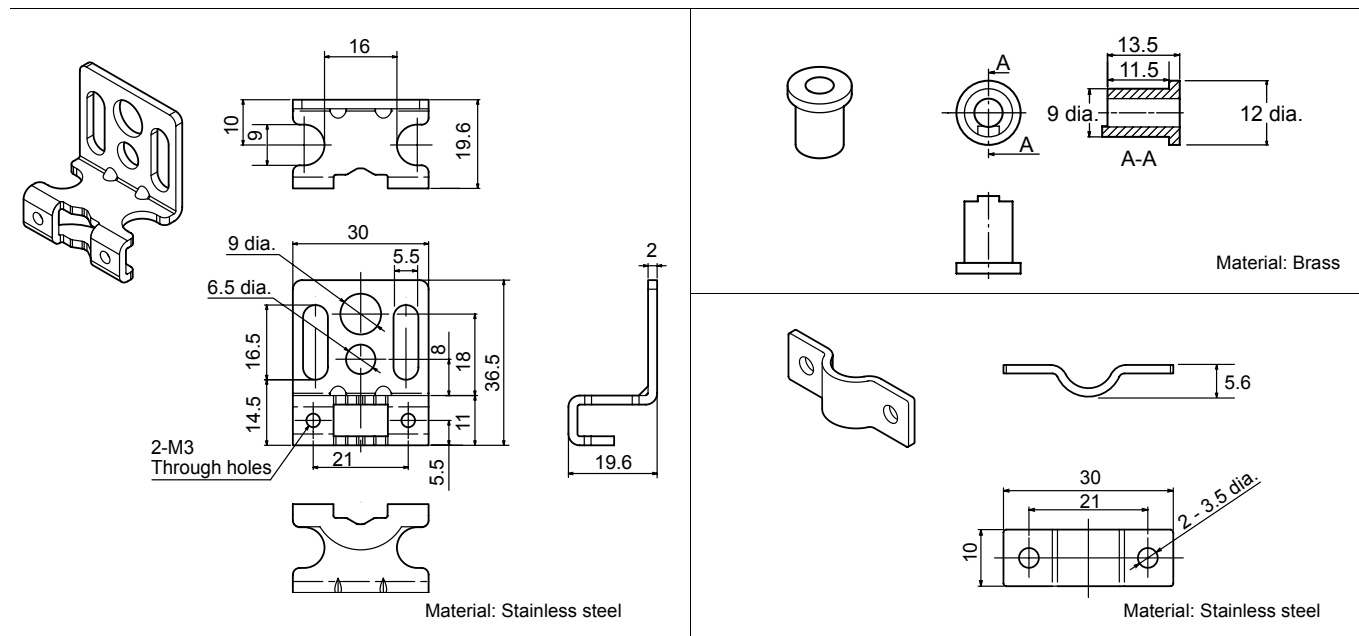


C (protective height): 4-digit number in the table  
A = C + 74, B = C + 46.5  
D = C - 20, E = See table below

Protective height	Number of intermediate brackets	E *
0245 to 0596	0	-
0605 to 1130	1	E = B / 2
1136 to 1658	2	E = B / 3
1667 to 2180	3	E = B / 4
2195 to 2495	4	E = B / 5

