


The updated F3SJ is even easier to use.

- The lineup also includes models with S-mark certification.
- New models for body protection or presence detection.



 Be sure to read the "Safety Precautions" on page 67 and the "Precautions for All Safety Sensors".

Features

Choose from two new tools for setting parameters and checking the system status.

"SD Manager" PC Setting Support Software

F3SJ

Branch Connector

Connection Cable

To a USB terminal

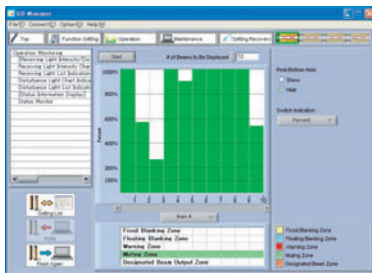
F39-JC□A Single-end Connector Cable or F39-JC□B Double-end Connector Cable

All parameters can be set and the system status can be checked with a personal computer. In addition to making it easy to monitor the beam alignment, the ambient incident light intensity can be displayed in bar graph form for an easy check of the system status.

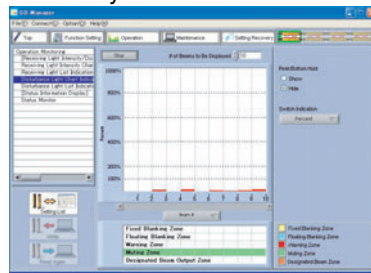
F39-GWUM "SD Manager" PC Setting Support Software

The "SD Manager" PC Setting Support Software helps reduce the time required for installing and troubleshooting the Safety Light Curtain.

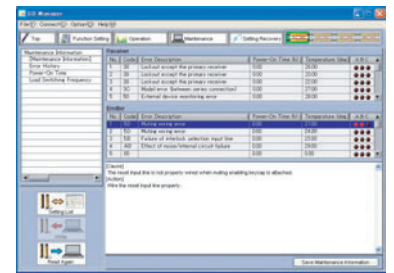
- Beam alignment is easier.
- The ambient incident light intensity can be checked.
- The error log can be displayed.



The incident light level can be displayed in a bar graph for each beam.



The incident light level when the light emission of the Safety Light Curtain is stopped is displayed in a bar graph.



The cause of the errors and countermeasures are both displayed.

Setting Console

F3SJ

Branch Connector

Connection Cable

F39-JC□A Single-end Connector Cable or F39-JC□B Double-end Connector Cable

When you don't want to carry a personal computer onto the worksite, the Setting Console is a handy way to set parameters and check the system status.

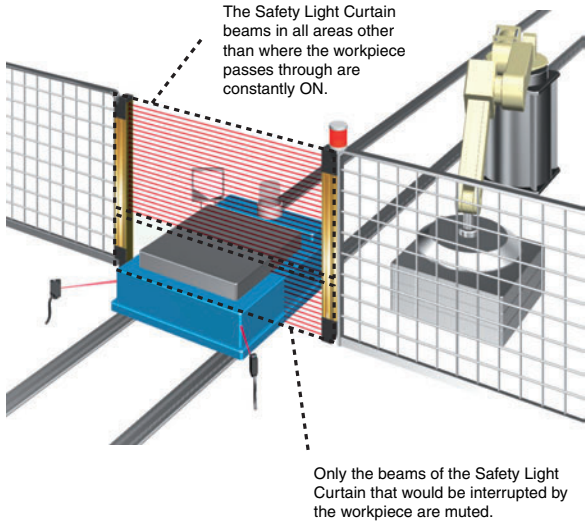
F39-MC21 Setting Console for the F3SJ

Note: The range of parameter setting and system status checking capabilities is different for the PC Setting Support Software and the Setting Console.

**New functions respond to a variety of safety needs.
Two new functions have been added to the muting function.**

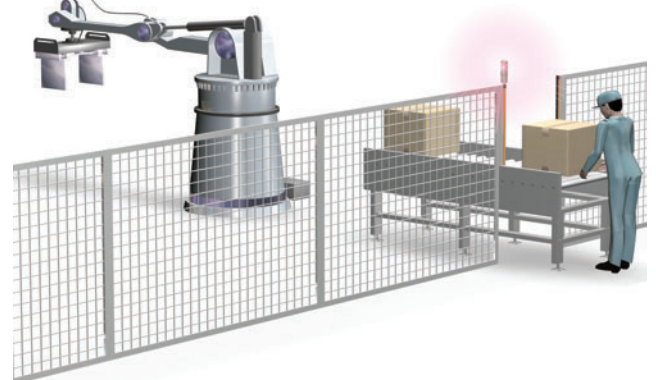
Partial muting

Partial muting raises safety by muting only the beams of the Safety Light Curtain in the area where the workpiece passes through, while preventing muting in all other areas.



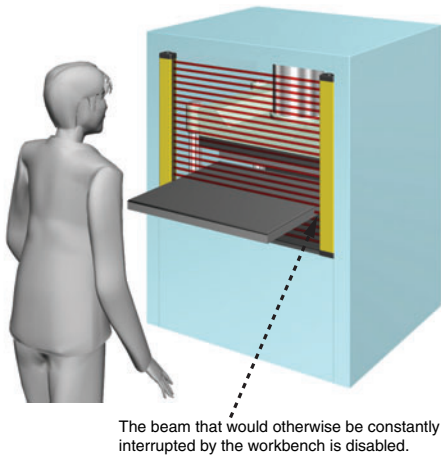
Position detection muting

This is used in applications where the workpiece is set in position each time by an operator, and then a turntable or positioning robot moves the workpiece to the area where the work is done. A limit switch or other means is used to detect when the robot is in a safe position, and muting is then applied.

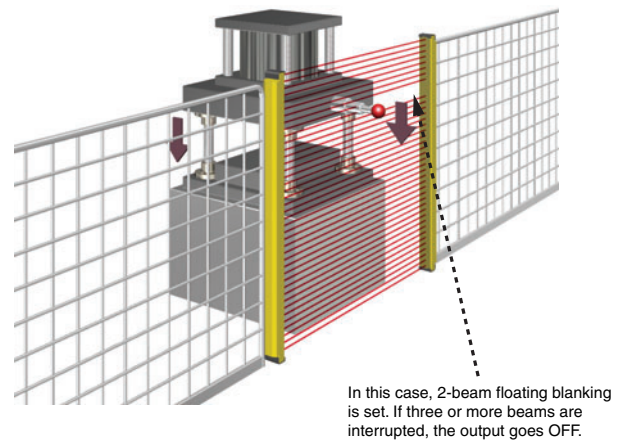


The blanking function disables specific beams of the Safety Light Curtain.

Fixed blanking

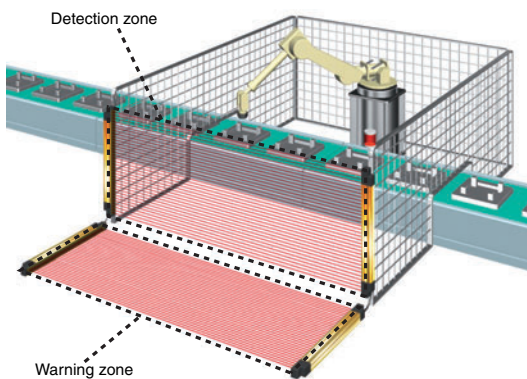


Floating blanking

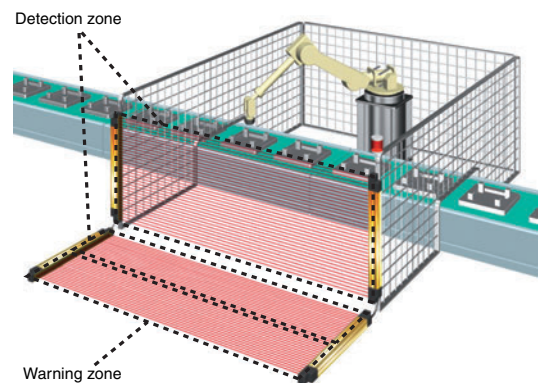


A warning zone can be set to alert people before they enter a danger zone.

Dividing the zone between series-connected sensors



A single sensor can also be divided



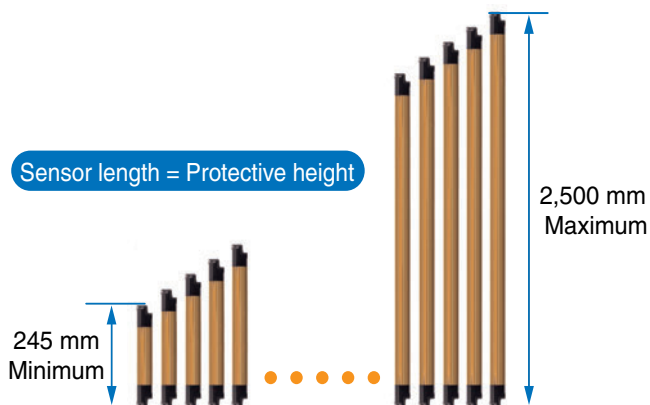
Selecting a device is as easy as 1-2-3.

The F3SJ Safety Light Curtain is a Type 4 safety sensor that can be used to configure a Category 4 safety circuit. This means that there is no need to worry about the safety of the resulting circuit. Use the following three easy steps to select the best model for your system design.

Step 1 Select the required sensor length.

The F3SJ incorporates the "perfect fit" concept that is a 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 8, 8 and 10 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.



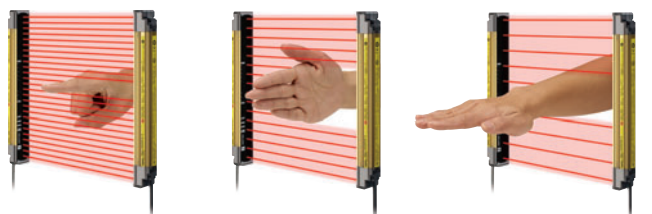
Step 2 Select the output transistor.

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.

In addition to finger protection, hand protection, and hand/arm protection models, new models have been added that detects a leg or the presence of a person.

For areas where there is only a short distance to the source of danger, select a finger protection model. For areas where there is some distance to the hazardous point and where the machinery stops with sufficient time to spare, choose an economical hand/arm/body protection model.



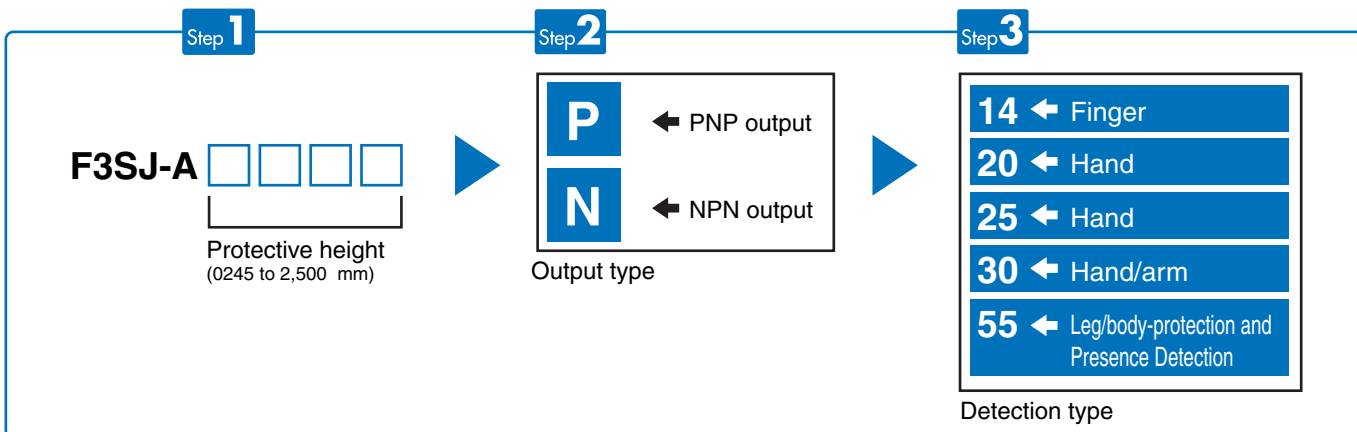
Finger-protection Detection
Capability: 14 mm diameter
(Beam gap: 9 mm)

Hand-protection Detection
Capability: 20 mm diameter
(Beam gap: 15 mm)
Capability: 25 mm diameter
(Beam gap: 20 mm)

Hand/arm-protection Detection
Capability: 30 mm diameter
(Beam gap: 25 mm)



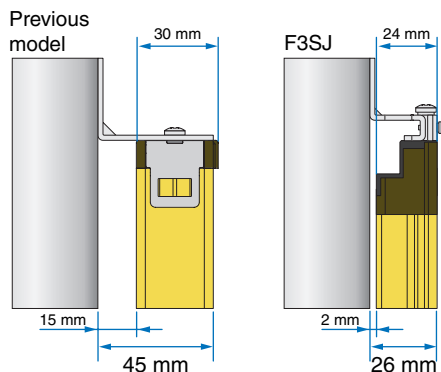
Leg/body-protection and Presence Detection
Capability: 55 mm diameter
(Beam gap: 50 mm)



Easier to install, easier to use.

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.

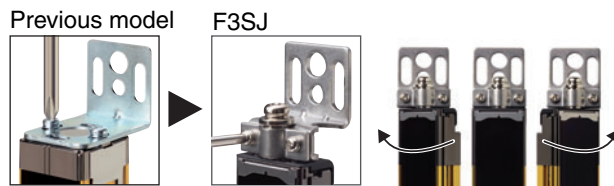
The F3SJ cables (0.3 m) have M12 connectors and can be routed in any direction. Problems with connector compatibility have been eliminated.



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.

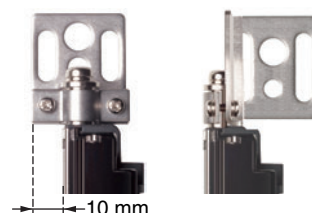


The direction of all screws can be oriented perpendicular to the lens surface. Easy screwdriver access.

The sensor can be rotated along its axis. Beam alignment can be fine-tuned, even when mounted side by side on a surface.

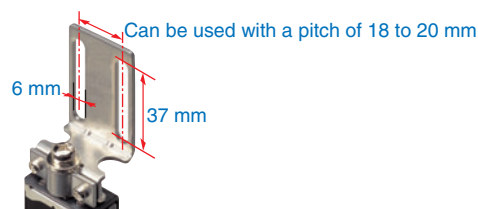
Side-mounting in tight spaces is simple.

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 multiple-beam area sensor, use the F39-LJ4 top / bottom mounting bracket B (sold separately), which features enlarged mounting holes.



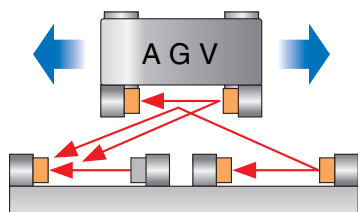
Many Innovations for Easy Installation and Application.

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

OMRON has developed a unique interference light prevention algorithm that automatically prevents malfunction, even when light is received from three 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.

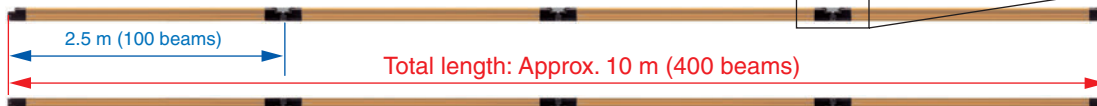
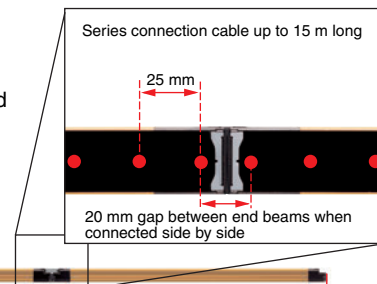
Also, the Setting Tool can be used to adjust the emitted light intensity to minimize the effect of light on other devices.



Maximum protective height of 2,500 mm.

Series connection is more convenient than ever.

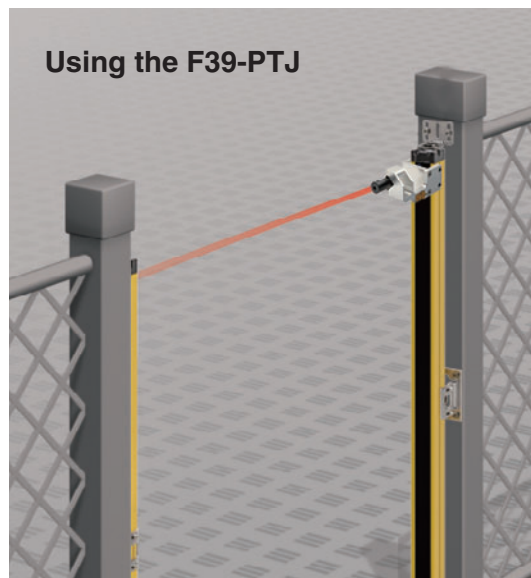
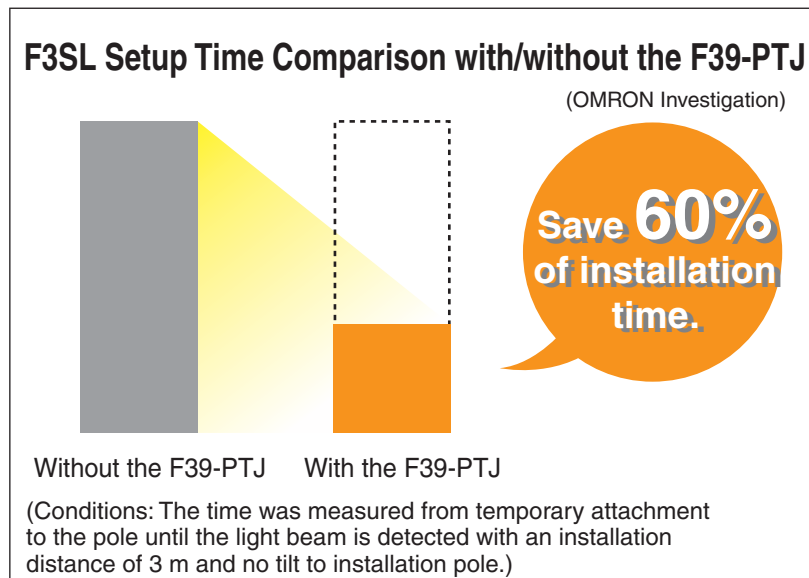
Sensors with protective heights of up to nearly 2.5 meters are available for applications that involve large-sized workpieces. And if you happen to make changes in the future, you can always extend the protective height with series connections. Up to four sets, or 400 beams, can be series-connected,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



Simple Light Beam Adjustment!

A laser light makes the light beams easy to adjust. **NEW**

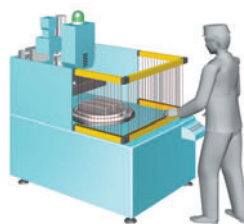
You can immediately see how far and in what direction the beam is offset, even for long adjustment distances. This saves approximately 60% of installation time.



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

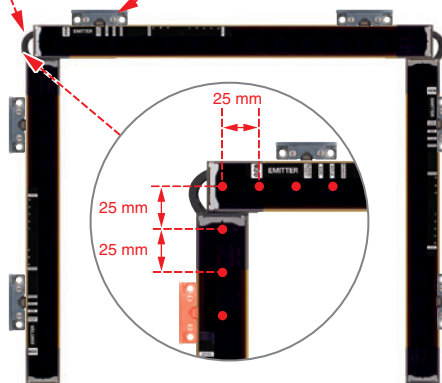
To create "perfect fit" installations with no dead zones or extra space when making series connections in L- or U-shaped configurations, use the F39-LJ3 free-location mounting brackets (sold separately) and F39-JJR06L Side-by-side Series Connection Cable.

In addition to the F39-JJR06L mentioned above, the F39-JJR15L and F39-JJR3W etc. can also be used with series connection cables.



Application example
U-shaped configuration

Side-by-side Series Connection Cable (F39-JJR06L)
F39-LJ3 free-location mounting brackets can be mounted in any location, without getting in the way of the adjacent sensor.



Keep a 25-mm beam gap in L-shaped installations. The cable (F39-JJR06L) does not get in the way when used in series connections.

New functions for extra reliability.

Combine safety and productivity with a controller-less 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.

A measure to prevent you from forgetting to connect a series connection cable.

The connectors for series connection feature an intelligent design. To connect a series connection cable to the F3SJ, remove the Key Cap that is required when the sensor is used by itself.

If you should happen to forget to connect the series connection cable, the sensor will not operate by itself without the Key Cap.

This solves the problem of sensors operating independently when a series connection cable is accidentally left unconnected, such as when equipment is moved.

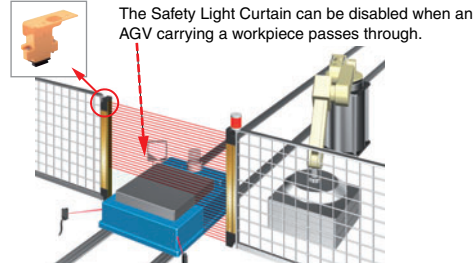
Complies with the latest international safety standards and regulations.

Like previous Type 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.

Built-in muting function

No controller required. Simply attach the Key Cap (sold separately) to the sensor.

F39-CN6
Key Cap for Muting



Operates as a single sensor when the Key Cap is attached.



Does not operate without the Key Cap.



International standards	IEC61496-1, IEC61496-2, IEC61508 (SIL3)
EU legislation EN standards	Machinery Directive, EMC Directive, EN61496-1, CLC/TS61496-2, EN61508 (SIL3), EN ISO 13849-1 (PLe, Cat.4)
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 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.
- Models are also available which have received S-mark certification from the Korea Occupational Safety and Health Agency (KOSHA). These models have an “-S” at the end of the model number.
