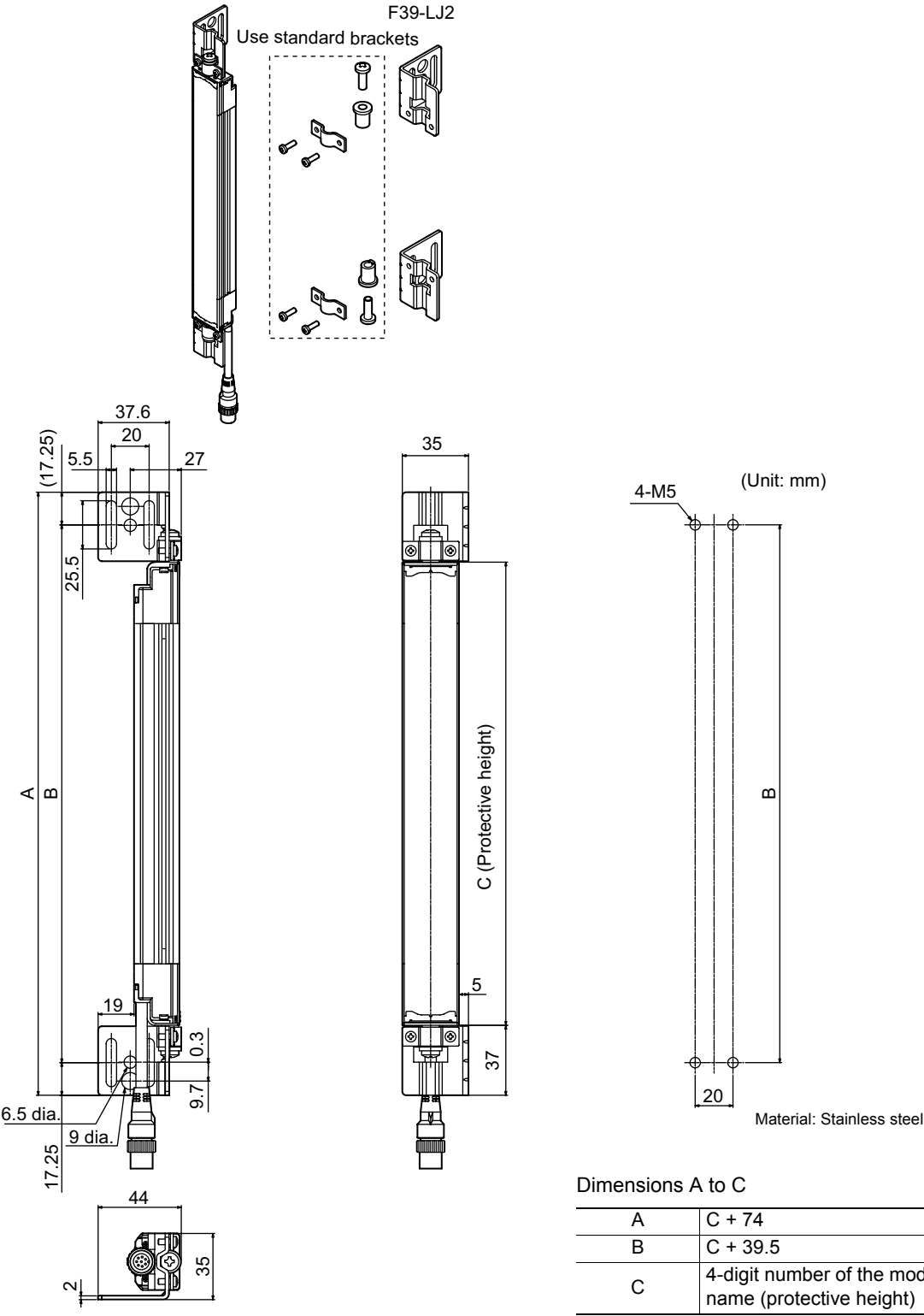
\*Use E = 530 or less when none of the E values shown above are used.

F39-LJ1 Detailed dimensions of bracket



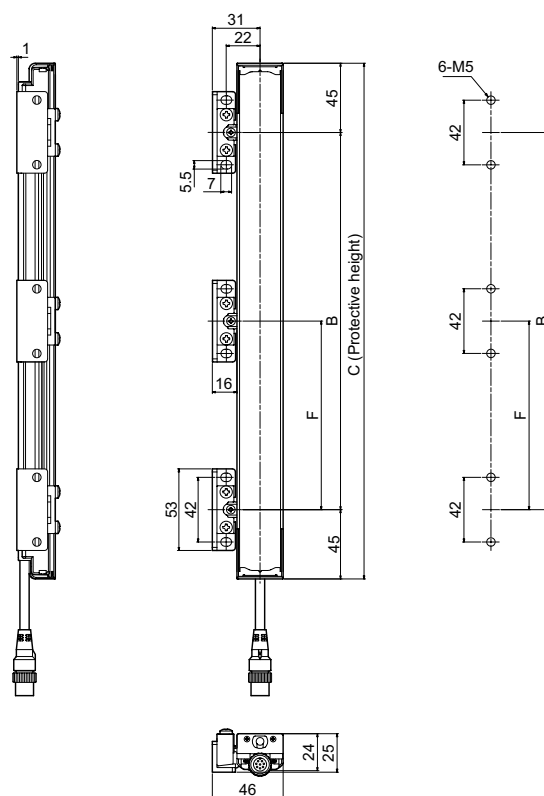
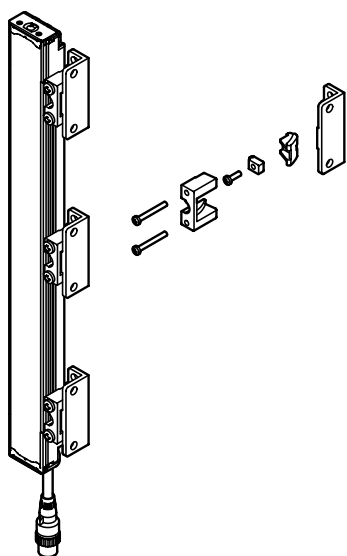