Ordering Information

Main Units

Safety Light Curtain F3SJ-A (Type 4)

 Infrared light

Application	Detection capability	Beam gap	Appearance	Operating range	Number of beams	Protective height (mm)	Model	
							PNP Output	NPN Output
Finger protection	14-mm-dia.	9 mm		 0.2 to 9 m	26 to 180	245 to 1,631	F3SJ-A□□□□P14 *1	F3SJ-A□□□□N14
				 0.2 to 9 m			F3SJ-A□□□□P14 -TS *2	---
Hand protection	20-mm-dia.	15 mm		 0.2 to 9 m	16 to 100	245 to 1,505	F3SJ-A□□□□P20 *1	F3SJ-A□□□□N20
				 0.2 to 7 m	110 to 166	1,655 to 2,495	F3SJ-A□□□□P20 -TS *2	---
				 0.2 to 9 m	16 to 100	245 to 1,505	F3SJ-A□□□□P20 *1	F3SJ-A□□□□N20
	25 mm-dia.	20 mm		 0.2 to 7 m	110 to 166	1,655 to 2,495	F3SJ-A□□□□P20 -TS *2	---
				 0.2 to 9 m	13 to 82	260 to 1,640	F3SJ-A□□□□P25 *1	F3SJ-A□□□□N25
				 0.2 to 7 m	83 to 125	1,660 to 2,500	F3SJ-A□□□□P25 -TS *2	---
Hand/arm protection	30-mm-dia.	25 mm		 0.2 to 9 m	10 to 65	245 to 1,620	F3SJ-A□□□□P30 *1	F3SJ-A□□□□N30
				 0.2 to 7 m	70 to 100	1,745 to 2,495	F3SJ-A□□□□P30 -TS *2	---
Leg/body protection, Presence Detection	55 mm-dia.	50 mm	 0.2 to 9 m	6 to 33	270 to 1,620	F3SJ-A□□□□P55 *1	F3SJ-A□□□□N55	
			 0.2 to 7 m	34 to 50	1,670 to 2,470	F3SJ-A□□□□P55 -TS *2	---	

Note: Connection cables are not included with the products and are to be purchased separately, as needed. You must purchase optional connector cable.
 *1. Models with S-mark certification have an "S" at the end of the model number. Example: F3SJ-A0245P14-S
 *2. Models with fixed auto reset (-TS). Parameters cannot be set using the F39-MC21 Setting Console or F39-GWUM "SD Manager" Setting Support Software for F3SJ. See the *Ratings and Performance* data for other differences between this and standard models.

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 (9-mm gap), F3SJ-A14-TS Series (9-mm gap) *1

Model		No. of Beams	Protective Height (mm) *2
PNP Output *1	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
F3SJ-A0623P14	F3SJ-A0623N14	68	623

Model		No. of Beams	Protective Height (mm) *2
PNP Output *1	NPN Output		
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

*1. The suffix "-TS" is attached to the model number of models with fixed auto reset. (Only for PNP output)
 *2. Protective Height (mm) = Total sensor length

**F3SJ-A20 Series (15-mm gap),
F3SJ-A20-TS Series (15-mm gap) *1**

Model		No. of Beams	Protective Height (mm) *2
PNP Output *1	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-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

*1. The suffix "-TS" is attached to the model number of models with fixed auto reset. (Only for PNP output)

*2. Protective Height (mm) = Total sensor length

**F3SJ-A25 Series (20-mm gap),
F3SJ-A25-TS Series (20-mm gap) *1**

Model		No. of Beams	Protective Height (mm) *2
PNP output *1	NPN Output		
F3SJ-A0260P25	F3SJ-A0260N25	13	260
F3SJ-A0300P25	F3SJ-A0300N25	15	300
F3SJ-A0340P25	F3SJ-A0340N25	17	340
F3SJ-A0380P25	F3SJ-A0380N25	19	380
F3SJ-A0420P25	F3SJ-A0420N25	21	420
F3SJ-A0460P25	F3SJ-A0460N25	23	460
F3SJ-A0500P25	F3SJ-A0500N25	25	500
F3SJ-A0540P25	F3SJ-A0540N25	27	540
F3SJ-A0580P25	F3SJ-A0580N25	29	580
F3SJ-A0620P25	F3SJ-A0620N25	31	620
F3SJ-A0660P25	F3SJ-A0660N25	33	660
F3SJ-A0700P25	F3SJ-A0700N25	35	700
F3SJ-A0740P25	F3SJ-A0740N25	37	740
F3SJ-A0780P25	F3SJ-A0780N25	39	780
F3SJ-A0820P25	F3SJ-A0820N25	41	820
F3SJ-A0860P25	F3SJ-A0860N25	43	860
F3SJ-A0900P25	F3SJ-A0900N25	45	900
F3SJ-A0940P25	F3SJ-A0940N25	47	940
F3SJ-A0980P25	F3SJ-A0980N25	49	980
F3SJ-A1020P25	F3SJ-A1020N25	51	1020
F3SJ-A1060P25	F3SJ-A1060N25	53	1060
F3SJ-A1100P25	F3SJ-A1100N25	55	1100
F3SJ-A1140P25	F3SJ-A1140N25	57	1140
F3SJ-A1180P25	F3SJ-A1180N25	59	1180
F3SJ-A1220P25	F3SJ-A1220N25	61	1220
F3SJ-A1260P25	F3SJ-A1260N25	63	1260
F3SJ-A1300P25	F3SJ-A1300N25	65	1300
F3SJ-A1340P25	F3SJ-A1340N25	67	1340
F3SJ-A1380P25	F3SJ-A1380N25	69	1380
F3SJ-A1420P25	F3SJ-A1420N25	71	1420
F3SJ-A1460P25	F3SJ-A1460N25	73	1460
F3SJ-A1500P25	F3SJ-A1500N25	75	1500
F3SJ-A1540P25	F3SJ-A1540N25	77	1540
F3SJ-A1580P25	F3SJ-A1580N25	79	1580
F3SJ-A1620P25	F3SJ-A1620N25	81	1620
F3SJ-A1660P25	F3SJ-A1660N25	83	1660
F3SJ-A1700P25	F3SJ-A1700N25	85	1700
F3SJ-A1740P25	F3SJ-A1740N25	87	1740
F3SJ-A1780P25	F3SJ-A1780N25	89	1780
F3SJ-A1820P25	F3SJ-A1820N25	91	1820
F3SJ-A1860P25	F3SJ-A1860N25	93	1860
F3SJ-A1900P25	F3SJ-A1900N25	95	1900
F3SJ-A1940P25	F3SJ-A1940N25	97	1940
F3SJ-A1980P25	F3SJ-A1980N25	99	1980
F3SJ-A2020P25	F3SJ-A2020N25	101	2020
F3SJ-A2060P25	F3SJ-A2060N25	103	2060
F3SJ-A2100P25	F3SJ-A2100N25	105	2100
F3SJ-A2140P25	F3SJ-A2140N25	107	2140
F3SJ-A2180P25	F3SJ-A2180N25	109	2180
F3SJ-A2220P25	F3SJ-A2220N25	111	2220
F3SJ-A2260P25	F3SJ-A2260N25	113	2260
F3SJ-A2300P25	F3SJ-A2300N25	115	2300
F3SJ-A2340P25	F3SJ-A2340N25	117	2340
F3SJ-A2380P25	F3SJ-A2380N25	119	2380
F3SJ-A2420P25	F3SJ-A2420N25	121	2420
F3SJ-A2460P25	F3SJ-A2460N25	123	2460
F3SJ-A2500P25	F3SJ-A2500N25	125	2500

*1. The suffix "-TS" is attached to the model number of models with fixed auto reset. (Only for PNP output)

*2. Protective Height (mm)= Total sensor length

F3SJ-A30 Series (25-mm 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
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

F3SJ-A55 Series (50-mm gap)


Model		No. of Beams	Protective Height (mm) *
PNP Output	NPN Output		
F3SJ-A0270P55	F3SJ-A0270N55	6	270
F3SJ-A0320P55	F3SJ-A0320N55	7	320
F3SJ-A0370P55	F3SJ-A0370N55	8	370
F3SJ-A0420P55	F3SJ-A0420N55	9	420
F3SJ-A0470P55	F3SJ-A0470N55	10	470
F3SJ-A0520P55	F3SJ-A0520N55	11	520
F3SJ-A0570P55	F3SJ-A0570N55	12	570
F3SJ-A0620P55	F3SJ-A0620N55	13	620
F3SJ-A0670P55	F3SJ-A0670N55	14	670
F3SJ-A0720P55	F3SJ-A0720N55	15	720
F3SJ-A0770P55	F3SJ-A0770N55	16	770
F3SJ-A0820P55	F3SJ-A0820N55	17	820
F3SJ-A0870P55	F3SJ-A0870N55	18	870
F3SJ-A0920P55	F3SJ-A0920N55	19	920
F3SJ-A0970P55	F3SJ-A0970N55	20	970
F3SJ-A1020P55	F3SJ-A1020N55	21	1020
F3SJ-A1070P55	F3SJ-A1070N55	22	1070
F3SJ-A1120P55	F3SJ-A1120N55	23	1120
F3SJ-A1170P55	F3SJ-A1170N55	24	1170
F3SJ-A1220P55	F3SJ-A1220N55	25	1220
F3SJ-A1270P55	F3SJ-A1270N55	26	1270
F3SJ-A1320P55	F3SJ-A1320N55	27	1320
F3SJ-A1370P55	F3SJ-A1370N55	28	1370
F3SJ-A1420P55	F3SJ-A1420N55	29	1420
F3SJ-A1470P55	F3SJ-A1470N55	30	1470
F3SJ-A1520P55	F3SJ-A1520N55	31	1520
F3SJ-A1570P55	F3SJ-A1570N55	32	1570
F3SJ-A1620P55	F3SJ-A1620N55	33	1620
F3SJ-A1670P55	F3SJ-A1670N55	34	1670
F3SJ-A1720P55	F3SJ-A1720N55	35	1720
F3SJ-A1770P55	F3SJ-A1770N55	36	1770
F3SJ-A1820P55	F3SJ-A1820N55	37	1820
F3SJ-A1870P55	F3SJ-A1870N55	38	1870
F3SJ-A1920P55	F3SJ-A1920N55	39	1920
F3SJ-A1970P55	F3SJ-A1970N55	40	1970
F3SJ-A2020P55	F3SJ-A2020N55	41	2020
F3SJ-A2070P55	F3SJ-A2070N55	42	2070
F3SJ-A2120P55	F3SJ-A2120N55	43	2120
F3SJ-A2170P55	F3SJ-A2170N55	44	2170
F3SJ-A2220P55	F3SJ-A2220N55	45	2220
F3SJ-A2270P55	F3SJ-A2270N55	46	2270
F3SJ-A2320P55	F3SJ-A2320N55	47	2320
F3SJ-A2370P55	F3SJ-A2370N55	48	2370
F3SJ-A2420P55	F3SJ-A2420N55	49	2420
F3SJ-A2470P55	F3SJ-A2470N55	50	2470

* Protective Height (mm)= Total sensor length

Accessories (Optional)


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
	0.5 m	M12 connector (8-pin)	F39-JCR5A
	3 m		F39-JC3A
	7 m		F39-JC7A
	10 m		F39-JC10A
	15 m		F39-JC15A
	20 m		F39-JC20A


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
	0.5 m	M12 connector (8-pin)	F39-JCR5B
	1 m		F39-JC1B
	3 m		F39-JC3B
	5 m		F39-JC5B
	7 m		F39-JC7B
	10 m		F39-JC10B
	15 m		F39-JC15B
	20 m		F39-JC20B
	30 m		F39-JC30B
	40 m		F39-JC40B

* To extend the cable length under series connection, use F39-JJR3W and F39-JC□B in combination. Also, the cable length 20 to 40 m cannot be used.

Power Cable (Included with the main unit) (2 cables per set, for emitter and receiver)

Appearance	Cable length	Model
	0.3 m	F39-JJR3K

Series Connection Cable (2 cables per set, for emitter and receiver)



Type	Appearance	Cable length	Model	Application
Series connection cable		0.3 m	F39-JJR3W	For series connection *1 When using the Water-resistant Case. *2
Extension cable		0.5 to 15 m	F39-JC□B	To change series connection length in combination with F39-JJR3W
Side-by-side Series connection cable		0.06 m	F39-JJR06L	Dedicated series connection cable with minimum length, used in place of the sensor's cable with connector
		0.15 m	F39-JJR15L	

*1. Total cable length of series connection is 0.6 m to connect to connector cable of the main sensor unit.


For series connection with minimum length, use the F39-JJR06L or F39-JJR15L.

*2. When using the F39-EJ□□□□-L/D Water-resistant Case in series connection configurations, use the special series connection cables for the Water-resistant Case. Refer to page 15 for details.

Relays with Forcibly Guided Contacts


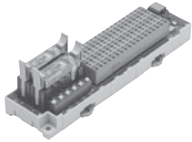
Type	Appearance	Specifications	Model	Remarks
G7SA Relays with Forcibly Guided Contacts		<ul style="list-style-type: none"> No. of contacts: 4 Contact type: 2NO+2NC Rated switch load: 250 VAC 6 A, 30 VDC 6 A 	G7SA-2A2B	For other models and functions, refer to G7SA and Socket models.
		<ul style="list-style-type: none"> No. of contacts: 4 Contact type: 3NO+1NC Rated switch load: 250 VAC 6 A, 30 VDC 6 A 	G7SA-3A1B	
G7S□-E Relays with Forcibly Guided Contacts		<ul style="list-style-type: none"> No. of contacts: 6 Contact type: 4NO+2NC Rated switch load: 250 VAC 10 A, 30 VDC 10 A 	G7S-4A2B-E	For other models and functions, refer to G7S□-E and Socket models.
		<ul style="list-style-type: none"> No. of contacts: 6 Contact type: 3NO+3NC Rated switch load: 250 VAC 10 A, 30 VDC 10 A 	G7S-3A3B-E	

**Control unit (Can not be used as a muting system)
(Dedicated PNP output type) ***

Appearance	Output	Model	Remarks
	Relay, 3NO+1NC	F3SP-B1P *	For connection with F3SJ-A, use an F39-JC□B double-end connector cable

* F3SJ for NPN output type cannot be connected.


Wire-saving Devices

Type	Appearance	Specifications	Model	Remarks
Connector Terminal Box/Muting Terminals *1		Model with PNP Muting Sensor Output	F39-TC5P01	Significantly reduces amount of wiring between Safety Light Curtains and Muting Sensors IP67 model for mounting at Sensor installation site Refer to F39-TC5
		Model with PNP Override Input	F39-TC5P02	
		Model with NPN Muting Sensor Output	F39-TC5N01	
		Model with NPN Override Input	F39-TC5N02	
Safety Terminal Relays *2		PNP output relay, SPDT-NO	F3SP-T01	Significantly reduces amount of wiring between Safety Light Curtains and Muting Sensors Refer to F3SP-T01


*1. For the F3SJ-A.

*2. For the F3SJ-A□P□.

Laser Pointer


Appearance	Specifications	Model
	Laser Pointer for F3SJ	F39-PTJ

Dedicated External Indicator Set (Can be connected to either an emitter or a receiver)

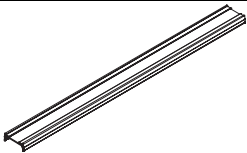
Appearance	Color	Model	Remarks
	Red	F39-A01PR-PAC	Indicator (red), mounting bracket (1 set), and dedicated connection cable (0.1 m)
	Green	F39-A01PG-PAC	Indicator (green), mounting bracket (1 set), and dedicated connection cable (0.1 m)
	Yellow	F39-A01PY-PAC	Indicator (yellow), mounting bracket (1 set), and dedicated connection cable (0.1 m)

Note: For indication timing (operation mode) see "Specifications" on page 16.

General External Indicator Cable

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

**Spatter Protection Cover (Includes two pieces for emitter and receiver)
(Each unit reduces the operating range by 10%)**

Appearance	Applicable sensor	Model
	F3SJ-A series	F39-HJ□□□□ *

* The same 4-digit numbers as the protective heights (□□□□ in the light curtain type names) are substituted by □□□□ in the model names.

Mirrors (12% Sensing Distance Attenuation)

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



Sensor Mounting Bracket (Sold separately)

Appearance	Specifications	Model	Application	Remarks
	Standard mounting bracket (for top/bottom)	F39-LJ1	(provided with the F3SJ)	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 (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 (For details about the number of required brackets, refer to page 39.)
	F3SN Intermediate Bracket Replacement Spacers	F39-LJ3-SN	When replacing the F3SN with the F3SJ, the mounting hole pitches in the Intermediate Brackets are not the same. This Spacer is placed between the mounting holes to mount the F3SJ.	1 set with 2 pieces
	Top/bottom mounting bracket B (mounting hole pitch 19 mm)	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 20 mm.	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 300 mm or less is replaced by an F3SJ.	2 for emitter, 2 for receiver (total of 4 per set)
	Space-saving mounting bracket	F39-LJ8	Use these brackets to mount facing inward. Length is 12 mm shorter than the standard F39-LJ1 bracket.	2 for emitter, 2 for receiver (total of 4 per set)
	Mounting bracket used when replacing an F3W-C.	F39-LJ9	Mounting bracket used when replacing existing F3W-C series area sensors with the F3SJ. For front mounting or side mounting. Mounting hole pitch 16 mm.	2 for emitter, 2 for receiver (total of 4 per set)
	Top/bottom mounting bracket C (mounting hole pitch 13 mm)	F39-LJ11	Mounting bracket used when replacing existing area sensors having a mounting pitch of 13 mm with the 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. (Case: orange)

Setting Tools *1

Type	Appearance	Model	Remarks
"SD Manager" Setting Support Software for the F3SJ		F39-GWUM	Accessories: SD Manager CD-ROM (1), F39-CN1 Branch Connector (1), Connector Cap (1), 2-m Dedicated Cable (1), 0.3-m Dedicated Cable with Plug (1), Instruction Manual
Setting Console		F39-MC21 *2	Accessories: F39-CN1 Branch Connector (1), Connector Cap (1), 2-m Dedicated Cable (1), 0.3-m Dedicated Cable with Plug (1), Instruction Manual




- *1. The setting tools described above can be connected only to F3SJ-A models with built-in software of Ver. 2 or later. Note that the setting tools cannot be used with products shipped prior to December 2005. The setting tools cannot be used for setting parameters on the F3SJ-A□-TS series, but the monitoring function can be used.
- *2. This product is for use only with the F3SJ-A. It cannot be connected to conventional models of the F3SN-A series. Similarly, the F39-MC11 and F39-MT11 Dedicated Consoles for the F3SN-A cannot be connected to the F3SJ-A series.

Protective Bar (Main unit mounting bracket (1) and a rear mounting bracket set) *1

Type	Appearance	Model	Remarks
Protective Bar Set		F39-PJ□□□□-S *2	Rear Mounting Brackets (2), including intermediate brackets to match protective height (0 to 2).
Intermediate brackets for side mounting		F39-PJ-MS	For side mounting, order to suit the desired protective height. Protective height of up to 1,000 mm: 0 intermediate brackets Protective height of 1,001 to 2,000 mm: 1 intermediate bracket Protective height of 2,001 mm or more: 2 intermediate brackets

- *1. When using for both emitter and receiver, order two sets.
- *2. The same four digits indicating protective height that are used in the Sensor model number (□□□□) are used in the □□□□ part of the Protector model number.

Water-resistant Case (Set of 1 tube, packing, and dedicated connector cable) *1 *2

Appearance	Specifications	Model	Remarks
	For emitter	F39-EJ□□□□-L *3	Includes gray cable for emitter.
	For receiver	F39-EJ□□□□-D *3	Includes black cable for receiver.
	Rear Mounting Brackets	F39-EJ-R *4	Top/bottom 1 each, total of 2
	Side Mounting Brackets	F39-EJ-S *4	Top/bottom 1 each, total of 2
---	Series connection cable (for emitter)	F39-JJR3WE-L	Purchase additionally for series connection when using the Water-resistant Case.
	Series connection cable (for receiver)	F39-JJR3WE-D	

- *1. When using for both emitter and receiver, order two sets.
- *2. There are restrictions to the application conditions depending on the protective height of the Curtain. Refer to the Water-resistant Case on page 23.
- *3. The same four digits indicating protective height that are used in the Sensor model number (□□□□) are used in the □□□□ part of the Case model number.
- *4. Be sure to purchase brackets with the Case to match the mounting direction (rear or side).

Specifications (For details, refer to the instruction manual or User's manual.)

Main Units

F3SJ-A□□□□P14/P20/P25/P30/P55/N14/N20/N25/N30/N55

Item	Model	PNP outputs	F3SJ-A□□□□P14	F3SJ-A□□□□P20	F3SJ-A□□□□P25	F3SJ-A□□□□P30	F3SJ-A□□□□P55
		NPN outputs	F3SJ-A□□□□N14	F3SJ-A□□□□N20	F3SJ-A□□□□N25	F3SJ-A□□□□N30	F3SJ-A□□□□N55
Sensor type		Type 4 safety light curtain					
Version		Ver. 2					
Setting tool connection		Connectable					
Applicable safety category		Category 4, 3, 2, 1, or B					
Detection capability		Opaque objects 14 mm in diameter		Opaque objects 20 mm in diameter		Opaque objects 25 mm in diameter	
Beam gap (P)		9 mm		15 mm		20 mm	
Number of beams (n)		26 to 180		16 to 166		13 to 125	
Protective height (PH)		245 to 1,631 mm		245 to 2,495 mm		260 to 2,500 mm	
Lens diameter		Diameter 5 mm					
Operating range *		0.2 to 9 m (protective height 1,640 mm max.), 0.2 to 7 m (protective height 1,655 mm min.) (Depending on the setting tool, the detection distance can be shortened to 0.5 m.)					
Response time (under stable light incident condition) (For details, see "Response Time" on page 21.)	ON to OFF	1 set, 0245 to 983: 11 ms to 17.5 ms max. 1,055 or higher: 20 ms to 25 ms max.		1 set, 0245 to 1,205: 10 ms to 15 ms max. 1,235 or higher: 17.5 ms to 22.5 ms max.		1 set, 0260 to 1,600: 10 ms to 15 ms max. 1,620 or higher: 17.5 ms to 20.0 ms max.	
	OFF to ON	1 set, 0245 to 983: 44 ms to 70 ms max. 1,055 or higher: 80 ms to 100 ms max.		1 set, 0245 to 1,205: 40 ms to 60 ms max. 1,235 or higher: 70 ms to 90 ms max.		1 set, 0260 to 1,600: 40 ms to 60 ms max. 1,620 or higher: 70 ms to 80 ms max.	
Startup waiting time		2 s max. (2.2 s max. for series connection)					
Power supply voltage (Vs)		24 VDC ±20% (ripple p-p10% max.)					
Current consumption (no load)	Emitter	Up to 50 beams: 76 mA max., 51 to 100 beams: 106 mA max., 101 to 150 beams: 130 mA max., 151 to 180 beams: 153 mA max., 201 to 234 beams: 165 mA max.					
	Receiver	Up to 50 beams: 68 mA max., 51 to 100 beams: 90 mA max., 101 to 150 beams: 111 mA max., 151 to 180 beams: 128 mA max., 201 to 234 beams: 142 mA max.					
Light source (emitted wavelength)		Infrared LED (870 nm)					
Effective aperture angle (EAA)		Based on IEC61496-2. Within ±2.5° for both emitter and receiver when the detection distance is 3 m or over					
Control outputs (OSSD)	PNP outputs	Two PNP transistor outputs, load current 300 mA max., residual voltage 2 V max. (except for voltage drop due to cable extension), allowable capacity load 2.2 µF, leak current 1 mA max. (This can be different from traditional logic (ON/OFF) because safety circuit is used.)					
	NPN outputs	Two NPN transistor outputs, load current 300 mA max., residual voltage 2 V max. (except for voltage drop due to cable extension), allowable capacity load 2.2 µF, leak current 2 mA max. (This can be different from traditional logic (ON/OFF) because safety circuit is used.)					
Auxiliary output 1 (non-safety output)	PNP output	One PNP transistor output, load current 300 mA max., residual voltage 2 V max. (except for voltage drop due to cable extension), leak current 1 mA max.					
	NPN output	One NPN transistor output, load current 300 mA max., residual voltage 2 V max. (except for voltage drop due to cable extension), leak current 1 mA max.					
Auxiliary output 2 (non-safety output, basic system functions)	PNP output	One PNP transistor output, load current 50 mA max., residual voltage 2 V max. (except for voltage drop due to cable extension), leak current 1 mA max.					
	NPN output	One NPN transistor output, load current 50 mA max., residual voltage 2 V max. (except for voltage drop due to cable extension), leak current 1 mA max.					
External indicator output (non-safety output)		Available indicators <ul style="list-style-type: none"> Incandescent lamp: 24 VDC, 3 to 7 W LED lamp: Load current 10 mA to 300 mA max., leak current 1 mA 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	Control outputs 1, 2:ON when receiving light Auxiliary output 1:Inverse of control output signals (Operating mode can be changed with the setting tool.) External indicator output 1:Inverse of control output signals for a basic system (Operating mode can be changed with the setting tool.) ON when muting/override for a muting system (Operating mode can be changed with the setting tool.)					
	Emitter	Auxiliary output 2: Turns ON when the point of 30,000 operating hours is reached (Operating mode can be changed with the setting tool.) External indicator output 2:ON when lock-out for a basic system (Operating mode can be changed with the setting tool.) ON when muting/override for a muting system (Operating mode can be changed with the setting tool.)					

* Use of the Spatter Protection Cover causes a 10% maximum sensing distance attenuation.

Model	PNP outputs	F3SJ-A□□□□P14	F3SJ-A□□□□P20	F3SJ-A□□□□P25	F3SJ-A□□□□P30	F3SJ-A□□□□P55
Item	NPN outputs	F3SJ-A□□□□N14	F3SJ-A□□□□N20	F3SJ-A□□□□N25	F3SJ-A□□□□N30	F3SJ-A□□□□N55
Input voltage	PNP output	Test input, interlock selection input, reset input, and muting input are all ON voltage:9 to 24 V (Vs) (sink current: 3 mA max.) OFF voltage:0 to 1.5 V, or open External device monitoring input ON voltage:9 to 24 V (Vs) (sink current: 5 mA max.) OFF voltage:0 to 1.5 V, or open				
	NPN output	Test input, interlock selection input, reset input, and muting input are all ON voltage:0 to 1.5 V (short-circuit current 3 mA max.) OFF voltage:9 to 24 V, or open External device monitoring input ON voltage:0 to 1.5 V (short-circuit current 5 mA max.) OFF voltage:9 to 24 V, or open				
Indicators	Emitter	Light intensity level indicators (green LED × 2, orange LED × 3): ON based on the light intensity Error mode indicators (red LED × 3): Blink to indicate error details Power indicator (green LED × 1): ON while power is on Interlock indicator (yellow LED × 1): ON while under interlock, blinks at lockout. External device monitoring indicator (muting input 1 indicator), Blanking/test indicator (muting input 2 indicator) (green LED × 2): ON/flash according to function				
	Receiver	Light intensity level indicators (green LED × 2, orange LED × 3): ON based on the light intensity Error mode indicators (red LED × 3): Blink to indicate error details OFF output indicator (red LED × 1): ON when safety output is OFF, blinks at lockout. ON output indicator (green LED × 1): ON while safety output is ON muting error indicator, Blanking /test indicator (green LED × 2): ON/flash according to function				
Mutual interference prevention function	Interference light prevention algorithm, detection distance change function					
Series connection	Time division emission by series connection <ul style="list-style-type: none"> • Number of connections: up to 4 sets • Total number of beams: up to 400 beams • Maximum cable length for 2 sets: no longer than 15 m • Response time under connection: See page 21 					
Test functions	<ul style="list-style-type: none"> • Self test (when power is turned ON and while power is supplied) • External test (emission stop function by test input) 					
Safety functions	<ul style="list-style-type: none"> • Start interlock, restart interlock (Must be set with a setting tool when the muting function is used.) • External device monitor • Muting (Lamp burnout detection, override function included. F39-CN6 key cap for muting is required.) • Fixed blanking (must be set by a setting tool) • Floating blanking (must be set by a setting tool) 					

Item	Model	PNP outputs	F3SJ-A□□□□P14	F3SJ-A□□□□P20	F3SJ-A□□□□P25	F3SJ-A□□□□P30	F3SJ-A□□□□P55
		NPN outputs	F3SJ-A□□□□N14	F3SJ-A□□□□N20	F3SJ-A□□□□N25	F3SJ-A□□□□N30	F3SJ-A□□□□N55
Connection type		Connectors (M12, 8-pin)					
Protective circuits		Output short-circuit protection, and power supply reverse polarity protection					
Ambient temperature		Operating: -10 to 55°C (no icing), Storage: -30 to 70°C					
Ambient humidity		Operating: 35% to 85% (no condensation), Storage: 35% to 95%					
Ambient operating light intensity		Incandescent lamp: 3,000 lx max. (light intensity on the receiver surface), Sunlight: 10,000 lx max. (light intensity on the receiver surface)					
Insulation resistance		20 MΩ min. (at 500 VDC)					
Dielectric strength		1,000 VAC 50/60 Hz, 1 min					
Degree of protection		IP65 (IEC60529)					
Vibration resistance		Malfunction: 10 to 55 Hz, 0.7-mm double amplitude, 20 sweeps in X, Y, and Z directions					
Shock resistance		Malfunction: 100 m/s ² , 1,000 times each in X, Y, and Z directions					
Materials		Casing (including metal parts on both ends): Aluminum, zinc die-cast Cap: ABS resin Optical cover: PMMA resin (acrylic) Cable: Oil resistant PVC					
Weight (packed state)		Calculate using the following equations: (1) For F3SJ-A□□□□14, weight (g)=(protective height) × 1.7 + α (2) For F3SJ-A□□□□20/F3SJ-A□□□□25/F3SJ-A□□□□30, weight (g)=(protective height) × 1.5 + α (3) For F3SJ-A□□□□55, weight (g)=(protective height) × 1.4 + α The values for α are as follows: Protected height 245 to 596 mm: α = 1,100 protected height 1,660 to 2,180 mm: α = 2,400 Protected height 600 to 1,130 mm: α = 1,500 protected height 2,195 to 2,500 mm: α = 2,600 Protected height 1,136 to 1,658 mm: α = 2,000					
Accessories		Test rod (*1), instruction manual, standard mounting bracket (F39-LJ1 bracket for top/bottom mounting), mounting brackets (intermediate) (*2), error mode label, User's Manual (CD-ROM) *1. The F3SJ-A□□□□55 is not included. *2. Number of intermediate mounting brackets depends on protective height of F3SJ. • For protective height from 600 to 1,130 mm: 1 set for each of the emitter and receiver is included • For protective height from 1,136 to 1,658 mm: 2 sets for each of the emitter and receiver are included • For protective height from 1,660 to 2,180 mm: 3 sets for each of the emitter and receiver are included • For protective height from 2,195 to 2,500 mm: 4 sets for each of the emitter and receiver are included					
Applicable standards		IEC61496-1, EN61496-1 UL61496-1, Type 4 ESPE (Electro-Sensitive Protective Equipment) IEC61496-2, CLC/TS61496-2, UL61496-2, Type 4 AOPD (Active Opto-electronic Protective Devices) IEC61508, EN61508 SIL3 EN ISO 13849-1: 2008 (PLe, Cat.4)					

F3SJ-A□□□□P14-TS/P20-TS/P25-TS

Item	Model	F3SJ-A□□□□P14-TS	F3SJ-A□□□□P20-TS	F3SJ-A□□□□P25-TS
Sensor type		Type 4 safety light curtain		
Version		Ver. 2		
Setting tool connection		Parameter setting: Not possible Monitoring: Possible		
Applicable safety category		Category 4, 3, 2, 1, or B		
Detection capability		Opaque objects 14 mm in diameter	Opaque objects 20 mm in diameter	Opaque objects 25 mm in diameter
Beam gap (P)		9 mm	15 mm	20 mm
Number of beams (n)		26 to 180	16 to 166	13 to 125
Protective height (PH)		245 to 1,631 mm	245 to 2,495 mm	260 to 2,500 mm
Lens diameter		Diameter 5 mm		
Operating range		0.2 to 9 m (protective height 1,640 mm max.), 0.2 to 7 m (protective height 1,655 mm max.)		
Response time (under stable light incident condition) (For details, see "Response Time" on page 21.)	ON to OFF	1 set, 0245 to 983: 11 ms to 17.5 ms max. 1,055 or higher: 20 ms to 25 ms max. 3 sets (240 beams): 45.5 ms	1 set, 0245 to 1,205: 10 ms to 15 ms max. 1,220 or higher: 17.5 ms to 22.5 ms max. 3 sets (240 beams): 45.5 ms	1 set, 0260 to 1,600: 10 ms to 15 ms max. 1,620 or higher: 17.5 ms to 20.0 ms max. 3 sets (240 beams): 45.5 ms
	OFF to ON	1 set, 0245 to 983: 44 ms to 70 ms max. 1,055 or higher: 80 ms to 100 ms max. 3 sets (240 beams): 200 ms	1 set, 0245 to 1,205: 40 ms to 60 ms max. 1,220 or higher: 70 ms to 90 ms max. 3 sets (240 beams): 200 ms	1 set, 0260 to 1,600: 40 ms to 60 ms max. 1,620 or higher: 70 ms to 80 ms max. 3 sets (240 beams): 200 ms
Startup waiting time		2 s max. (2.2 s max. for series connection)		
Power supply voltage (Vs)		24 VDC ±20% (ripple p-p10% max.)		
Current consumption (no load)	Emitter	Up to 50 beams: 76 mA max., 51 to 100 beams: 106 mA max., 101 to 150 beams: 130 mA max., 151 to 180 beams: 153 mA max.		
	Receiver	Up to 50 beams: 68 mA max., 51 to 100 beams: 90 mA max., 101 to 150 beams: 111 mA max., 151 to 180 beams: 128 mA max.		
Light source (emitted wavelength)		Infrared LED (870 nm)		
Effective aperture angle (EAA)		Based on IEC61496-2. Within ±2.5° for both emitter and receiver when the detection distance is 3 m or over		
Control outputs (OSSD)		Two PNP transistor outputs, load current 300 mA max., residual voltage 2 V max. (except for voltage drop due to cable extension), allowable capacity load 2.2 µF, leak current 1 mA max. (This can be different from traditional logic (ON/OFF) because safety circuit is used.)		
Auxiliary output 1 (non-safety output)		One PNP transistor output, load current 300 mA max., residual voltage 2 V max. (except for voltage drop due to cable extension), leak current 1 mA max.		
External indicator output (non-safety output)		Available indicators <ul style="list-style-type: none"> Incandescent lamp: 24 VDC, 3 to 7 W LED lamp: Load current 10 mA to 300 mA max., leak current 1 mA 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	Control outputs 1, 2: ON when receiving light Auxiliary output 1: Inverse of control output signals External indicator output 1: Inverse of control output signals for a basic system ON when muting/override for a muting system		
	Emitter	External indicator output 2: ON when lock-out for a basic system ON when muting/override for a muting system		
Input voltage		Test input, reset input, and muting input are all ON voltage: 9 to 24 V (Vs) (sink current: 3 mA max.) OFF voltage: 0 to 1.5 V, or open External device monitoring input ON voltage: 9 to 24 V (Vs) (sink current: 5 mA max.) OFF voltage: 0 to 1.5 V, or open		
Indicators	Emitter	Light intensity level indicators (green LED × 2, orange LED × 3): ON based on the light intensity Error mode indicators (red LED × 3): Blink to indicate error details Power indicator (green LED × 1): ON while power is on Lockout indicator (yellow LED × 1): Blinks to indicate lockout. External device monitoring indicator (muting input 1 indicator), Test indicator (muting input 2 indicator) (green LED × 2): ON/flash according to function		
	Receiver	Light intensity level indicators (green LED × 2, orange LED × 3): ON based on the light intensity Error mode indicators (red LED × 3): Blink to indicate error details OFF output indicator (red LED × 1): ON when safety output is OFF, blinks at lockout. ON output indicator (green LED × 1): ON while safety output is ON muting error indicator, Test indicator (green LED × 2): ON/flash according to function		

Item	Model	F3SJ-A□□□□P14-TS	F3SJ-A□□□□P20-TS	F3SJ-A□□□□P25-TS
Mutual interference prevention function		Interference light prevention algorithm		
Series connection		Time division emission by series connection <ul style="list-style-type: none"> • Number of connections: up to 3 sets • Total number of beams: up to 240 beams • Maximum cable length for 2 sets: no longer than 15 m • Response time under connection: See page 21 		
Test functions		<ul style="list-style-type: none"> • Self test (when power is turned ON and while power is supplied) • External test (emission stop function by test input) 		
Safety functions		<ul style="list-style-type: none"> • External device monitor • Muting (Override function included. F39-CN6 Key Cap for muting is required.) Lockout occurs under either of the following conditions: <ul style="list-style-type: none"> • When more than 3 Units are connected in series. • When the total number of beams connected in series exceeds 240. • When any model other than a "TS" model is included in a series connection. 		
Connection type		Connectors (M12, 8-pin)		
Protective circuits		Output short-circuit protection, and power supply reverse polarity protection		
Ambient temperature		Operating: -10 to 55°C (no icing), Storage: -30 to 70°C		
Ambient humidity		Operating: 35% to 85% (no condensation), Storage: 35% to 95%		
Ambient operating light intensity		Incandescent lamp: 3,000 lx max. (light intensity on the receiver surface), Sunlight: 10,000 lx max. (light intensity on the receiver surface)		
Insulation resistance		20 MΩ min. (at 500 VDC)		
Dielectric strength		1,000 VAC 50/60 Hz, 1 min		
Degree of protection		IP65 (IEC60529)		
Vibration resistance		Malfunction: 10 to 55 Hz, 0.7-mm double amplitude, 20 sweeps in X, Y, and Z directions		
Shock resistance		Malfunction: 100 m/s ² , 1,000 times each in X, Y, and Z directions		
Materials		Casing (including metal parts on both ends): Aluminum, zinc die-cast Cap: ABS resin Optical cover: PMMA resin (acrylic) Cable: Oil resistant PVC		
Weight (packed state)		Calculate using the following equations: For F3SJ-A□□□□P□□-TS, weight (g)=(protective height) × 1.5 + α The values for α are as follows: Protected height 245 to 590 mm: α = 1,100 protected height 1,660 to 2,180 mm: α = 2,400 Protected height 600 to 1,130 mm: α = 1,500 protected height 2,195 to 2,500 mm: α = 2,600 Protected height 1,140 to 1,655 mm: α = 2,000		
Accessories		Test rod, instruction manual, standard mounting bracket (F39-LJ1 bracket for top/bottom mounting), mounting brackets (intermediate) (*), error mode label, User's Manual (CD-ROM) * Number of intermediate mounting brackets depends on protective height of F3SJ. <ul style="list-style-type: none"> • For protective height from 600 to 1,130 mm: 1 set for each of the emitter and receiver is included • For protective height from 1,140 to 1,655 mm: 2 sets for each of the emitter and receiver are included • For protective height from 1,660 to 2,180 mm: 3 sets for each of the emitter and receiver are included • For protective height from 2,195 to 2,500 mm: 4 sets for each of the emitter and receiver are included 		
Applicable standards		IEC61496-1, EN61496-1 UL61496-1, Type 4 ESPE (Electro-Sensitive Protective Equipment) IEC61496-2, CLC/TS61496-2, UL61496-2, Type 4 AOPD (Active Opto-electronic Protective Devices) IEC61508, EN61508 SIL3 EN ISO 13849-1: 2008 (PLe, Cat.4)		

Response Time

Model	Protective Height (mm)	Number of Beams	Response time ms (ON to OFF)	Response time ms (OFF to ON)
F3SJ-A□14 series F3SJ-A□P14-TS 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
	1,055 to 1,271	116 to 140	20	80
	1,343 to 1,559	148 to 172	22.5	90
	1,631	180	25	100
F3SJ-A□20 series F3SJ-A□P20-TS series	245	16	10	40
	275 to 425	18 to 28	11	44
	455 to 635	30 to 42	12	48
	665 to 815	44 to 54	13	52
	845 to 995	56 to 66	14	56
	1,025 to 1,205	68 to 80	15	60
	1,235 to 1,655	82 to 110	17.5	70
	1,805 to 2,105	120 to 140	20	80
	2,255 to 2,495	150 to 166	22.5	90
F3SJ-A□25 series F3SJ-A□P25-TS series	260 to 320	13 to 16	10	40
	340 to 580	17 to 29	11	44
	600 to 840	30 to 42	12	48
	860 to 1100	43 to 55	13	52
	1120 to 1340	56 to 67	14	56
	1360 to 1600	68 to 80	15	60
	1620 to 2240	81 to 112	17.5	70
	2260 to 2500	113 to 125	20.0	80
F3SJ-A□30 series	245 to 395	10 to 16	10	40
	420 to 720	17 to 29	11	44
	745 to 1,045	30 to 42	12	48
	1,070 to 1,295	43 to 52	13	52
	1,395 to 1,620	56 to 65	14	56
	1,745 to 1,995	70 to 80	15	60
	2,120 to 2,495	85 to 100	17.5	70
F3SJ-A□55 series	270 to 770	6 to 16	10	40
	820 to 1420	17 to 29	11	44
	1470 to 2070	30 to 42	12	48
	2120 to 2470	43 to 50	13	52

Note: 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 + Response time of 3rd unit - 5 (ms)

Response time (OFF to ON): Response time calculated by the above x 5 (ms)
(For models with the "-TS" suffix, multiply the response time obtained by the above x 5 (ms), or use 200 ms, whichever is less.)

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 must be no greater than the lengths described below.

When the F3SJ and an external power supply are directly connected, or when the F3SJ is connected to a G9SA-300-SC.

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

When connected to the F3SP-B1P.

Condition	1 set	2 sets	3 sets	4 sets
Using incandescent lamp for external indicator output 2	40 m	30 m	25 m	20 m
Using incandescent lamp for external indicator output 1	60 m	45 m	30 m	20 m
Using incandescent lamp for auxiliary output 1				
Not using incandescent lamp	100 m	60 m	45 m	30 m

Note: Keep the cable length within the rated length. Failure to do so is dangerous as it may prevent safety functions from operating normally.

Accessories

Control Unit

Item	Model	F3SP-B1P
Applicable sensor		F3SJ-A (Only for PNP output type) *
Power supply voltage		24 VDC±10%
Power consumption		DC1.7 W max. (not including sensor's current consumption)
Operation time		100 ms max. (not including sensor's response time)
Response time		10 ms max. (not including sensor's response time)
Relay output	Number of contacts	3NO+1NC
	Rated load	25 VAC 5 A (cosφ= 1), 30 VDC 5 A L/R = 0 ms
	Rated current	5 A
Connection type	Between sensors	M12 connector (8-pin)
	Others	Terminal block
Weight (packed state)		Approx. 280 g
Accessories		Instruction manual

* NPN output type cannot be connected. Also, the system cannot be used as a muting system.

Laser Pointer

Item	Model	F39-PTJ
Applicable sensor		F3SJ-A Series
Power supply voltage		4.5 or 4.65 VDC
Power consumption		Three button batteries (SR44 or LR44)
Battery life		SR44: 10 hours of continuous operation, LR44: 6 hours of continuous operation
Light source		Red semiconductor laser (wavelength: 650 nm, 1 mW max. JIS class 2, EN/IEC class 2, FDA class II)
Spot diameter (typical value)		6.5 mm at 10 m
Ambient temperature		Operating: 0 to 40°C Storage: 15 to 60°C (with no icing or condensation)
Ambient humidity		Operating and storage: 35% to 85% (with no condensation)
Materials		Laser module case: aluminum Mounting bracket: aluminum and stainless
Weight		Approx. 220 g (packed)
Accessories		Laser safety standard labels (EN: 1, FDA: 3) Button batteries (SR44: 3), operating instructions

Dedicated External Indicator Set

Item	Model	F39-A01PR-PAC	F39-A01PG-PAC	F39-A01PY-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	Yellow LED
Power supply voltage		24 VDC±10% (supplied by sensor)		
Consumption current		50 mA 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 (0.1 m), Dedicated mounting brackets (1 for each)	Indicator (green), Dedicated connector cable (0.1 m), Dedicated mounting brackets (1 for each)	Indicator (yellow), Dedicated connector cable (0.1 m), Dedicated mounting brackets (1 for each)

Water-resistant Case

Item	Model	F39-EJ□□□□-L, F39-EJ□□□□-D
Applicable sensor		F3SJ-series Curtains with a protective height of 600 mm max. / F3SJ-series Curtains with a protective height of 605 mm min.
Ambient temperature		-10 to 55°C (operation and storage) / 13 to 33°C (operation and storage)
Mounting direction		No restrictions / Vertical direction only (see following diagram)
Operating range		0.2 to 7 m (for a protective height of 1,631 mm max.), 0.2 to 5 m (for a protective height of 1,655 mm min.)
Degree of protection		IP67 (IEC60529) (When assembled according to the application precautions)
Materials		Case: Acrylic resin, Rubber: Nitrile rubber, M5 bolt: SUSXM7, M4 bolt: SUS316L, Cable: Oil-resistant PVC, Plate: SUS304, Mounting Bracket (optional): SUS304
Weight (packed state)		Calculation formula: Weight (g) = 1.5 x □□□□ + 300 (□□□□ stands for the four digits of the model number (protective height)) (The optional Mounting Brackets come in a set of two, and weigh 120 g. This weight is not included in the above formula.)