Using side flat mounting bracket (F39-LJ2)

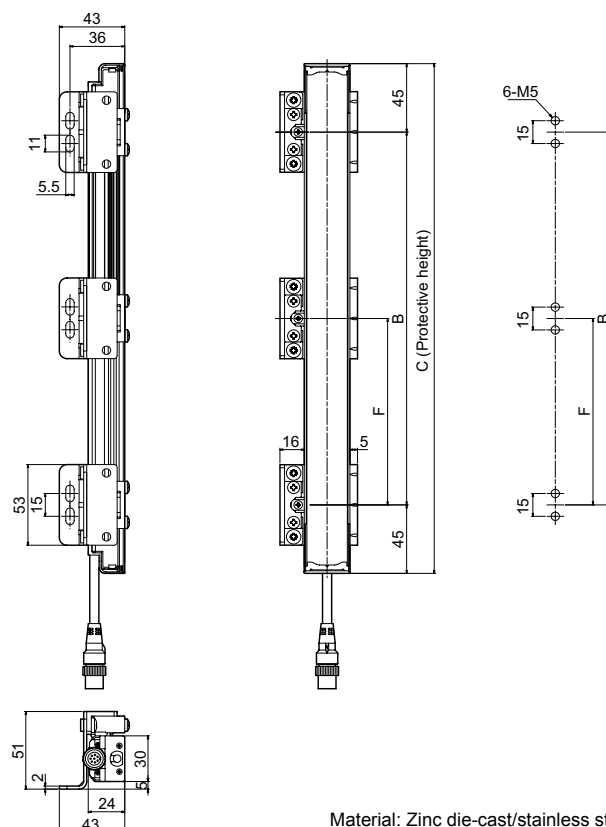
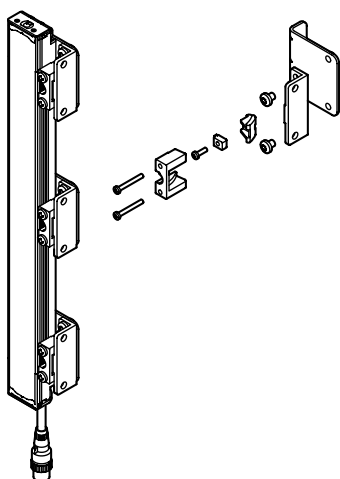


### Using free location mounting bracket (F39-LJ3)

## Backside mounting



### Side mounting



Material: Zinc die-cast/stainless steel

# Dimensions B, C, and F

B	C - 90
C	4-digit number of the model name (protective height)
F	Depends on the protective height. See the table below.

## F

Protective height	Number of intermediate mounting brackets	F*
245 to 440	2	-
443 to 785	3	B / 2
794 to 1136	4	B / 3
1145 to 1490	5	B / 4
1495 to 1838	6	B / 5
1845 to 2180	7	B / 6
2195 to 2495	8	B / 7

\*Use F = 350 or less when none of the F values shown above are used.

When only F39-LJ3 free-location mounting brackets are used without standard brackets, allow a space of at least 350mm between the brackets. The number of brackets required varies according to the protective height. For details about the number of required brackets, refer to the table below.