Note: 1. Vibration

When using Curtains with a protective height of 605 mm or more, the vibration performance of the applicable sensor is reduced. Do not use these Curtains in locations that are subject to vibration.

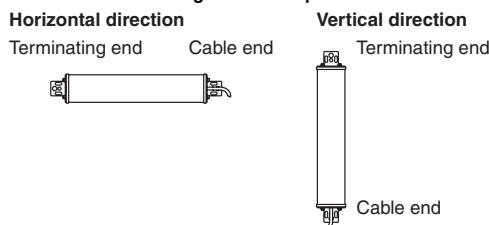
2. Protective height

When using these cases, the protective height of the applicable sensor is reduced. Check the rating and performance prior to use.

3. Mounting direction

When using Curtains with a protective height of 605 mm or more, some slackness occurs due to the weight of the Curtain. For this reason, mount these Curtains only in the vertical direction.

Mounting direction
(the cable end and terminating end can be positioned in either direction)



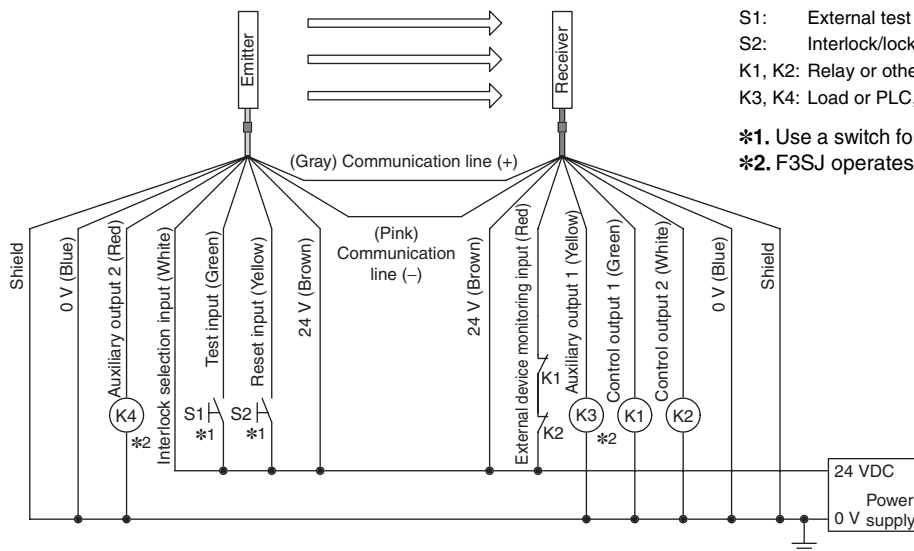
Connections

Basic Connection for 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.

For PNP output (See page 25 for NPN output wiring.)

Wiring when using manual reset mode, external device monitoring

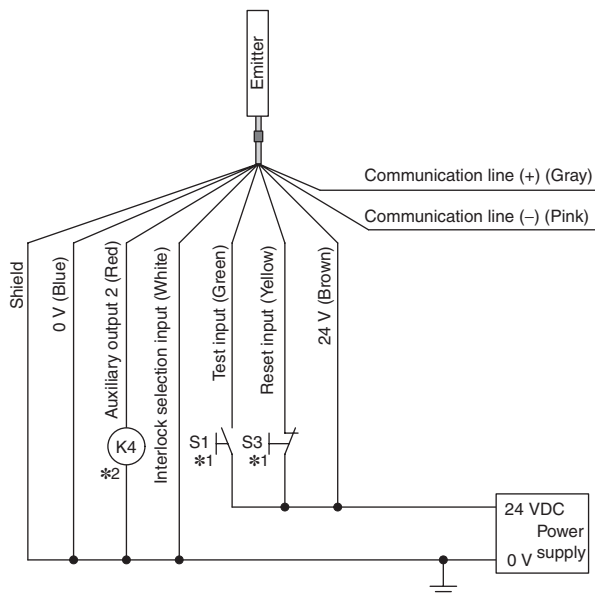


- S1: External test switch (connect to 0 V if the switch is not necessary.)
- S2: Interlock/lockout reset switch
- K1, K2: Relay or other device that controls hazardous parts of the machine
- K3, K4: Load or PLC, etc. (for monitoring)

- *1. Use a switch for micro loads (Input specifications: 24 V, 1.8 mA).
- *2. F3SJ operates even when K3 and K4 are not connected.

Wiring for auto reset mode

- The auto reset mode will be enabled when the emitter is wired as shown below.



S1: External test switch (connect to 0 V if the switch is not necessary.)

S3: Lockout reset switch (connect to 24 V if the switch is not necessary)

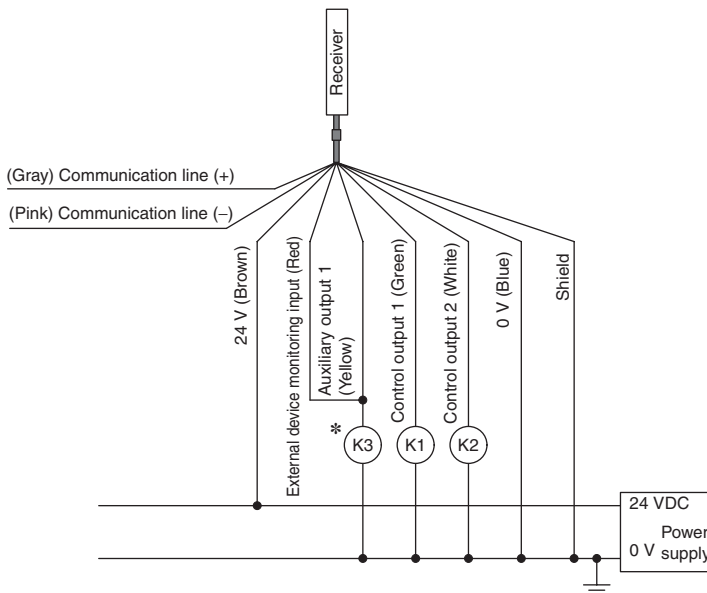
K4: Load or PLC, etc. (for monitoring)

*1. Use a switch for micro loads (Input specifications: 24 V, 1.8 mA).

*2. F3SJ operates even when K4 is not connected.

Wiring when the external device monitoring function will not be used

- Use a setting tool to set the external device monitoring function to "Disabled."
- When using an auxiliary output 1 that has not been changed (output operation mode is "control output data," and inverse of control output signals is "Enabled"), the external device monitoring function will be disabled when auxiliary output 1 and the external device monitoring input are connected as shown below.



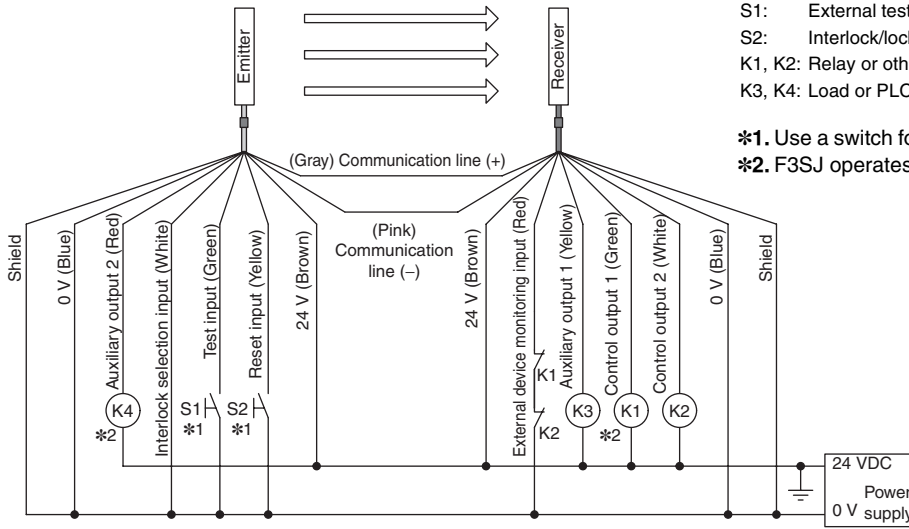
K1, K2: Relay or other device that controls hazardous parts of the machine

K3: Load or PLC, etc. (for monitoring)

* The F3SJ operates even when K3 is not connected. When K3 is not necessary, connect auxiliary output 1 only to the external device monitoring input.

For NPN output (See page 24 for PNP output wiring.)

Wiring when using manual reset mode, external device monitoring

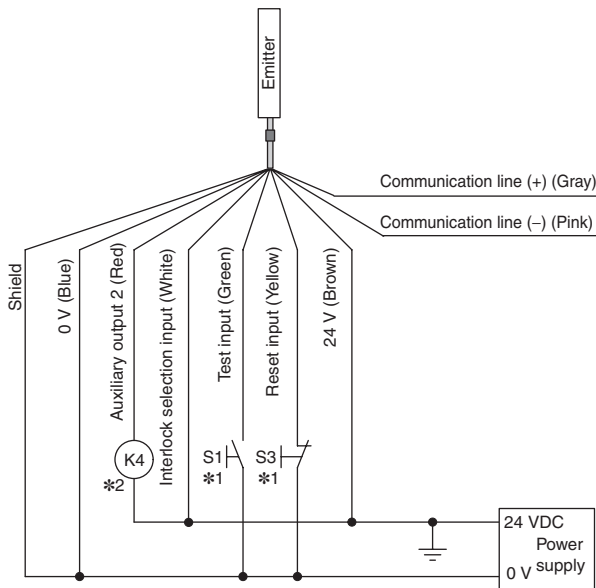


- S1: External test switch (connect to 24 V if the switch is not necessary.)
- S2: Interlock/lockout reset switch
- K1, K2: Relay or other device that controls hazardous parts of the machine
- K3, K4: Load or PLC, etc. (for monitoring)

- *1. Use a switch for micro loads (Input specifications: 5 V, 1 mA).
- *2. F3SJ operates even when K3 and K4 are not connected.

Wiring for auto reset mode

- The auto reset mode will be enabled when the emitter is wired as shown below.

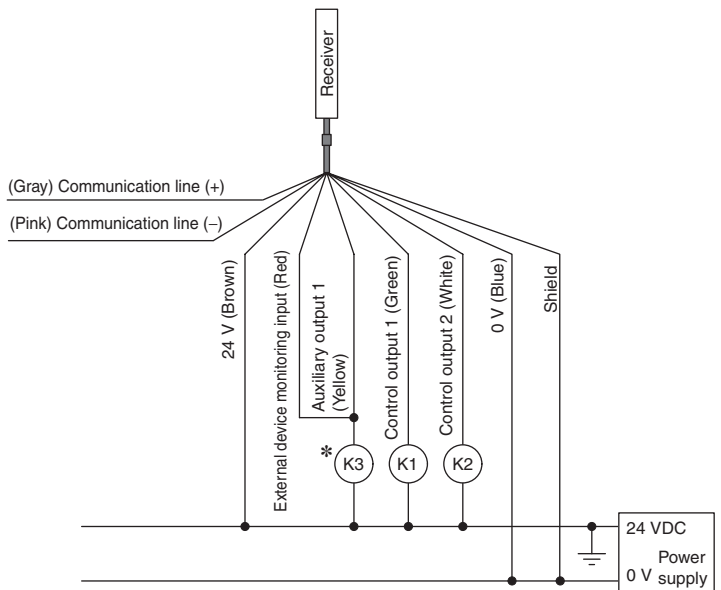


- S1: External test switch (connect to 24 V if the switch is not necessary.)
- S3: Lockout reset switch (connect to 0 V if the switch is not necessary)
- K4: Load or PLC, etc. (for monitoring)

- *1. Use a switch for micro loads (Input specifications: 5 V, 1 mA).
- *2. F3SJ operates even when K4 is not connected.

Wiring when the external device monitoring function will not be used

- Use a setting tool to set the external device monitoring function to "Disabled."
- When using an auxiliary output 1 that has not been changed (output operation mode is "control output data," and inverse of control output signals is "Enabled), the external device monitoring function will be disabled when auxiliary output 1 and the external device monitoring input are connected as shown below.



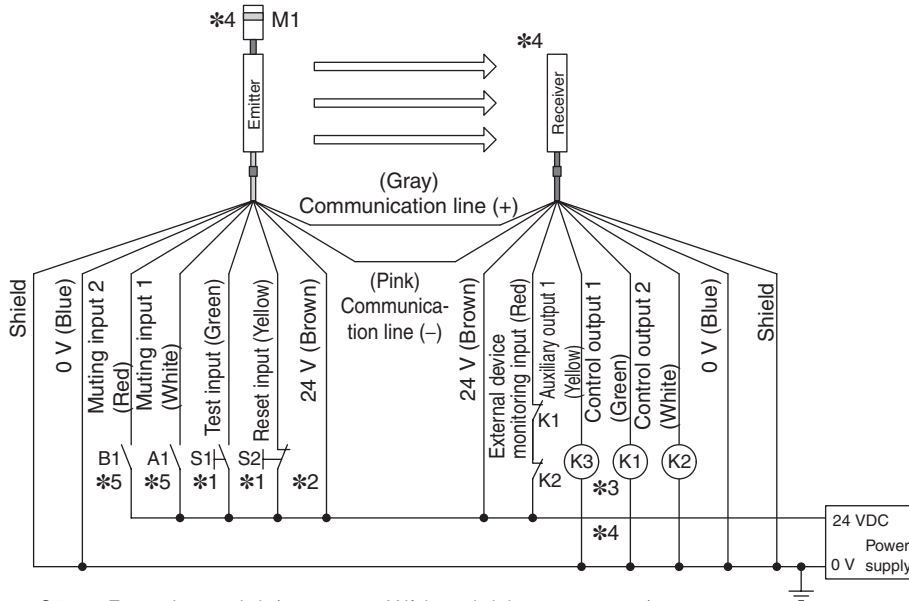
- K1, K2: Relay or other device that controls hazardous parts of the machine
- K3: Load or PLC, etc. (for monitoring)

- * The F3SJ operates even when K3 is not connected. When K3 is not necessary, connect auxiliary output 1 only to the external device monitoring input.

Basic Connection for Muting System

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

Wiring when using muting and external device monitoring functions

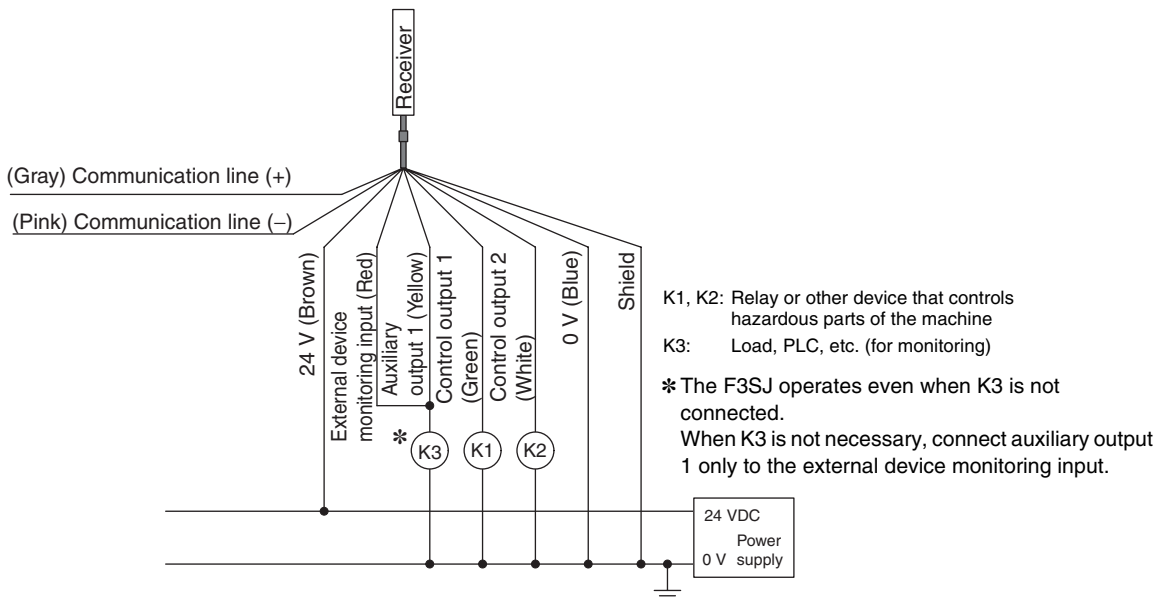


- S1: External test switch (connect to 0 V if the switch is not necessary.)
- S2: Lockout reset switch (connect to 24 V if the switch is not necessary.)
- A1: Contact by muting sensor A1
- B1: Contact by muting sensor B1
- K1, K2: Relay or other device that controls hazardous parts of the machine
- K3: Load or PLC, etc. (for monitoring)
- M1: Muting lamp

- *1. Use a switch for small loads (input specifications: 24 V, 1.8 mA)
- *2. When using the interlock function, this also functions as an interlock reset switch. (Must be set with a setting tool.)
- *3. The F3SJ will operate even if K3 is not connected.
- *4. Connect the muting lamp to either the external indicator output or auxiliary output 1 for the emitter or the receiver. When connecting the muting lamp to auxiliary output 1, the parameter must be changed with a setting tool.
- *5. Two-wire sensors cannot be used.

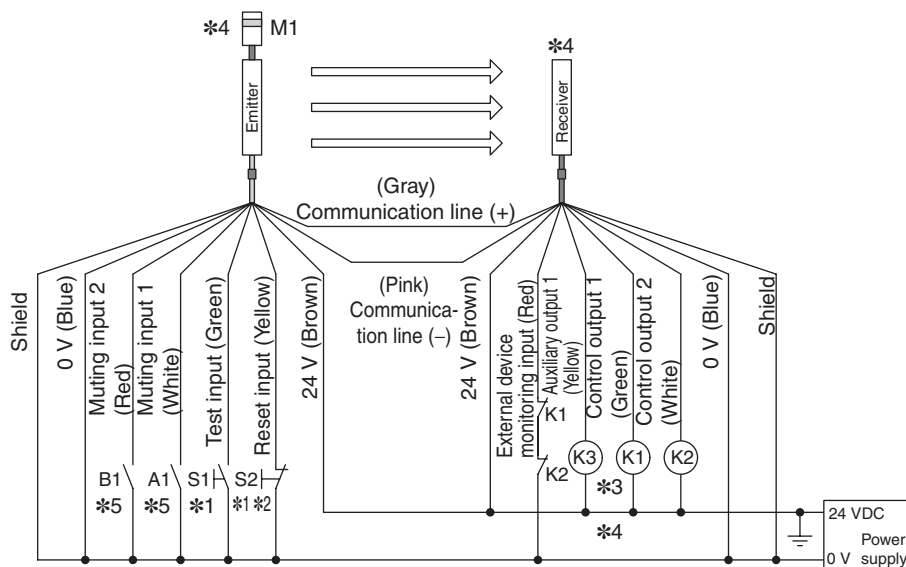
Wiring when the external device monitoring function will not be used

- Use a setting tool to set the external device monitoring function to "Disabled."
- When using an auxiliary output 1 that has not been changed (output operation mode is "control output data," and inverse of control output signals is "Enabled), the external device monitoring function will be disabled when auxiliary output 1 and the external device monitoring input are connected as shown below.



- K1, K2: Relay or other device that controls hazardous parts of the machine
- K3: Load, PLC, etc. (for monitoring)
- * The F3SJ operates even when K3 is not connected. When K3 is not necessary, connect auxiliary output 1 only to the external device monitoring input.

**For NPN output (See page 26 for PNP output wiring.)
Wiring when using muting and external device monitoring functions**

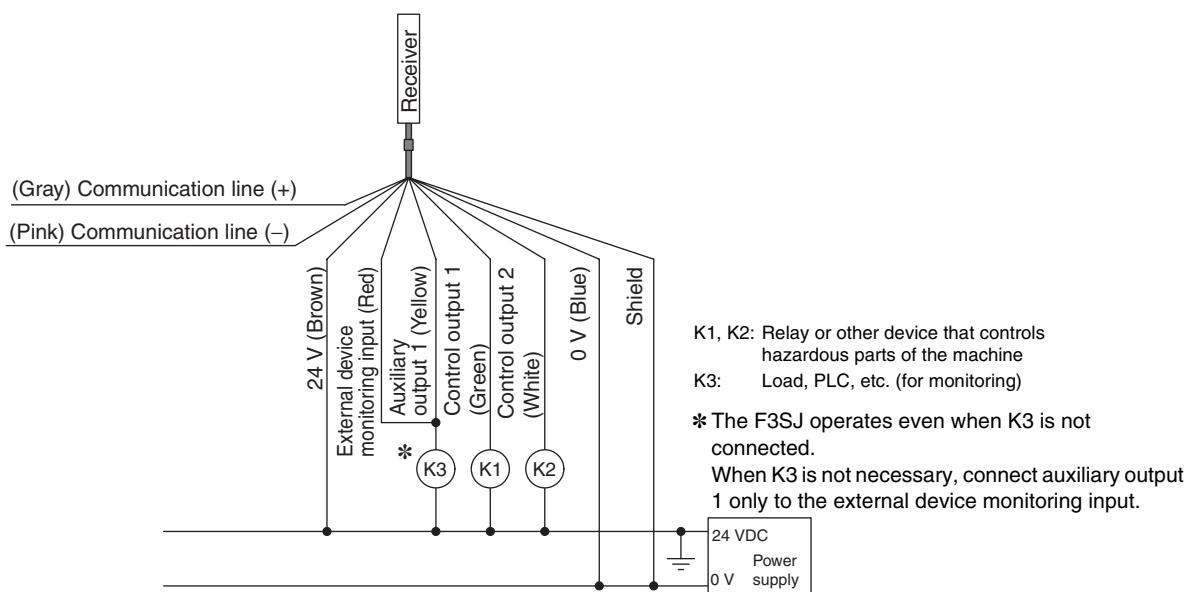


- S1: External test switch (connect to 24 V if the switch is not necessary.)
- S2: Lockout reset switch (connect to 0 V if the switch is not necessary.)
- A1: Contact by muting sensor A1
- B1: Contact by muting sensor B1
- K1, K2: Relay or other device that controls hazardous parts of the machine
- K3: Load or PLC, etc. (for monitoring)
- M1: Muting lamp

- *1. Use a switch for small loads (input specifications: 5 V, 1 mA).
- *2. When using the interlock function, this also functions as an interlock reset switch. (Must be set with a setting tool.)
- *3. The F3SJ operates even when K3 is not connected.
- *4. Connect the muting lamp to either the external indicator output or auxiliary output 1 for the emitter or the receiver. When connecting the muting lamp to auxiliary output 1, the parameter must be changed with a setting tool.
- *5. Two-wire sensors cannot be used.

Wiring when the external device monitoring function will not be used

- Use a setting tool to set the external device monitoring function to "Disabled."
- When using an auxiliary output 1 that has not been changed (output operation mode is "control output data," and inverse of control output signals is "Enabled), the external device monitoring function will be disabled when auxiliary output 1 and the external device monitoring input are connected as shown below.



- K1, K2: Relay or other device that controls hazardous parts of the machine
- K3: Load, PLC, etc. (for monitoring)
- * The F3SJ operates even when K3 is not connected. When K3 is not necessary, connect auxiliary output 1 only to the external device monitoring input.

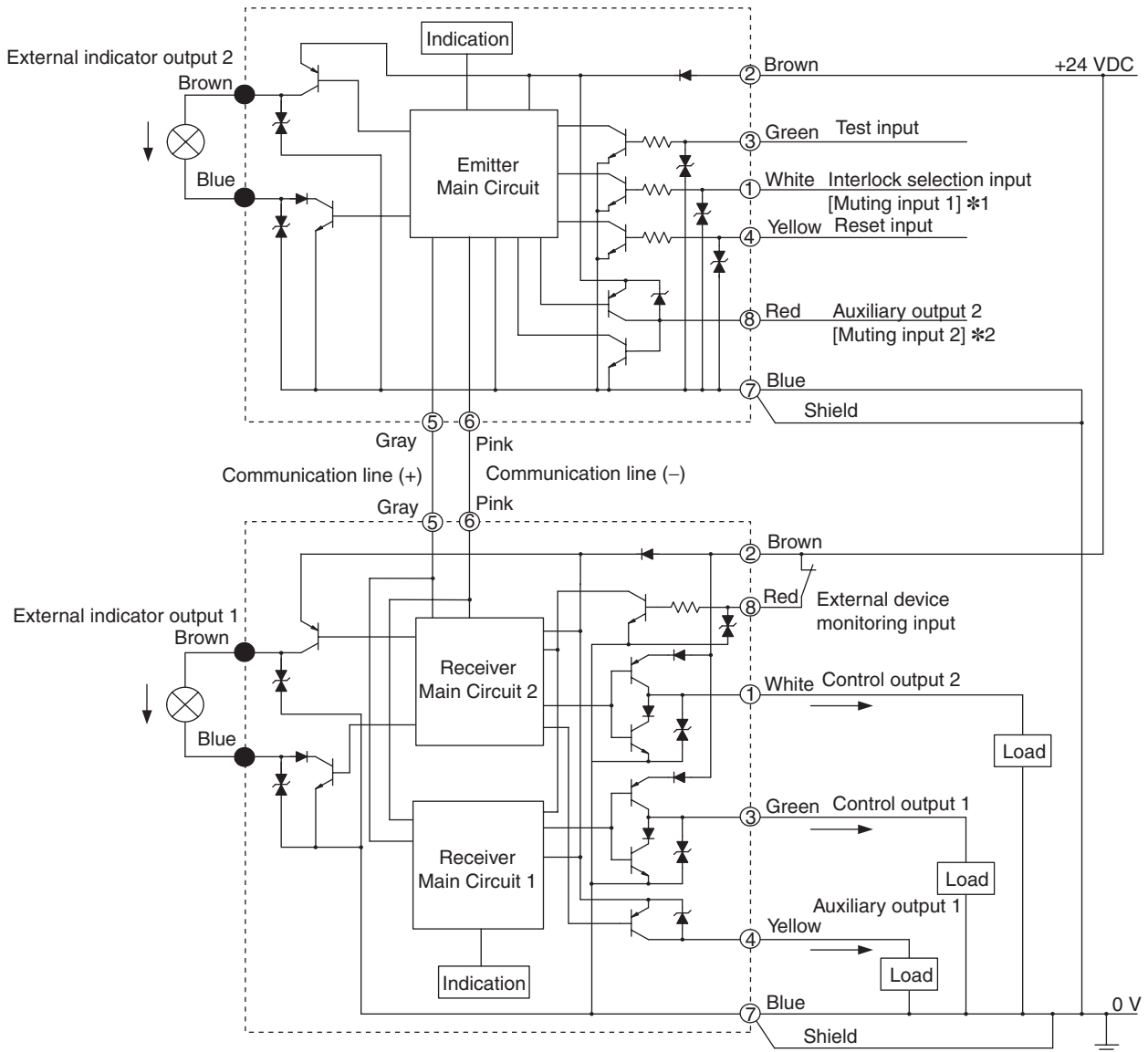
I/O Circuit Diagrams

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.



*1. Open or muting input 1 for models with the "-TS" suffix.

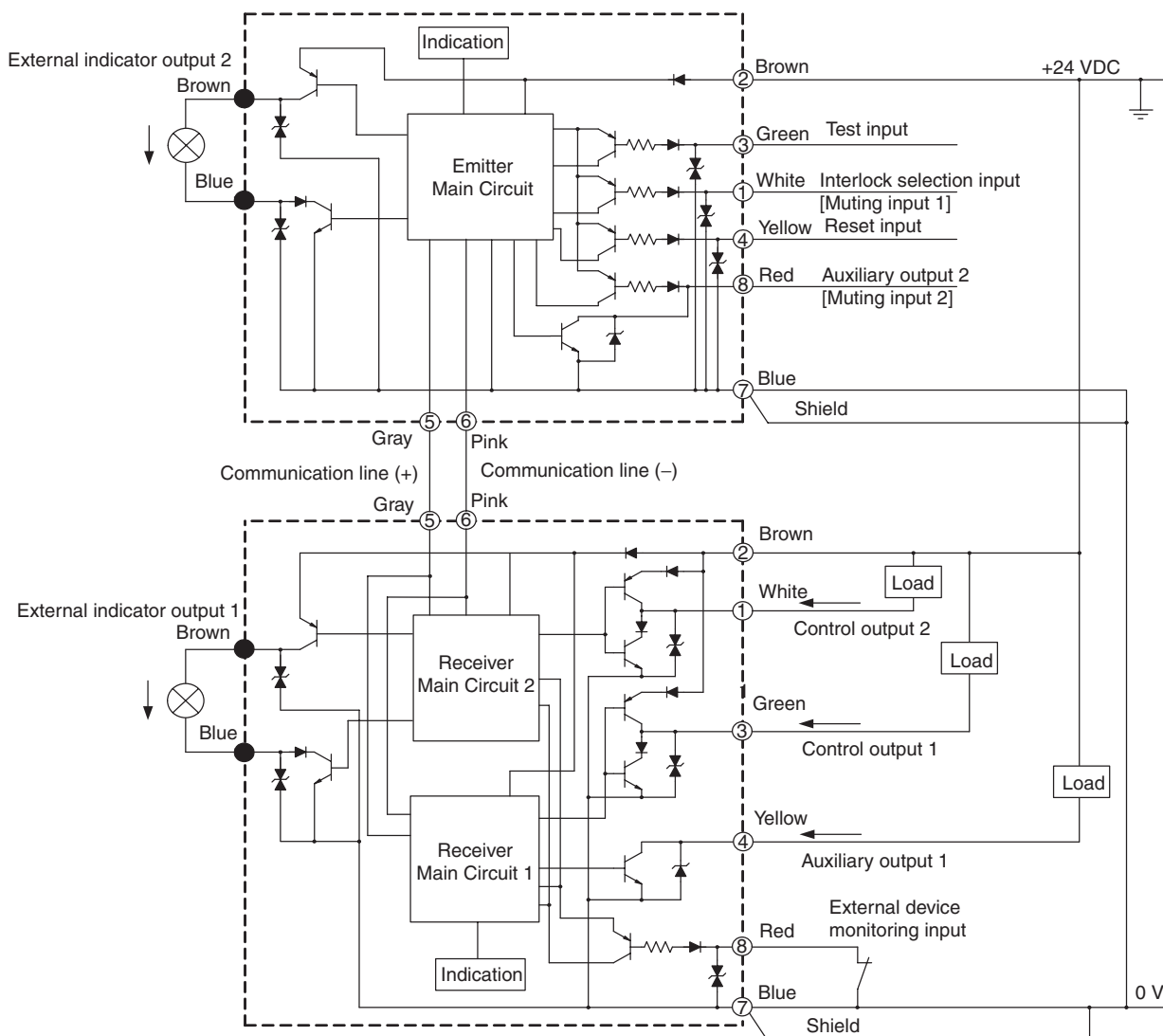
*2. Open or muting input 2 for models with the "-TS" suffix.

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 *1		Muting system *1	
				Receiver	Emitter	Receiver	Emitter
F39-JCR5A (0.5 m)		(1)	White	Safety output 2	Interlock selection input *2	Safety output 2	Muting input 1
F39-JC3A (3 m)		(2)	Brown	+24 VDC	+24 VDC	+24 VDC	+24 VDC
F39-JC7A (7 m)		(3)	Green	Control output 1	Test Input	Control output 1	Test Input
F39-JC10A (10 m)		(4)	Yellow	Auxiliary output 1	Reset input	Auxiliary output 1	Reset input
F39-JC15A (15 m)		(5)	Gray	Communication line (+)	Communication line (+)	Communication line (+)	Communication line (+)
		(6)	Pink	Communication line (-)	Communication line (-)	Communication line (-)	Communication line (-)
		(7)	Blue	0 V	0 V	0 V	0 V
		(8)	Red	External device monitoring input	Auxiliary output 2 *2	External device monitoring input	Muting input 2

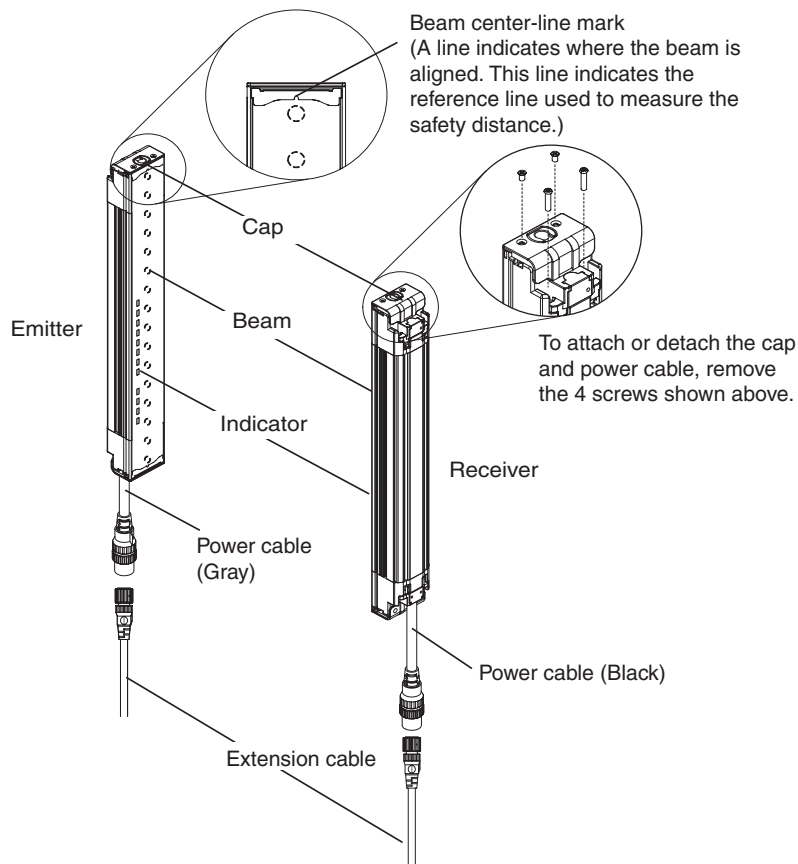
*1. Basic system indicates a system with default factory settings.

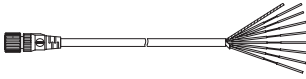

Muting system indicates a system attached with a muting keycap (F39-CN6) to enable muting function.

*2. N.C. for models with the "-TS" suffix.

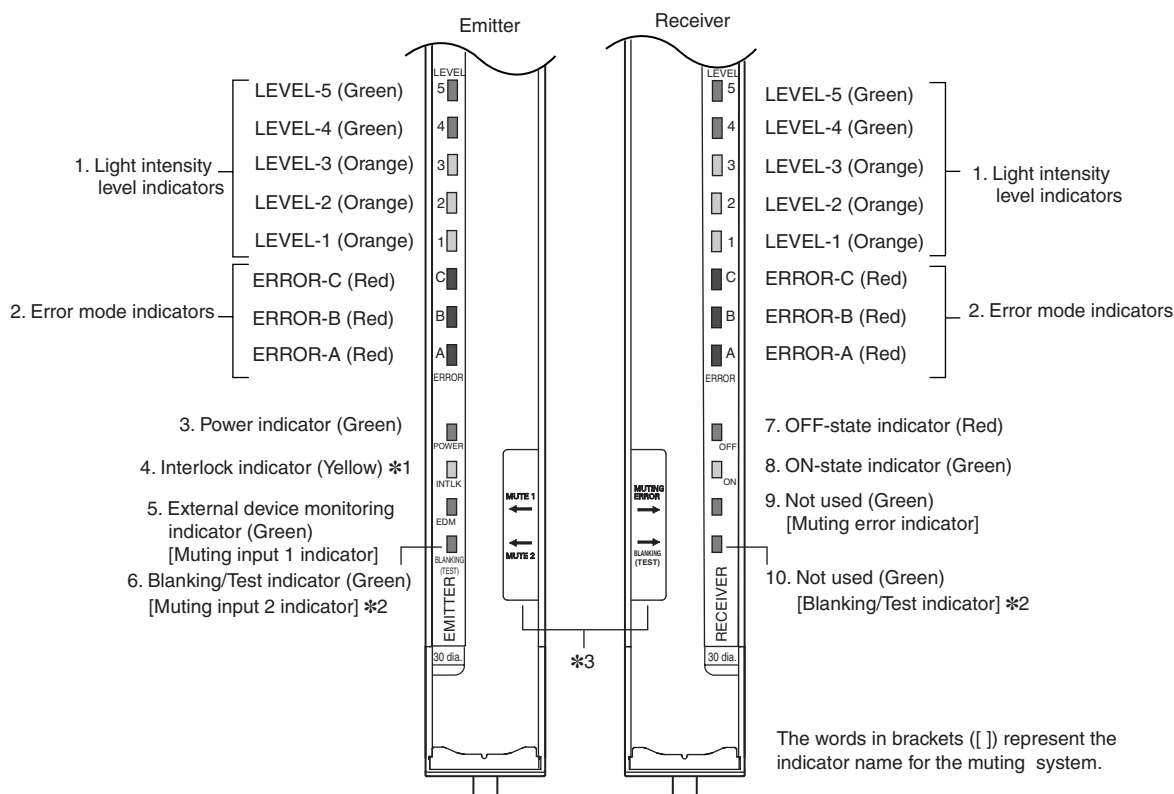
Nomenclature

Main Unit and Cables



Component	Model	Description	
Emitter, receiver	F3SJ-A□□□□P□□ or F3SJ-A□□□□N□□	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□□-□ <div style="display: flex; justify-content: center; align-items: center; gap: 10px;"> 1 2 3 4 </div> 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. For models with fixed auto reset, the suffix "-L-TS" is an emitter, "-D-TS" is a receiver, and "-TS" is an emitter/receiver set.	
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





No.	Internal Indicators		Description	
			For basic system	For muting system
1	Light intensity level indicators (LEVEL-1 to 5) (refer to page 32.)	ON	Indication status of LEVEL-1 to 5 shows the light intensity level status of the F3SJ.	
2	Error mode indicators (ERROR-A to C) (refer to page 32.)	ON/ Blinking	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)	ON	Turns ON while the power is ON.	
		Blinking	Blinks when in maintenance mode.	
4	Interlock indicator (INTLK) *1	ON	Turns ON when F3SJ is in interlock state.	
		Blinking	Blinks when under lockout.	
5	External device monitoring indicator (EDM) Muting input 1 indicator (MUTE1)	ON	Turns ON when an input is given to external device monitoring input.	Turns ON when an input is given to muting input 1.
		Blinking	Not used	Blinks during muting override.
6	Blanking/Test indicator (BLANKING/TEST) *2 Muting input 2 indicator (MUTE2)	ON	Turns ON when the blanking function and warning zone function are enabled.	Turns ON when an input is given to muting input 2.
		Blinking	Blinks when external test is being performed.	Blinks during muting override.
7	OFF output indicator (OFF)	ON	Turns ON when control output is OFF.	
		Blinking	Blinks in the following states: • Lockout state • One or more beams are blocked in maintenance mode	
8	ON output indicator (ON)	ON	Turns ON when safety output is ON.	
		Blinking	Blinks when no beams are blocked in maintenance mode	
9	Muting error indicator (MUTING ERROR)	ON	Not used	Turns ON when a muting error occurs.
10	Blanking/Test indicator (BLANKING/TEST) *2	ON	Not used	Turns ON when the blanking function is enabled.
		Blinking	Not used	Blinks when external test is being performed.







*1. Lockout indicator (LOCKOUT) for models with the "-TS" suffix.

*2. In the TS model, this is a test indicator labeled TEST.

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

Indication Patterns and Intensity Levels of the Light Intensity Level Indicators (LEVEL-1 to 5)











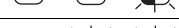
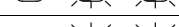
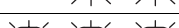
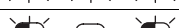



 
ON OFF

1 2 3 4 5	Light intensity level
	170% or higher of control output ON level
	From 130 to 170% of control output ON level
	From 100 to 130% of control output ON level
	From 75 to 100% of control output ON level
	From 50 to 75% of control output ON level
	Less than 50% of control output ON level

Note: Operation is possible with light intensity 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
	Mutual interference or ambient incident light.
	Power supply voltage of F3SJ is out of the rated range. Insufficient current capacity of power supply.
	Incident light to blanking beams.
	Failure in communication line.
	Emitter and receiver have different F3SJ type names or number of series connections.
	Outside the effective range of parameters set by setting tool.
	Cap is not attached.
	External device monitor failure.
	Failure in interlock selection input line or reset input line.
	Muting wiring failure.
	Failure in control output wiring.
	Failure in series connection cable wiring.
	Failure in wiring of external display lamp output.
	Failure in wiring of auxiliary output.
	Broken series connection cable.
	Wiring error or broken communications wire.
	Influence of electrical noise, or failure in a series-connected F3SJ.

Safety-related Functions

Interlock Function

The F3SJ turns the safety outputs OFF when the power is turned ON or when a beam is interrupted, 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 Mode

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.

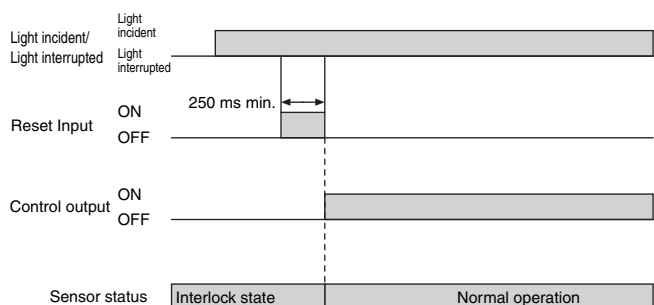
Note: Auto reset is always used in the F3SJ-A□-TS series.

Auto reset wiring procedure:

For PNP output	For NPN output
<ol style="list-style-type: none"> 1. Open the interlock selection input line, or short-circuit it to 0 to 1.5 V (pin 1/white). 2. Short-circuit the reset input line to 9 to 24 V (pin 4/yellow). 3. Turn ON the power of F3SJ. 	<ol style="list-style-type: none"> 1. Open the interlock selection input line, or short-circuit it to 9 to 24 V (pin 1/white). 2. Short-circuit the reset input line to 0 to 1.5 V (pin 4/yellow). 3. Turn ON the power of F3SJ.

Manual Reset Mode

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 interrupted (restart interlock). After F3SJ is interrupted and the machine stops, the machine can be restarted after safety is ensured.

Manual Reset Wiring Procedure:

For PNP output	For NPN output
<ol style="list-style-type: none"> 1. Connect the interlock selection input line to 9 to 24 V (pin 1/white). 2. Connect the reset input line to 9 to 24 V via the reset switch (NO-contact) (pin 4/yellow). 3. Keep the reset switch contact open, and turn the power of F3SJ ON. 	<ol style="list-style-type: none"> 1. Connect the interlock selection input line to 0 to 1.5 V (pin 1/white). 2. Connect the reset input line to 0 to 1.5 V via the reset switch (NO-contact) (pin 4/yellow). 3. Keep the reset switch contact open, and turn the power of F3SJ ON.

To reset:

For PNP output	For NPN output
Apply voltage of 9 to 24 V for 250 ms or longer to the reset input line, and set it open or to 0 to 1.5 V.	Apply voltage of 0 to 1.5 V for 250 ms or longer to the reset input line, and set it open or to 9 to 24 V.

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

Interlock Function in a Muting System

Because the interlock selection input line is used as muting input 1 when using the muting function, the default setting is auto reset. Use a setting tool for manual reset.