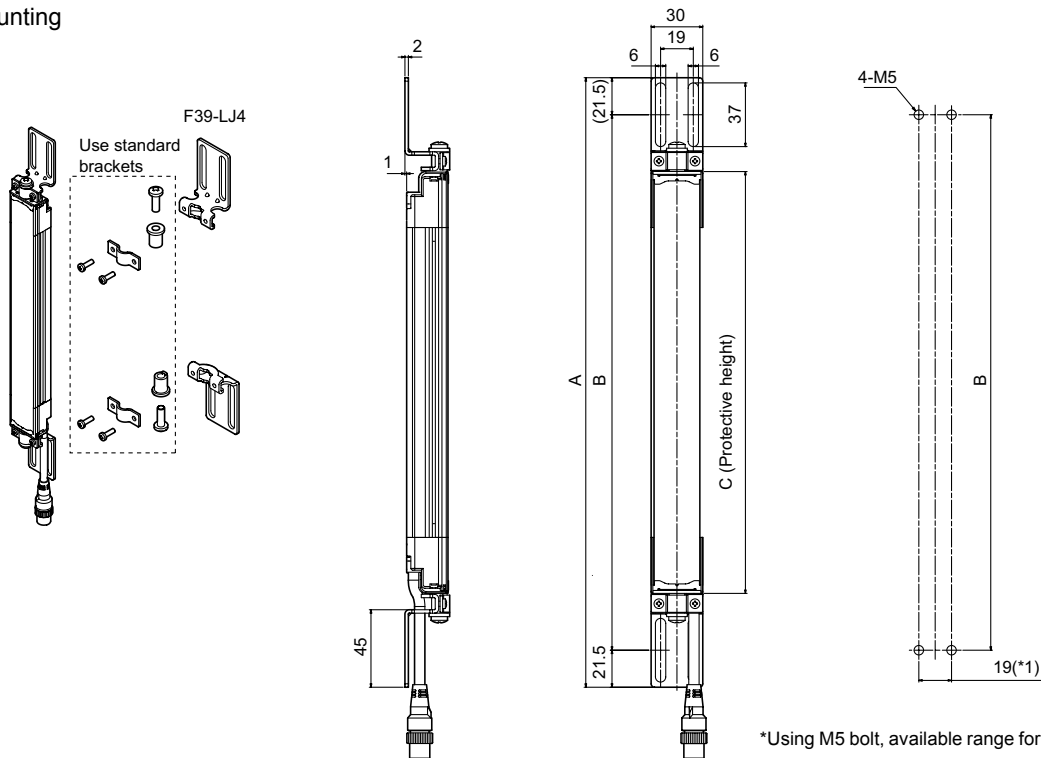
The standard included intermediate mounting brackets are the same as the F39-LJ3 free-location mounting brackets. Purchase brackets as necessary if there are fewer intermediate mounting brackets than required. When intermediate mounting brackets are included, they can be used as free-location mounting brackets.

Required number of F39-LJ3 free-location mounting brackets for 1 F3SJ set (emitter/receiver) (2 pieces are included with F39-LJ3)

Protective height	Number of included free location brackets as intermediate brackets	Number of free location brackets to mount F3SJ	Number of free location brackets to be purchased
245 to 440	0	4	2 sets
443 to 596	0	6	3 sets
605 to 785	2	6	2 sets
794 to 1130	2	8	3 sets
1136	4	8	2 sets
1145 to 1490	4	10	3 sets
1495 to 1658	4	12	4 sets
1667 to 1838	6	12	3 sets
1845 to 2180	6	14	4 sets
2195 to 2495	8	16	4 sets

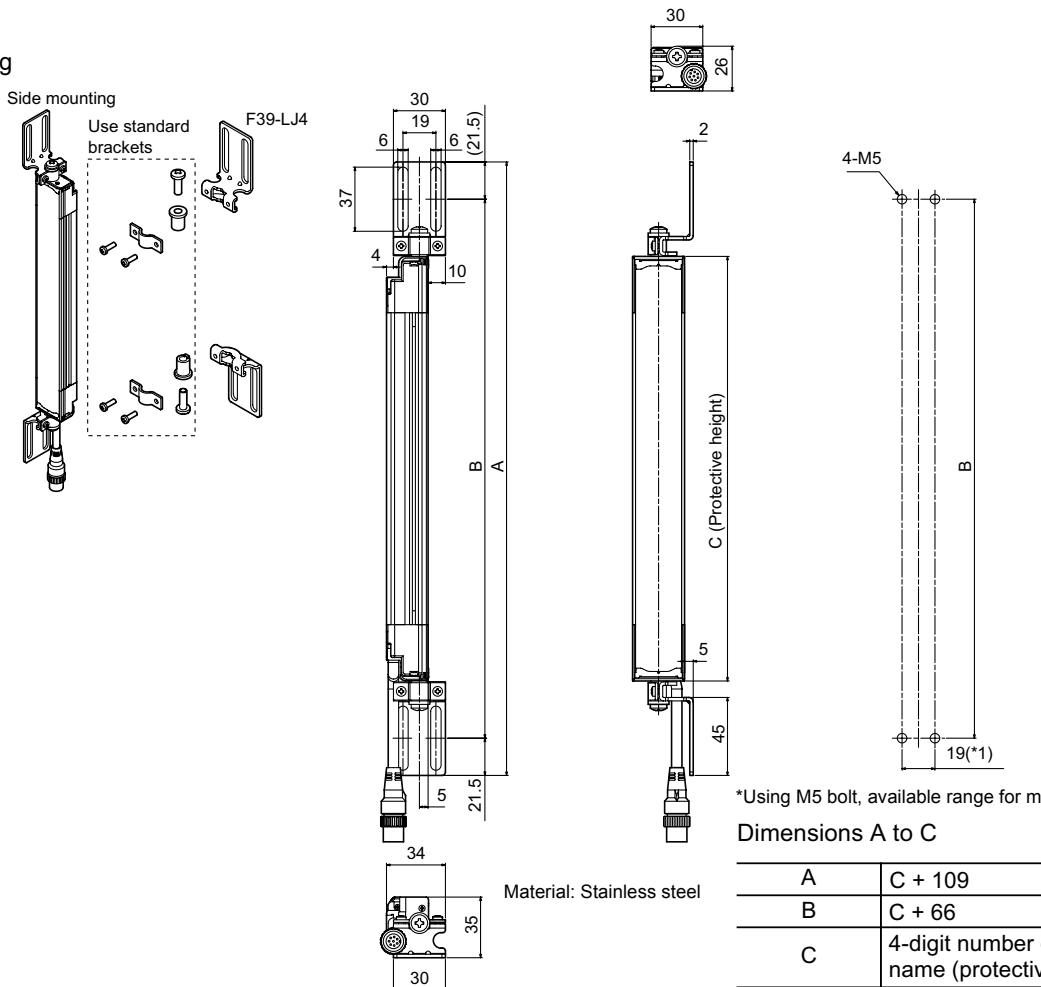
Using top/bottom mounting bracket B (F39-LJ4)

Backside mounting



\*Using M5 bolt, available range for mounting is 18 to 20

Side mounting



\*Using M5 bolt, available range for mounting is 18 to 20

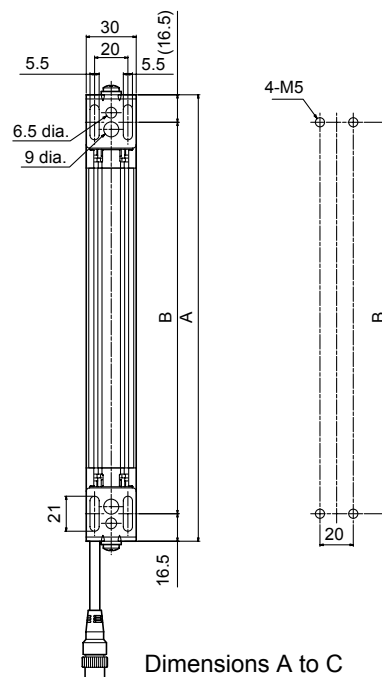
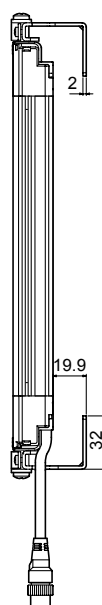
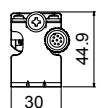
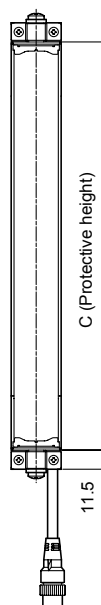
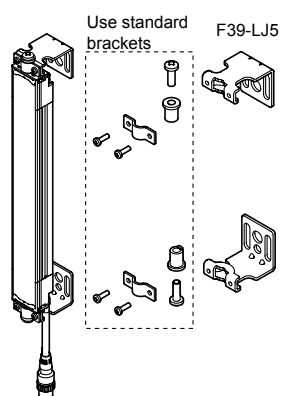
Dimensions A to C

A	C + 109
B	C + 66
C	4-digit number of the model name (protective height)