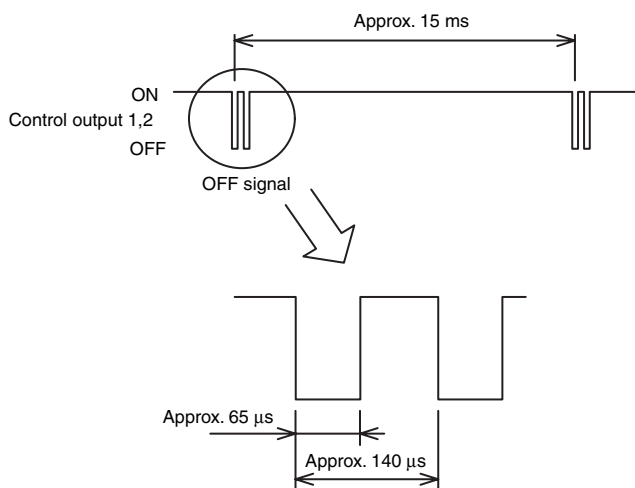
Diagnostic Functions

Self-test

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 Control Outputs

When the F3SJ is receiving light, the control 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. (Refer to the following illustration.)



External Test

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

To stop emission, apply 9 to 24 V for PNP output types or 0 to 1.5 V for NPN output types to the test input line of the emitter. Apply the voltage for a minimum of 4 x the safety output response time.

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

[For PNP output]

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

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

[For NPN output]

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

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

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 300 ms 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 300 ms after the control 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.

There are two auxiliary outputs: Auxiliary output 1 and auxiliary output 2.

- Auxiliary output 1: Control output inversion signal
- Auxiliary output 2: Turns ON when the point of 30,000 operating hours is reached

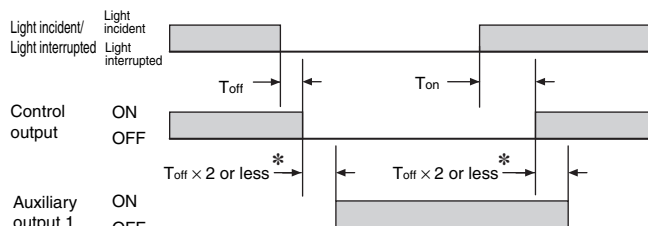
The auxiliary output modes can be changed with a setting tool. See the User's Manual for details on the modes that can be set.

WARNING

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

Failure of these outputs may prevent detection of people and result in serious injury.

- Note:**
1. Auxiliary output 1 has a load current of 300 mA max., and auxiliary output 2 has a load current of 50 mA.
 2. The timing when auxiliary output 1 is set as a control output inversion signal is shown in the diagram below.



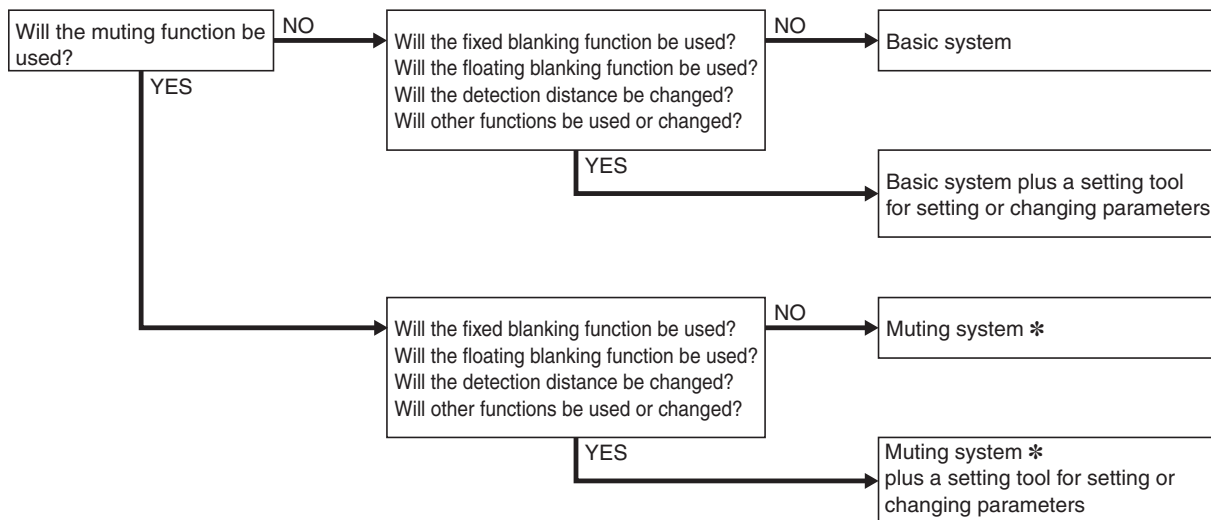
Toff: Response time of control output's ON to OFF, Ton: Response time of control output's OFF to ON

* When auxiliary output 2 is set as a control output inversion signal, the response delay for control output becomes Toff x 3 max.

Selecting the System Configuration

Selection Flowchart

The necessary system configuration varies depending on the functions to be used.
Use the following flowchart to decide what kind of system is required.



* F39-CN6 Key Cap for muting is required.

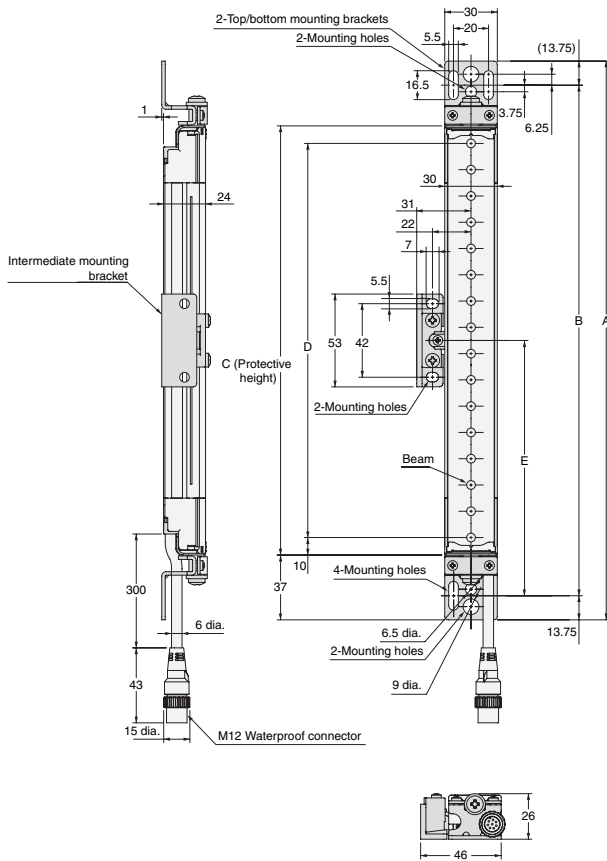
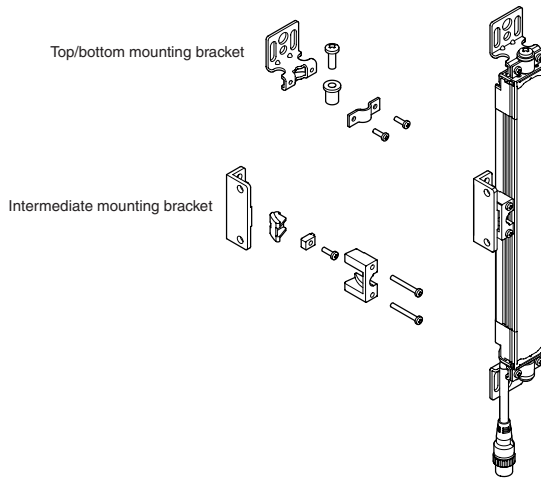
Note: Refer to the User's Manual to determine whether the functions can be used in combination or not.

Dimensions

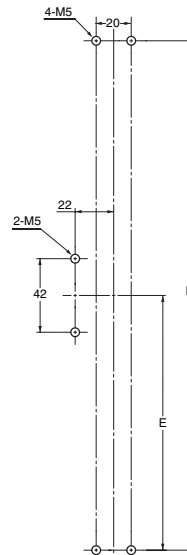
Main Units

When Using Standard Mounting Brackets

Backside mounting



Mounting screw holes

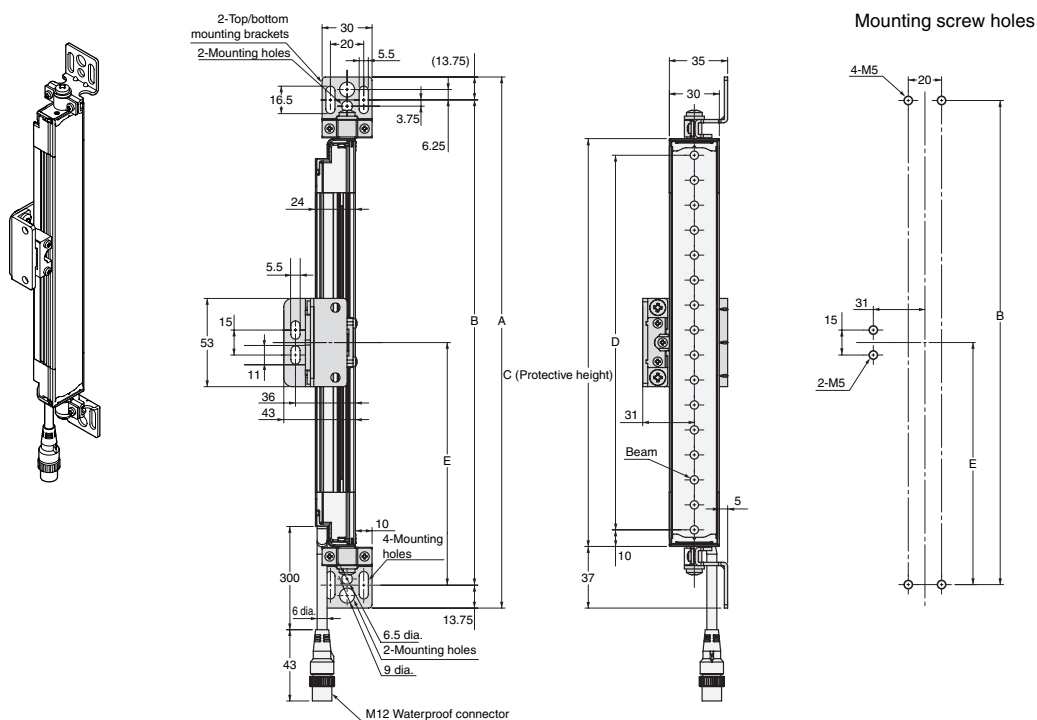


C (protective height): 4-digit number in the table
 $A = C + 74$, $B = C + 46.5$
 $D = C - 20$, $E =$ See table below.

Protective height	Number of intermediate brackets	E *
0245 to 0596	0	---
0600 to 1130	1	$E = B / 2$
1136 to 1658	2	$E = B / 3$
1660 to 2180	3	$E = B / 4$
2195 to 2500	4	$E = B / 5$

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

Side mounting



C (protective height): 4-digit number in the table

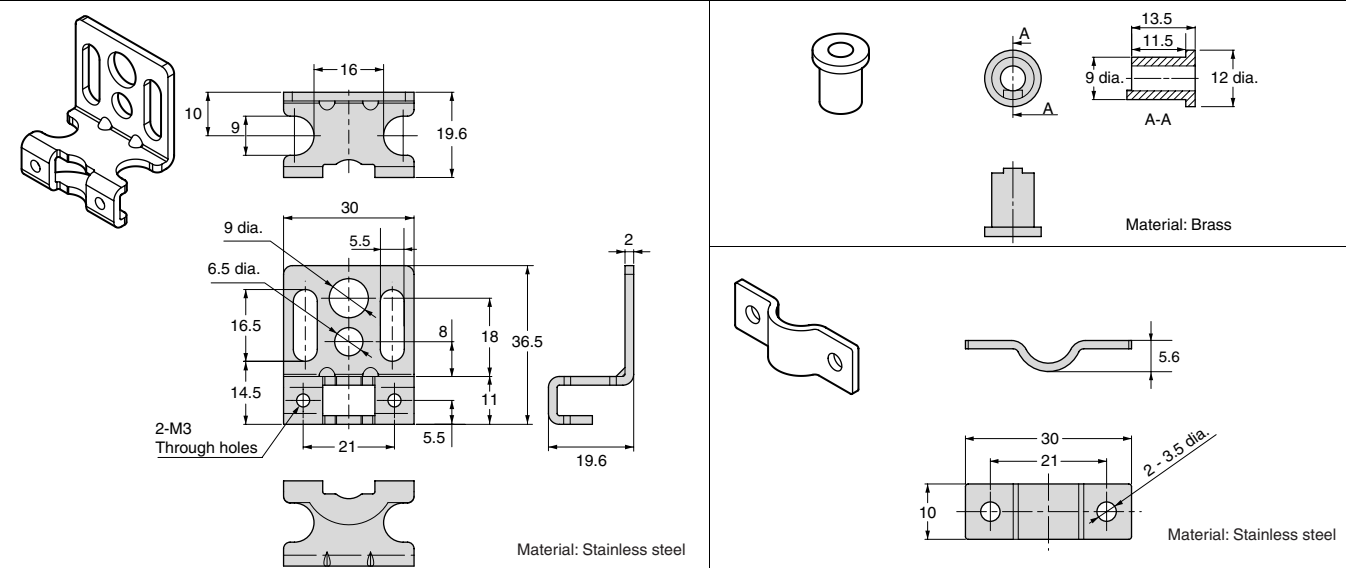
$A = C + 74$, $B = C + 46.5$

$D = C - 20$, $E =$ See table below.

Protective height	Number of intermediate brackets	E *
0245 to 0596	0	---
0600 to 1130	1	$E = B / 2$
1136 to 1658	2	$E = B / 3$
1660 to 2180	3	$E = B / 4$
2195 to 2500	4	$E = B / 5$

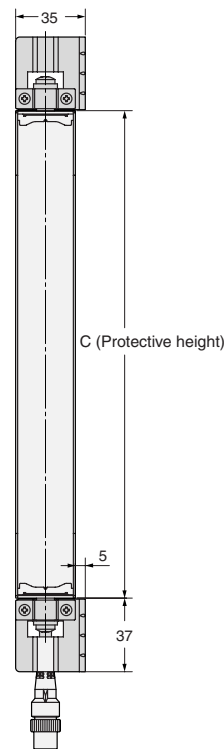
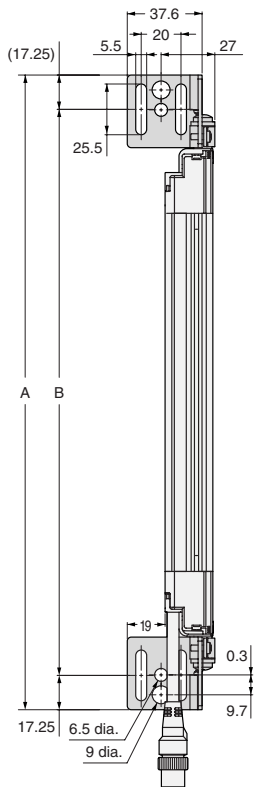
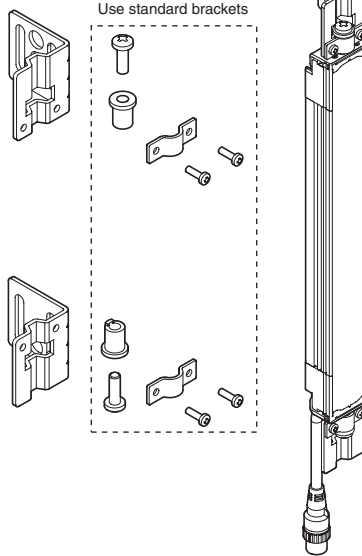
* Use E = 530 or less when none of the E values shown above are used.

F39-LJ1 Detailed Dimensions of Bracket

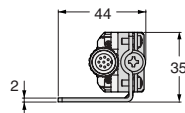
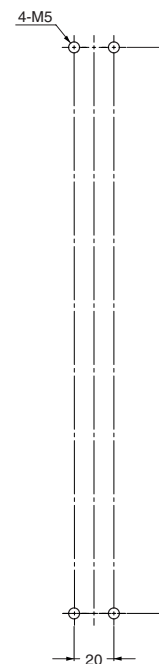


Using Side Flat Mounting Bracket (F39-LJ2)

F39-LJ2
Material: Stainless steel



Mounting screw holes



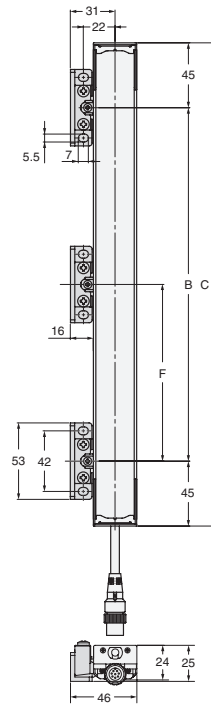
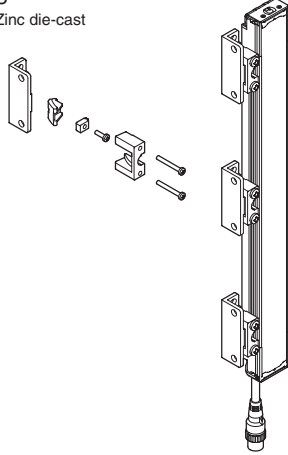
Dimensions A to C

A	C + 74
B	C + 39.5
C	4-digit number of the model name (protective height)

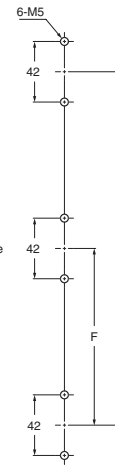
Using Free Location Mounting Bracket (F39-LJ3)

Backside mounting

F39-LJ3
Material: Zinc die-cast

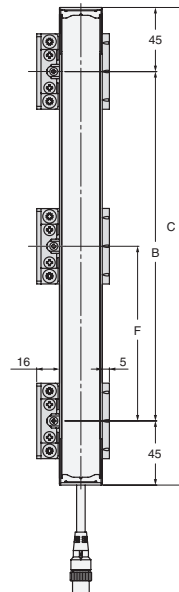
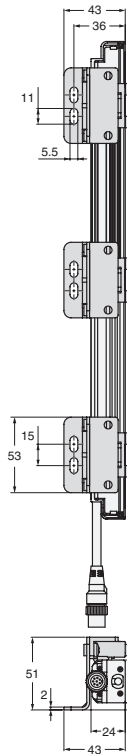
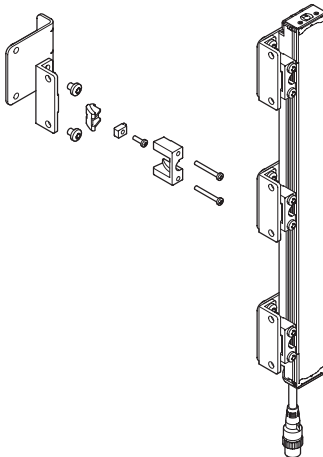


Mounting screw holes

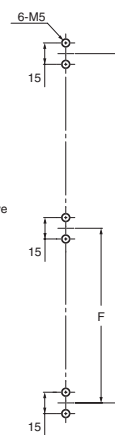


Side mounting

F39-LJ3
Material: Zinc die-cast/stainless



Mounting screw holes



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 on the right.

Dimension F

Protective height	Number of intermediate mounting brackets	F *
245 to 440	2	---
443 to 785	3	B / 2
794 to 1140	4	B / 3
1145 to 1490	5	B / 4
1495 to 1840	6	B / 5
1845 to 2180	7	B / 6
2195 to 2500	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 350 mm 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
0245 to 0440	0	4	2 sets
0443 to 0596	0	6	3 sets
0600 to 0785	2	6	2 sets
0794 to 1130	2	8	3 sets
1136 to 1140	4	8	2 sets
1145 to 1490	4	10	3 sets
1495 to 1658	4	12	4 sets
1660 to 1840	6	12	3 sets
1845 to 2180	6	14	4 sets
2195 to 2500	8	16	4 sets

Guide to Replacing F3SN Models with F3SJ Models

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

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

(1) For F3SN models with a protective height of 225 mm max.

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

(2) For F3SN models with a protective height of 234 mm min.

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)

- Note:**
- The protective height becomes 11 mm longer.
 - 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 600 mm or less.

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

(1) For F3SN models with a protective height of 247 mm max.

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

(2) For F3SN models with a protective height of 262 mm min.

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)

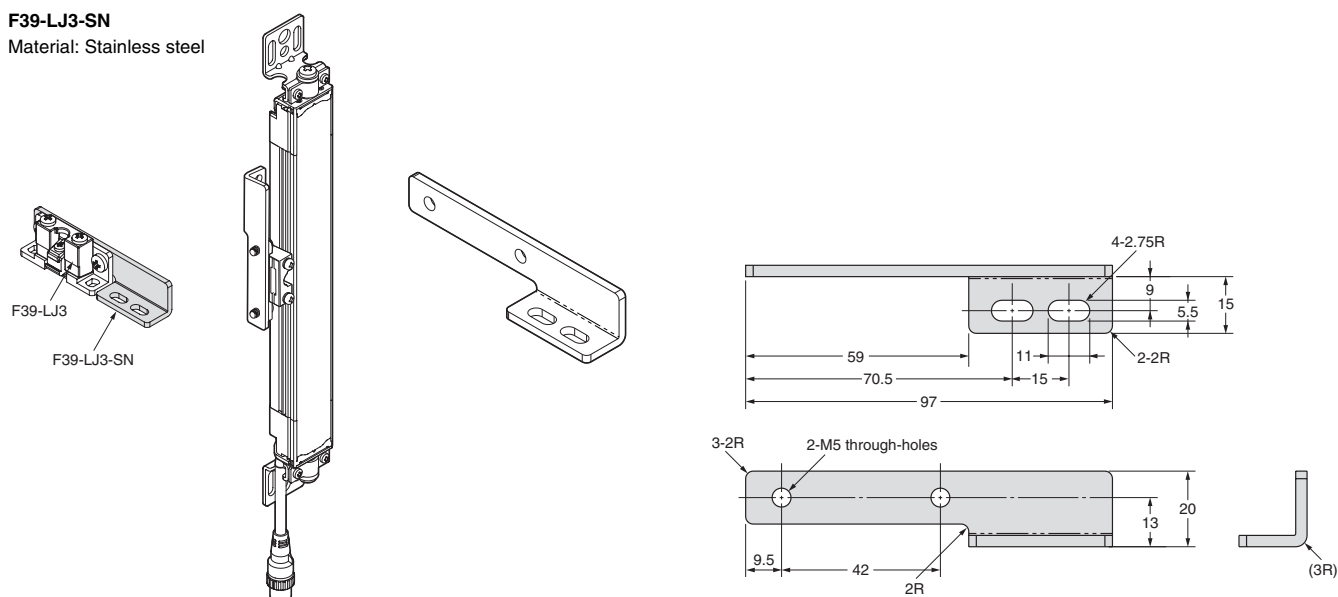
- Note:**
- The protective height gets 17 mm shorter.
 - Replace with outward-facing mounting of F39-LJ5 when you want to set the detection surface height to be same as the F3SN. However, the F39-LJ5 and intermediate mounting brackets cannot be mounted simultaneously, so set the protective height to 600 mm or less.