Material: Stainless steel

### Using mounting bracket for short-length F3SN (F39-LJ5)

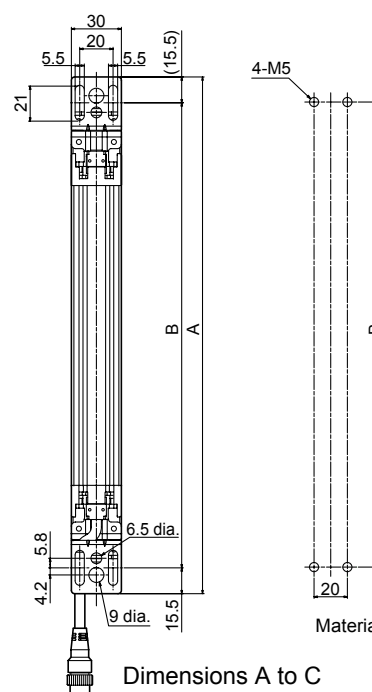
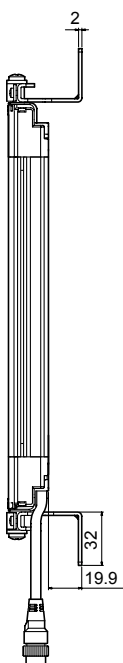
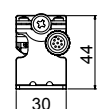
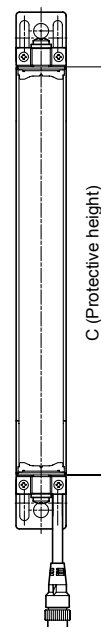
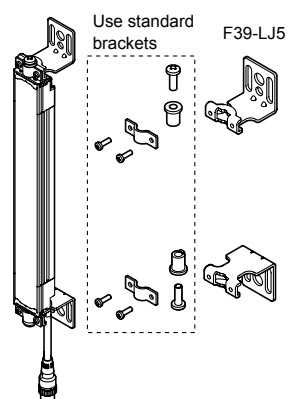
### Inward-facing mounting



Dimensions A to C

A	C + 23
B	C - 10
C	4-digit number of the model name (protective height)

### Outward-facing mounting

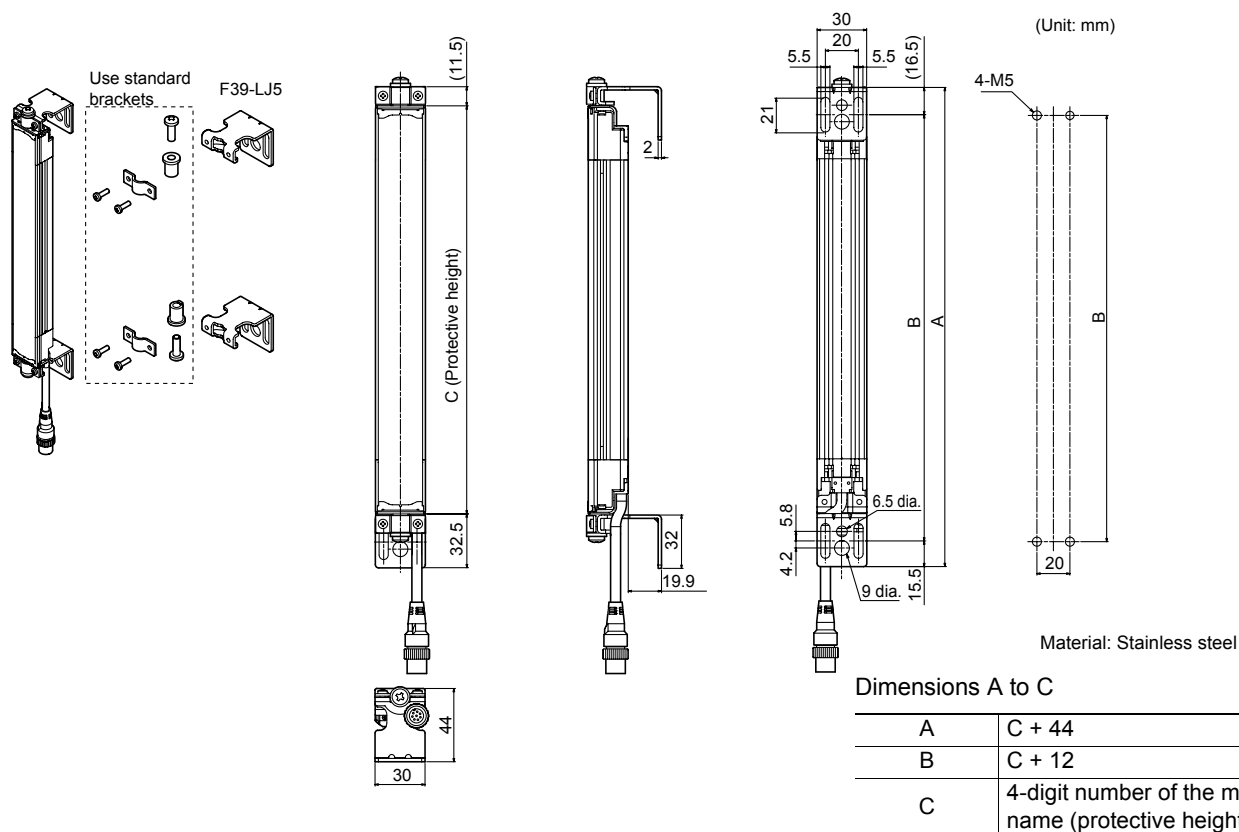


Material: Stainless steel

Dimensions A to C

A	C + 65
B	C + 34
C	4-digit number of the model name (protective height)

Inward + outward-facing mounting



F3SN replacement correspondence table (F3SN mounting holes can be used without modification)

When replacing F3SN-□□□□P(N)14 with F3SJ-A□□□□P(N)14

F3SN		Replacement F3SJ		Replacement method using F39-LJ5
Model	Protective height	Model	Protective height	
F3SN-□0153P(N)14	153	-	-	-
F3SN-□0180P(N)14	180	F3SJ-A0245P(N)14	245	Inward-facing mounting
F3SN-□0189P(N)14	189	F3SJ-A0245P(N)14	245	Inward-facing mounting
F3SN-□0198P(N)14	198	F3SJ-A0245P(N)14	245	Inward + outward-facing mounting
F3SN-□0207P(N)14	207	F3SJ-A0245P(N)14	245	Inward + outward-facing mounting
F3SN-□0216P(N)14	216	F3SJ-A0245P(N)14	245	Outward-facing mounting
F3SN-□0225P(N)14	225	F3SJ-A0245P(N)14	245	Outward-facing mounting

For length greater than F3SN-□0234P(N)14:

Add 11 to the F3SN's 4-digit number and apply it as the F3SJ's 4-digit number, and then replace with the standard brackets included with the product.

[Selection example] F3SN-A0315P(N)14 becomes F3SJ-A0326P(N)14 (replace with standard brackets)

Note1.The protective height becomes 11mm longer.

Note2. Replace with outward-facing mounting of F39-LJ5 when you want to set the detection surface height to be same as the F3SN.

However, the F39-LJ5 and intermediate mounting brackets cannot be mounted simultaneously, so set the protective height to 600mm or less.

When replacing F3SN-□□□□P (N)25 with F3SJ-A□□□□P (N)20

F3SN		Replacement F3SJ		Replacement method using F39-LJ5
Model	Protective height	Model	Protective height	
F3SN-□0187P(N)25	187	-	-	-
F3SN-□0217P(N)25	217	F3SJ-A0260P(N)20	260	Inward-facing mounting
F3SN-□0232P(N)25	232	F3SJ-A0260P(N)20	260	Inward + outward-facing mounting
F3SN-□0247P(N)25	247	F3SJ-A0245P(N)20	245	Outward-facing mounting



For length greater than F3SN-□0262P(N)25:

Subtract 17 from the F3SN's 4-digit number and apply it as the F3SJ's 4-digit number, and then replace with the standard brackets included with the product.

[Selection example] F3SN-A0322P(N)25 becomes F3SJ-A0305P(N)20 (replace with standard brackets)

Note1. The protective height gets 17mm shorter.

2. Replace with outward-facing mounting of F39-LJ5 when you want to set the detection surface height to be same as the F3SN.

However, the F39-LJ5 and intermediate mounting brackets cannot be mounted simultaneously, so set the protective height to 600mm or less.

## Accessories

### Single-end connector cable

F39-JC3A(L = 3m)

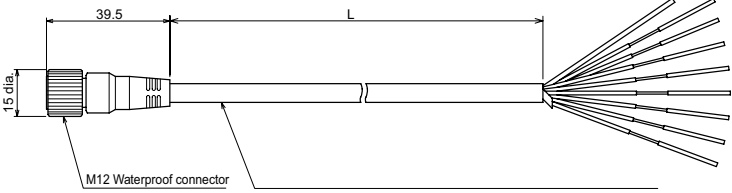
F39-JC10A(L = 10m)

F39-JC7A(L = 7m)

F39-JC15A(L = 15m)



Cable color: Gray for emitter  
Black for receiver



Insulated vinyl round cable 6.6 dia.  
8-wire (4-pair) (Cross section of conductor: 0.3mm<sup>2</sup>/insulator diameter: 1.15mm)  
Standard length L

\* Cables with L=3, 7, 10, and 15m are available.