When using intermediate mounting brackets to replace a rear mounted F3SN with an F3SJ

Because the pitch of the mounting holes for the intermediate mounting brackets are different (F3SN: 15 mm, F3SJ: 42 mm), use F39-LJ3-SN Spacers for F3SN intermediate mounting bracket replacement.

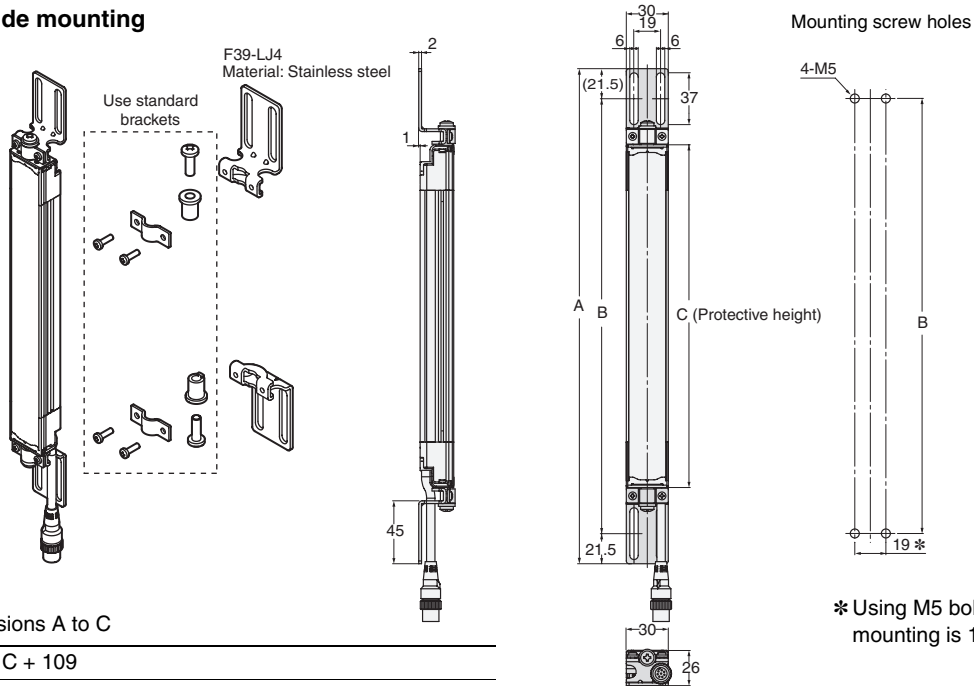
F39-LJ3-SN

Material: Stainless steel



Using Top/Bottom Mounting Bracket B (F39-LJ4)

Backside mounting



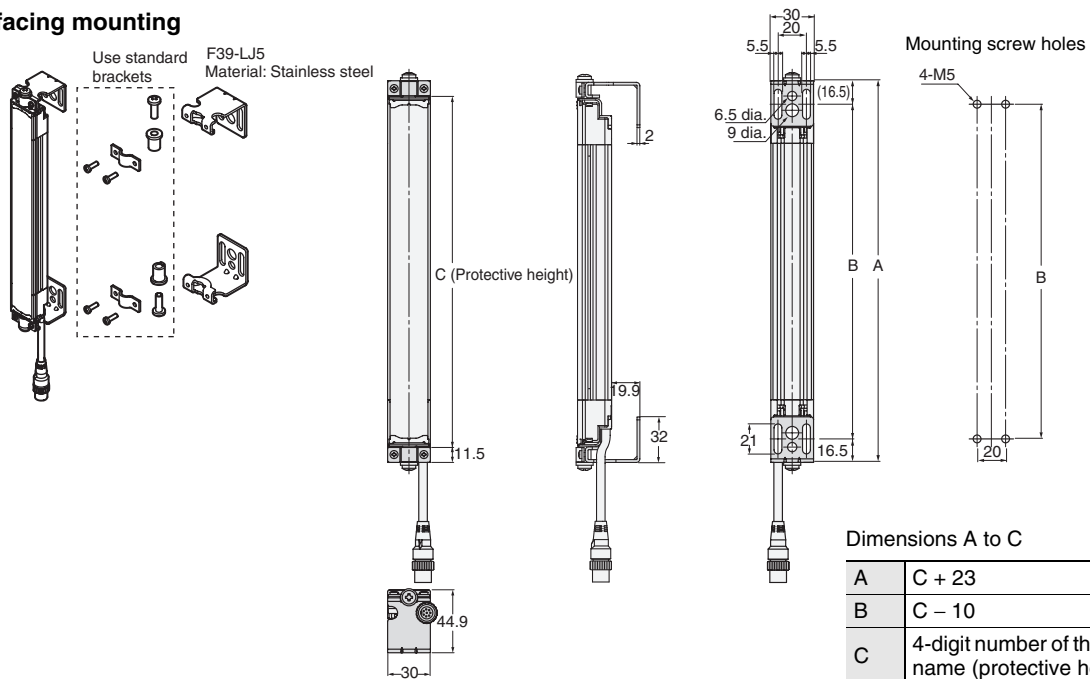
Dimensions A to C

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

Note: Refer to the *User's Manual* (Cat. No. SCHG-718 and SCHG-719) for the dimensions for side mounting.

Using Mounting Bracket for Short-length F3SN (F39-LJ5)

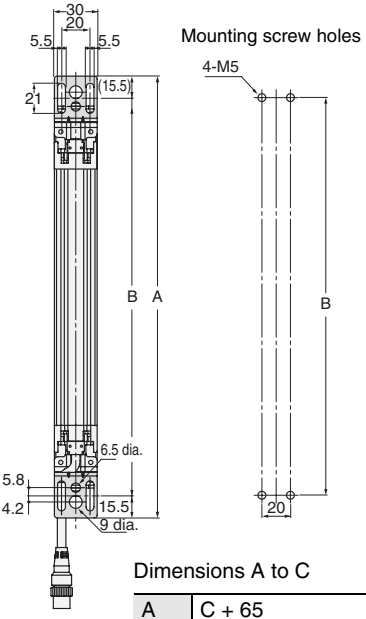
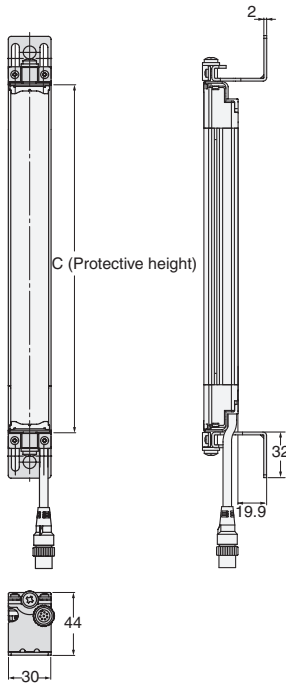
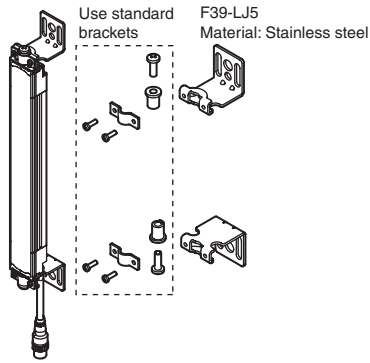
Inward-facing mounting



Dimensions A to C

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

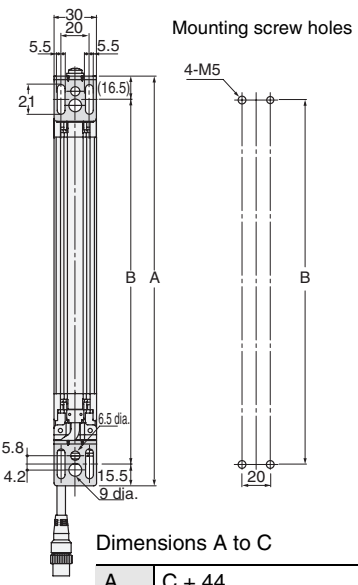
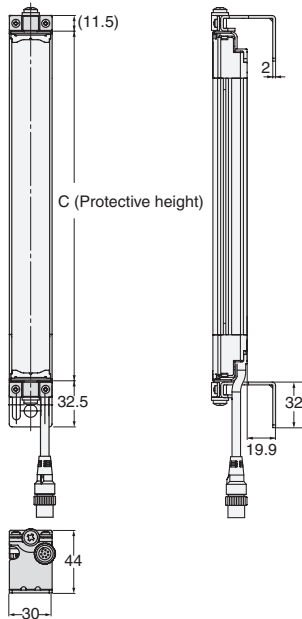
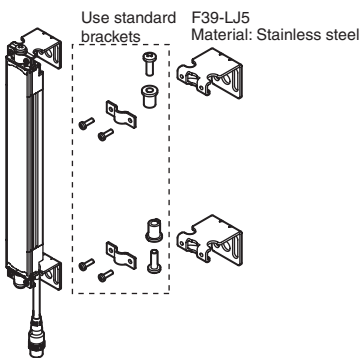
Outward-facing mounting



Dimensions A to C

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

Inward + outward-facing mounting



Dimensions A to C

A	C + 44
B	C + 12
C	4-digit number of the model name (protective height)

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 F3SN models with a protective height of 234 mm min.

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)

- Note:**
1. The protective height becomes 11 mm longer.
 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 600 mm 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 F3SN models with a protective height of 262 mm min.

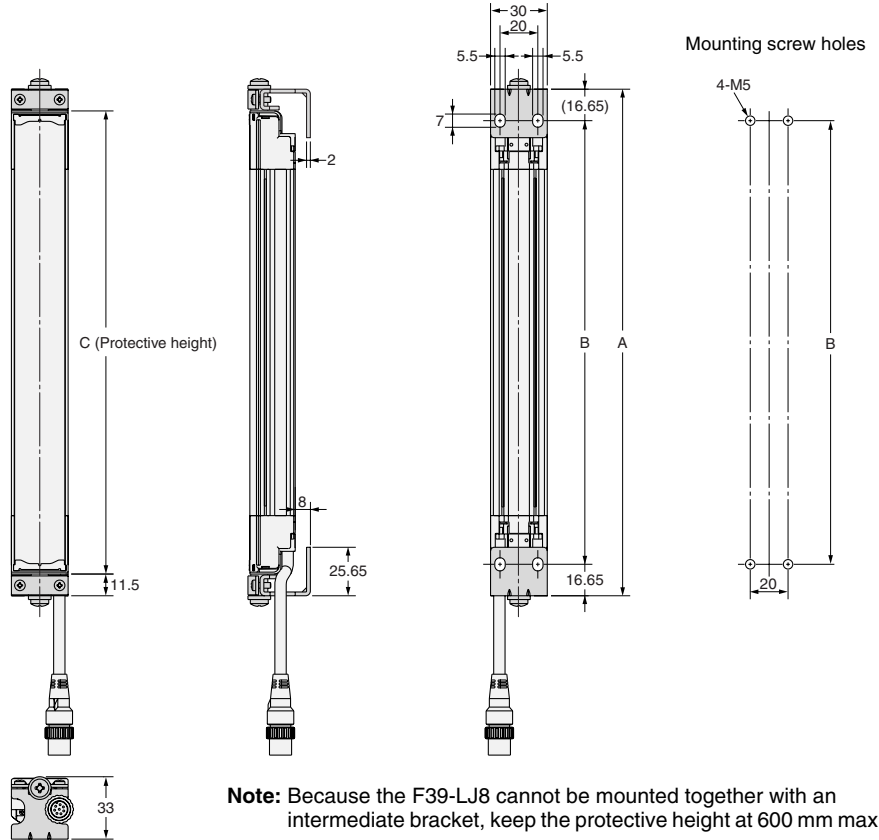
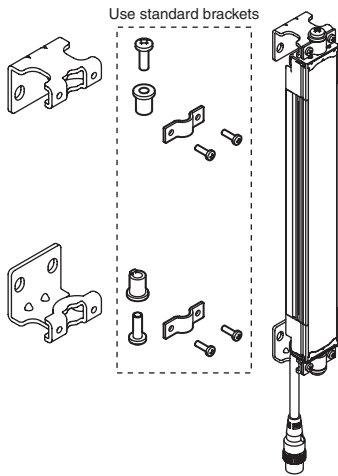
Subtract 17 from the F3SN's 4-digit number and apply it as the F3SJ's 4-digit number, and then replace with the standard brackets included with the product.
 [Selection example] F3SN-A0322P(N)25 becomes F3SJ-A0305P(N)20 (replace with standard brackets)

- Note:**
1. The protective height becomes 17 mm 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 600 mm or less.

Using Space-saving Mounting Bracket (F39-LJ8)

Backside mounting

F39-LJ8
Material: Stainless steel



Dimensions A to C

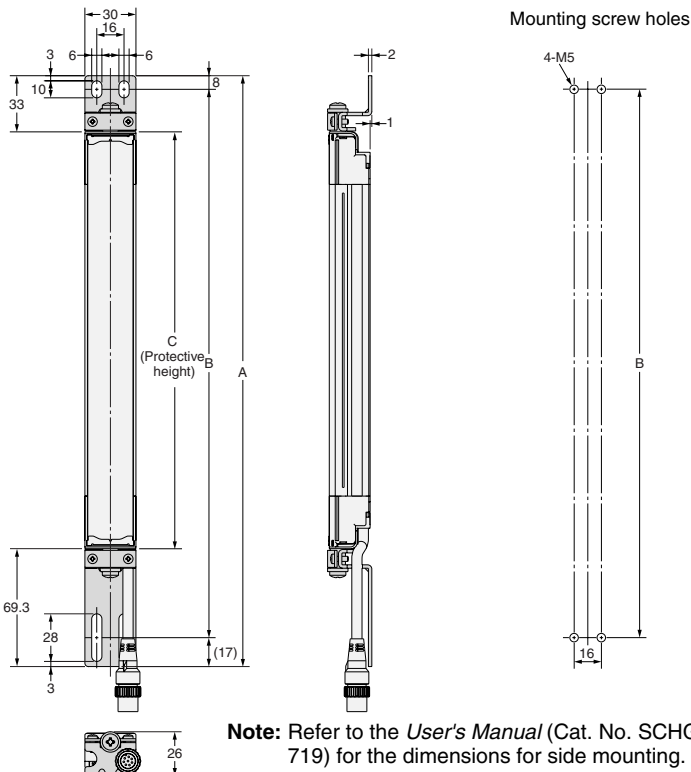
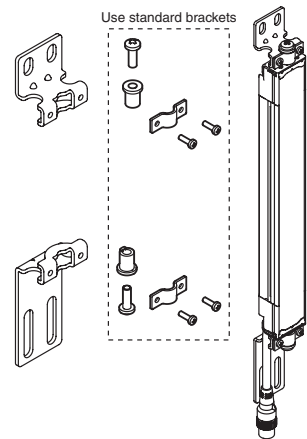
A	$C + 23$
B	$C - 10.3$
C	4-digit number of the model name (protective height)

Note: Because the F39-LJ8 cannot be mounted together with an intermediate bracket, keep the protective height at 600 mm max.

Mounting Bracket (F39-LJ9) Used when Replacing an F3W-C.

Backside mounting

F39-LJ9
Material: Stainless steel



Dimensions A to C

A	$C + 102.3$
B	$C + 77.3$
C	4-digit number of the model name (protective height)

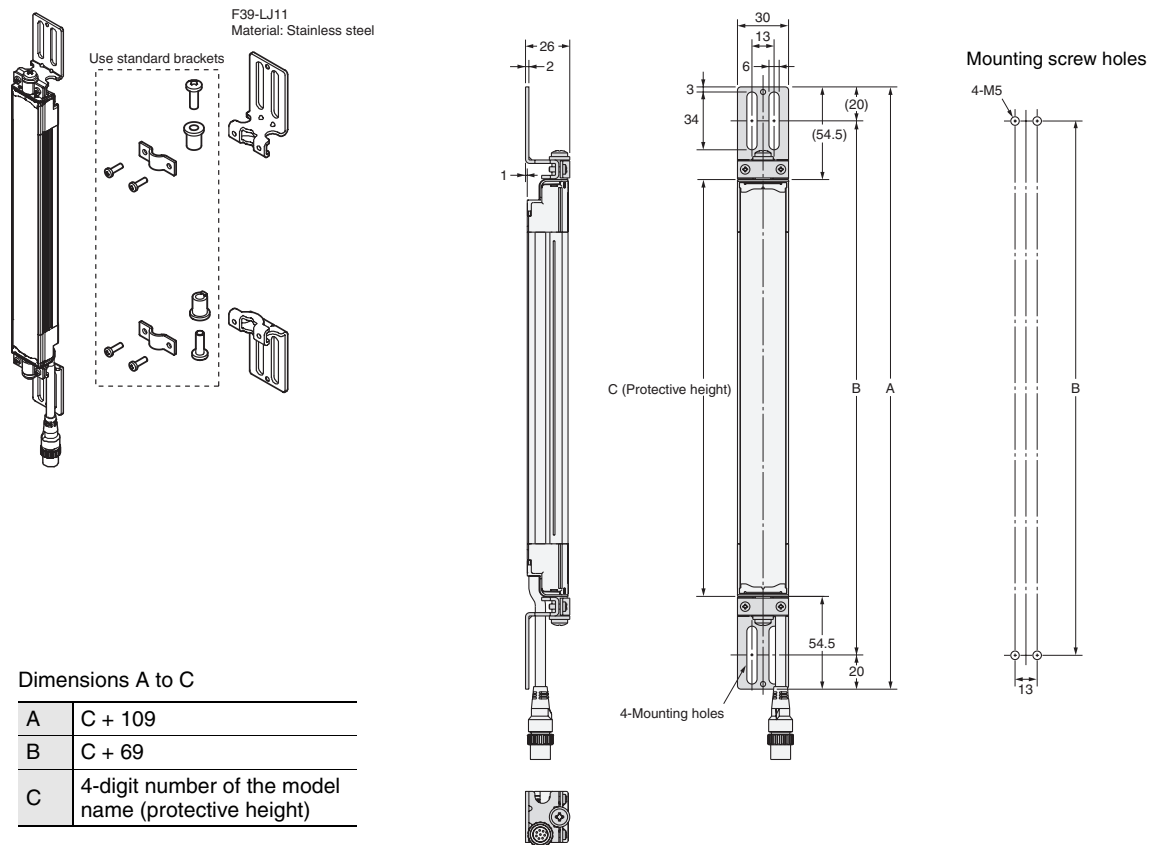
Note: Refer to the *User's Manual* (Cat. No. SCHG-718 and SCHG-719) for the dimensions for side mounting.

F3W-C replacement correspondence table (F3W-C mounting holes can be used without modification)
 When replacing F3W-C□□□ with F3SJ-A□□□□□30

F3W-C		Replacement F3SJ	
Model	Protective height	Model	Protective height
F3W-C044	120	---	---
F3W-C084	280	F3SJ-A0320□30	320
F3W-C124	440	F3SJ-A0470□30	470
F3W-C164	600	F3SJ-A0620□30 *	620
F3W-C204	760	F3SJ-A0795□30 *	795
F3W-C244	920	F3SJ-A0945□30 *	945

* New holes must be drilled for the intermediate bracket.

Using Top/Bottom Mounting Bracket C (F39-LJ11)



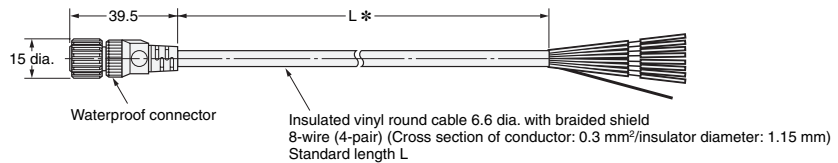
Accessories

Single-end Connector Cable

- F39-JCR5A (L=0.5 m)
- F39-JC3A (L = 3 m)
- F39-JC7A (L = 7 m)
- F39-JC10A (L = 10 m)
- F39-JC15A (L = 15 m)
- F39-JC20A (L = 20 m)



Color: Emitter (gray)
Receiver (black)

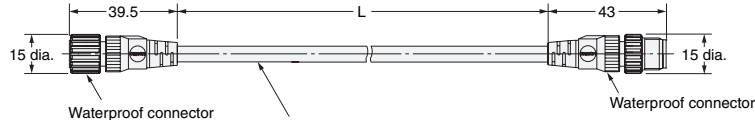


* Cables with L=3, 7, 10, 15, and 20 m are available.