### Double-end connector cable

F39-JCR5B(L=0.5m)

F39-JC7B(L=7m)

F39-JC1B(L=1m)

F39-JC10B(L=10m)

F39-JC3B(L=3m)

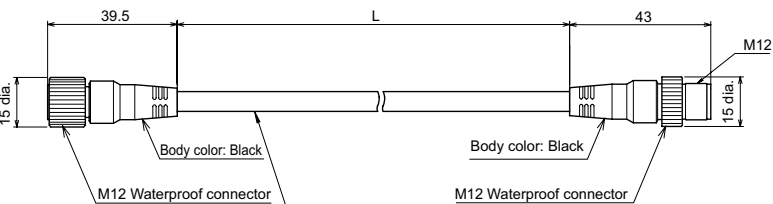
F39-JC15B(L=15m)

F39-JC5B(L=5m)

F39-JC20B(L=20m)



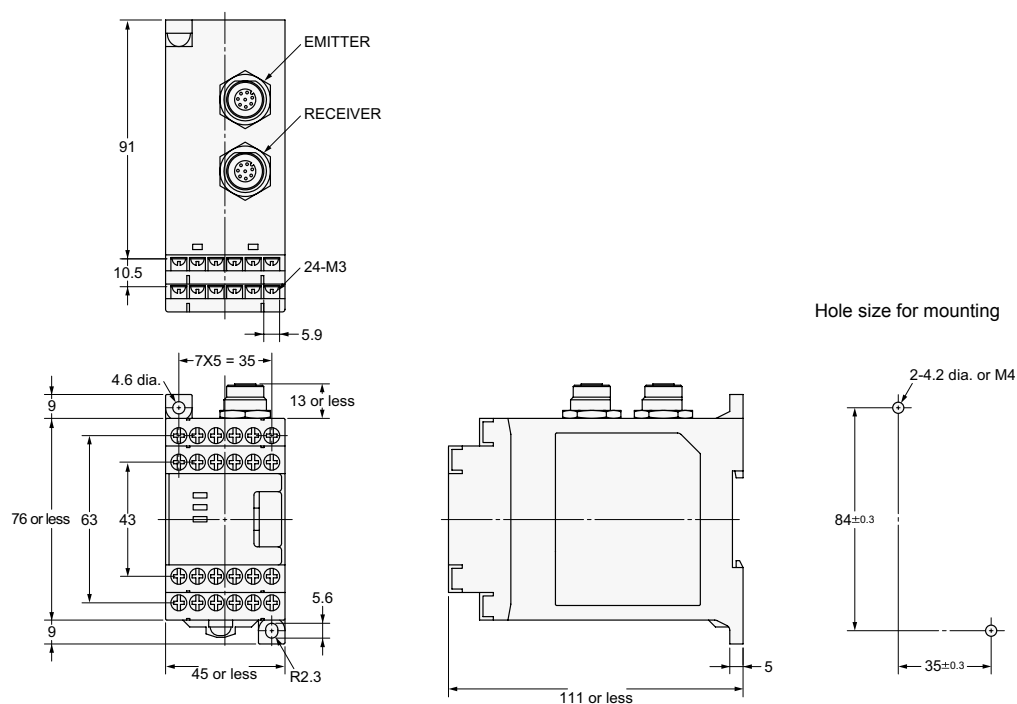
Cable color: Gray for emitter  
Black for receiver



Vinyl-insulated round cable: 6.6 dia.  
8-wire (4-pair) (Cross section of conductor: 0.3mm<sup>2</sup>/ Insulator diameter: 1.15mm)  
Standard length L

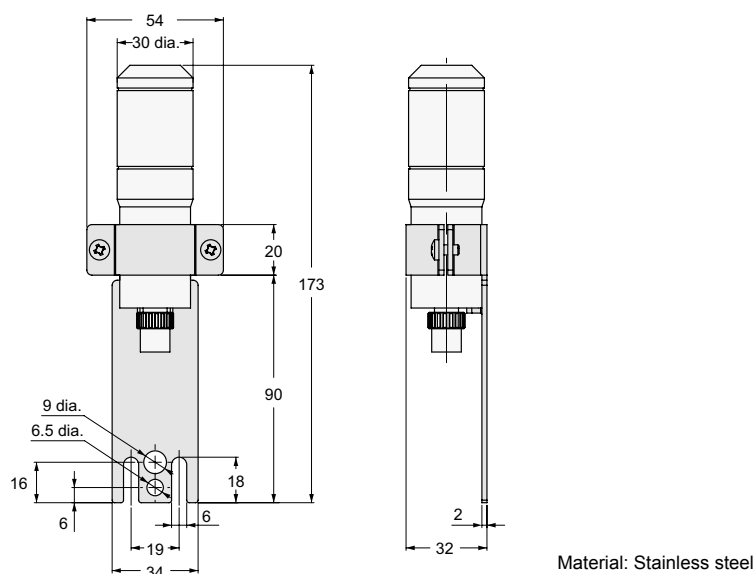
Control unit

F3SP-B1P



Large indicator set

F39-A01-PAC



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

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

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