Cables with Connectors on Both Ends

- F39-JCR5B (L = 0.5 m)
- F39-JC1B (L = 1 m)
- F39-JC3B (L = 3 m)
- F39-JC5B (L = 5 m)
- F39-JC7B (L = 7 m)

- F39-JC10B (L = 10 m)
- F39-JC15B (L = 15 m)
- F39-JC20B (L = 20 m)
- F39-JC30B (L = 30 m)
- F39-JC40B (L = 40 m)

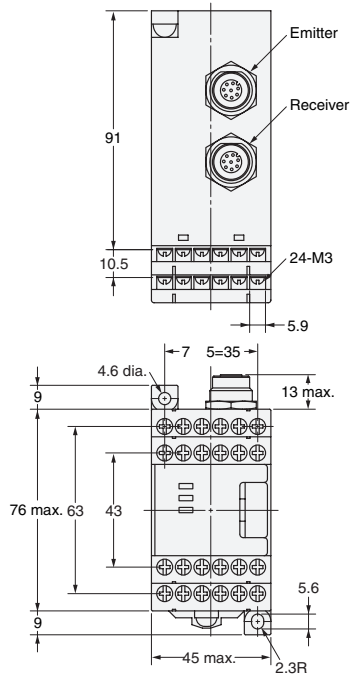


Vinyl-insulated round cable: 6.6 dia. with braided shield
 8-wire (4-pair) (Cross section of conductor: 0.3 mm²/ Insulator diameter: 1.15 mm)
 Standard length L

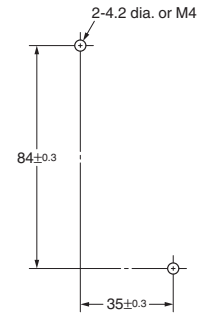
Color: Emitter (gray)
 Receiver (black)

Control Unit

F3SP-B1P

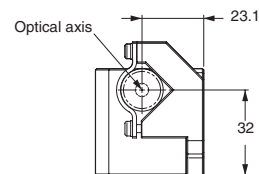
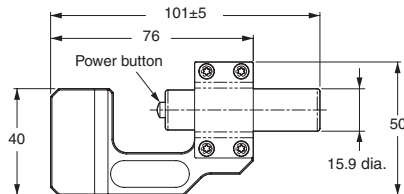
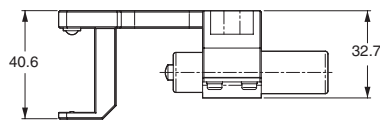


Mounting screw holes



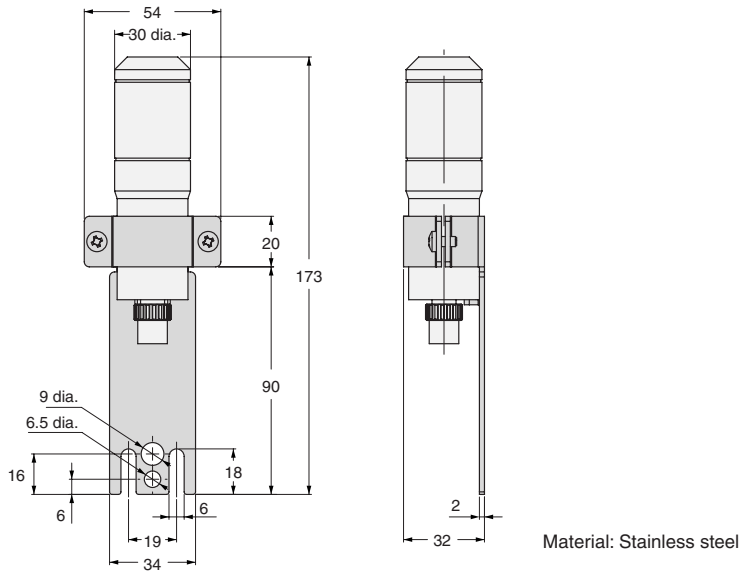
Laser Pointer

F39-PTJ



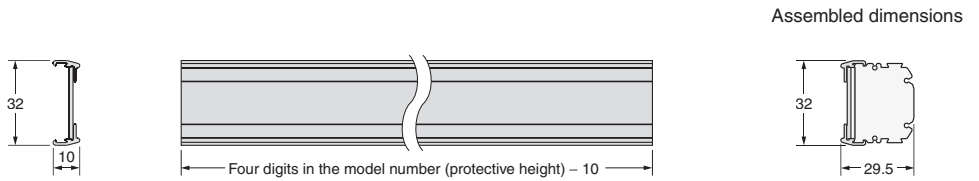
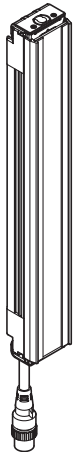
Dedicated External Indicator Set

F39-A01□-PAC



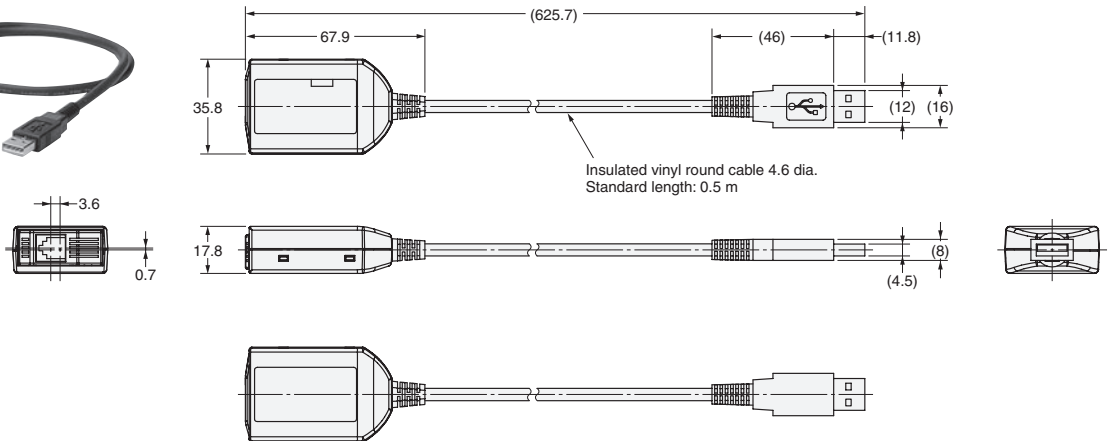
Spatter Protection Cover

F39-HJ□□□□

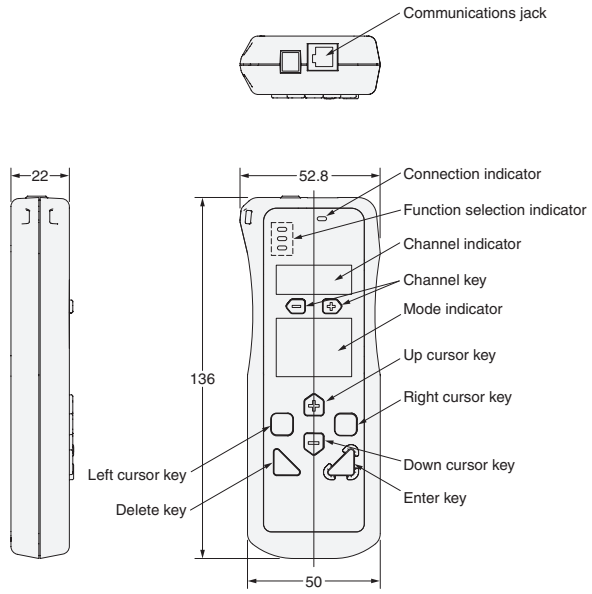


Setting Support Software for the F3SJ

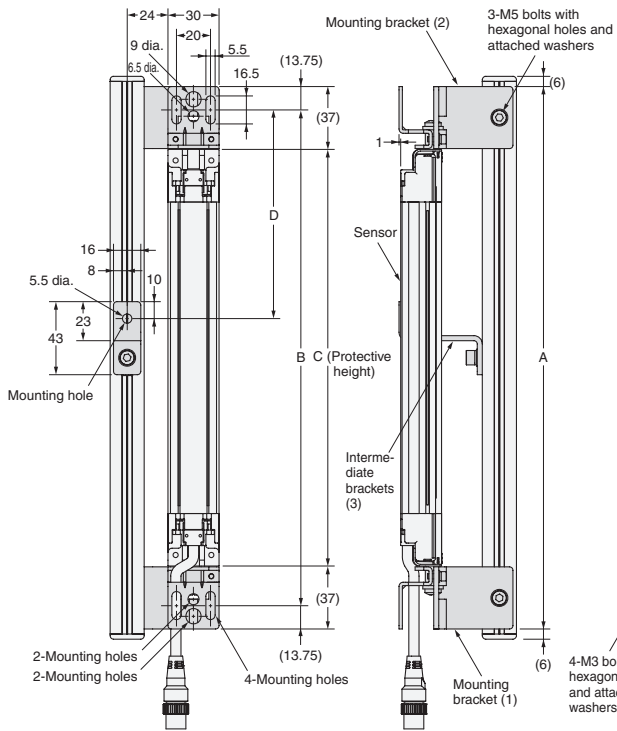
F39-GWUM



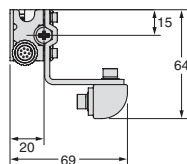
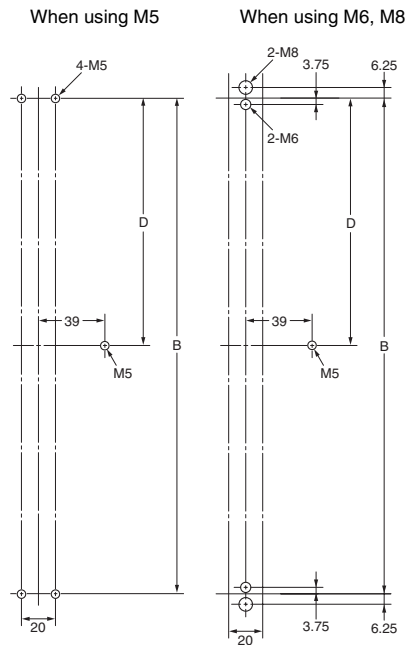
Setting Console
F39-MC21



Protective Bar
F39-PJ□□□□-S
Backside mounting



Mounting screw holes

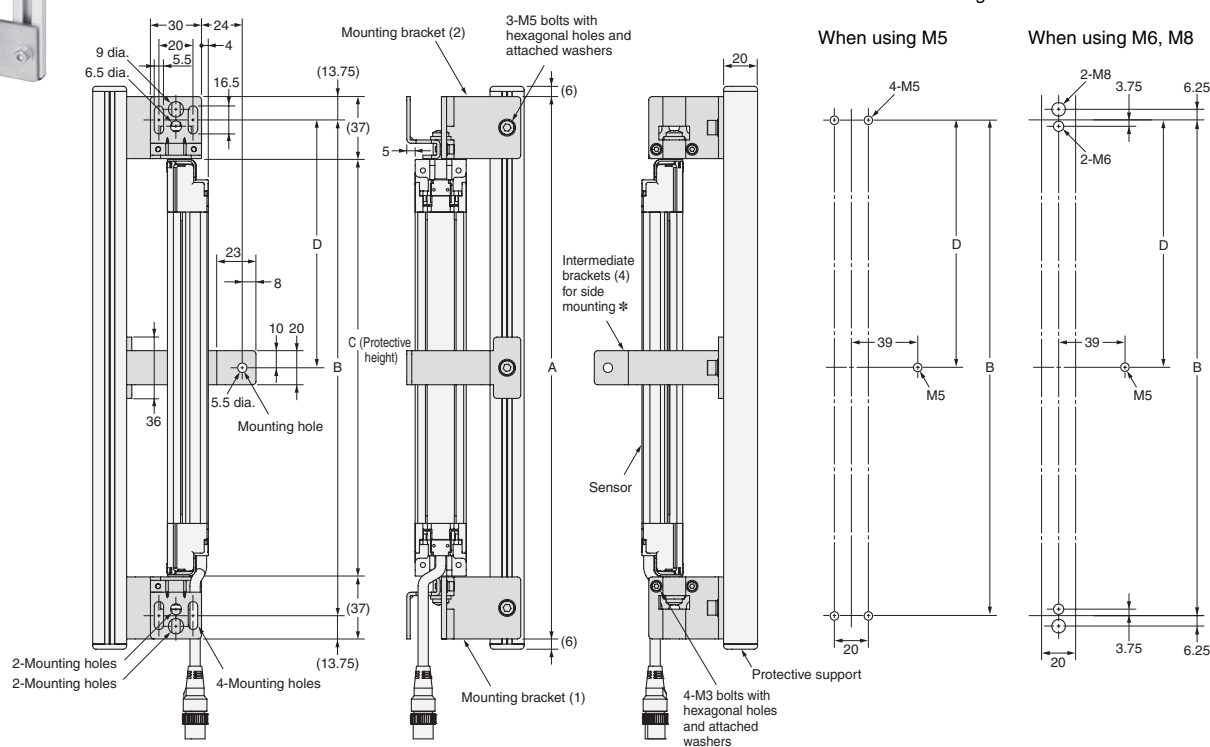


C (protective height): 4-digit number in the table
 $A = C + 74$, $B = C + 46.5$

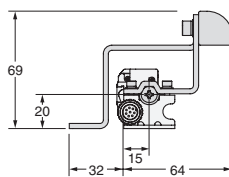
Protective height	Number of intermediate brackets used (3)	D
0245 to 0995	0	---
1001 to 2000	1	B/2
2009 to 2500	2	B/3

Note: For reference, D is the dimension that will not interfere with the intermediate bracket on the Safety Light Curtain body.

Side mounting



* The four intermediate brackets (F39-PJ-MS) for side mounting are not provided.

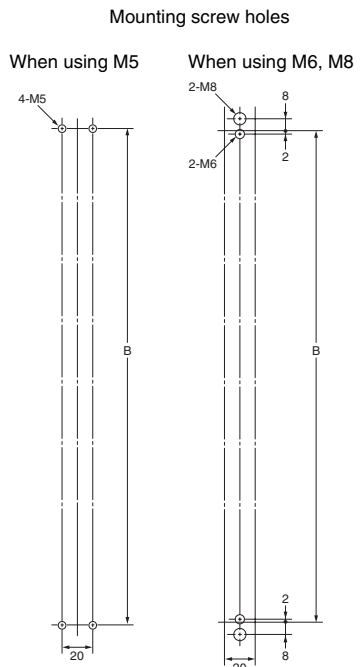
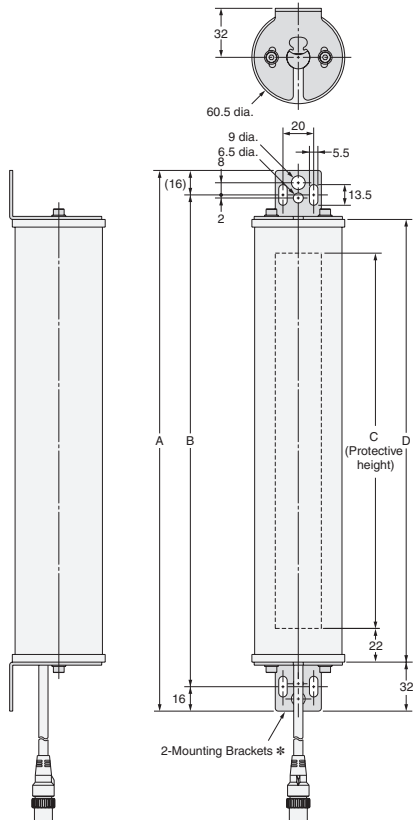


C (protective height): 4-digit number in the table
 $A = C + 74$, $B = C + 46.5$

Protective height	Number of protective brackets used (4)	D
0245 to 0995	0	---
1001 to 2000	1	B/2
2009 to 2500	2	B/3

Note: For reference, D is the dimension that will not interfere with the intermediate bracket on the Safety Light Curtain body.

Water-resistant Case
F39-EJ□□□□-L(D)
Backside mounting

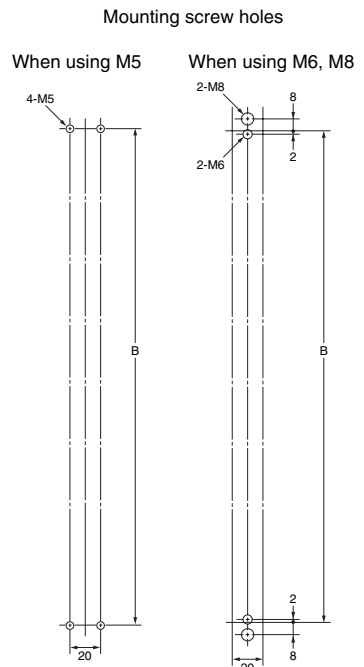
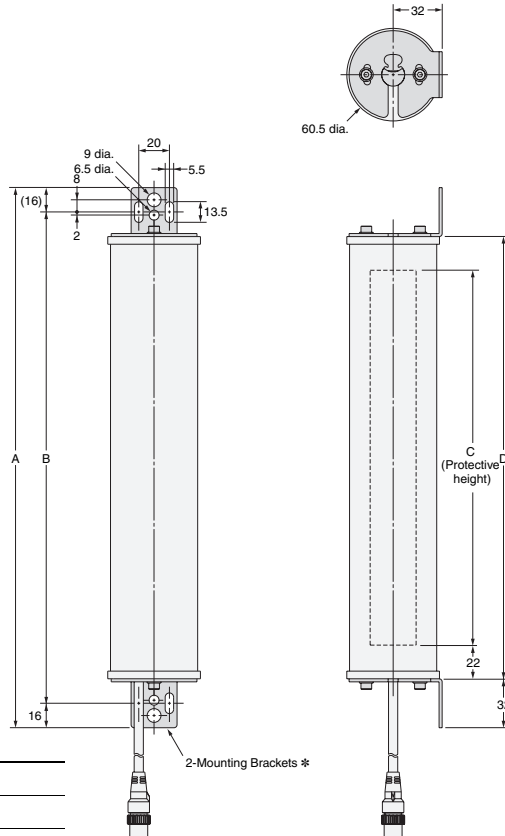


Dimensions A to D

A	C + 108
B	C + 76
C	4-digit number of the model name (protective height)
D	C + 44

* The Mounting Brackets (F39-EJ-R) are sold separately.

Side mounting



Dimensions A to D

A	C + 108
B	C + 76
C	4-digit number of the model name (protective height)
D	C + 44

* The Mounting Brackets (F39-EJ-S) are sold separately.

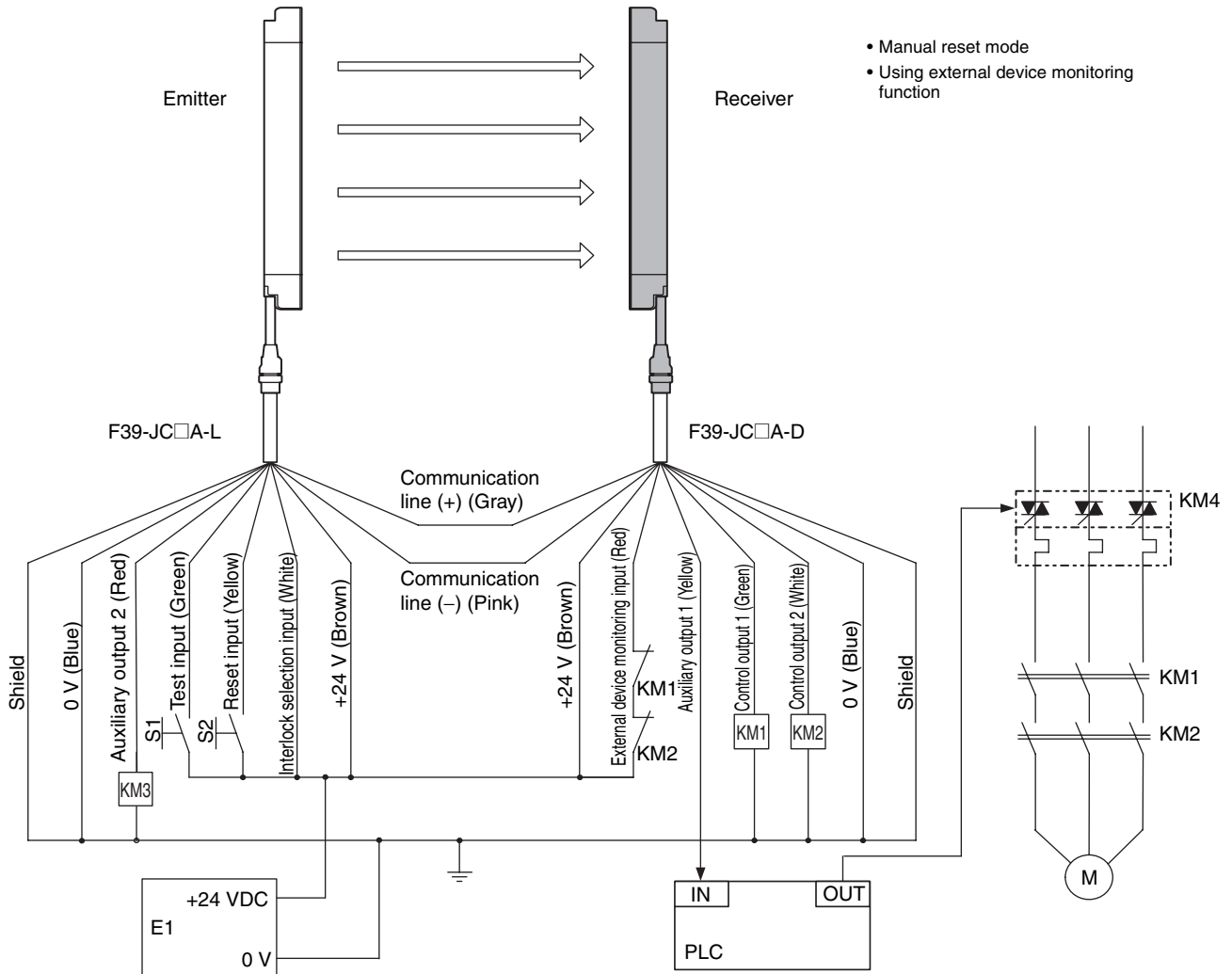
Connection Circuit Examples

Examples of Safety Circuits

For PNP output (See page 58 for NPN output wiring.)

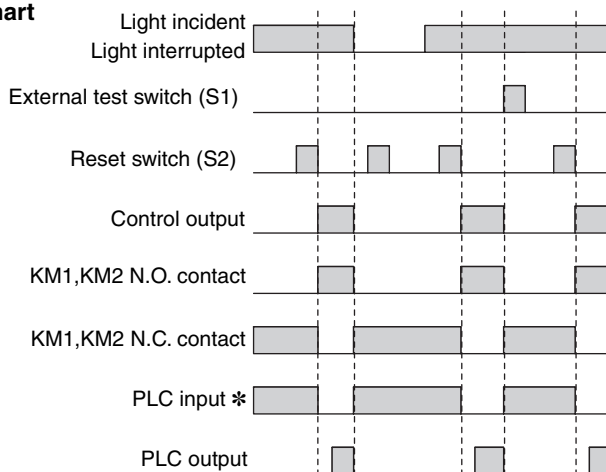
Wiring for single F3SJ application (category 4)

- Use of welded relay contact detection and interlock is possible without a controller or relay unit.



- Manual reset mode
- Using external device monitoring function

Timing Chart

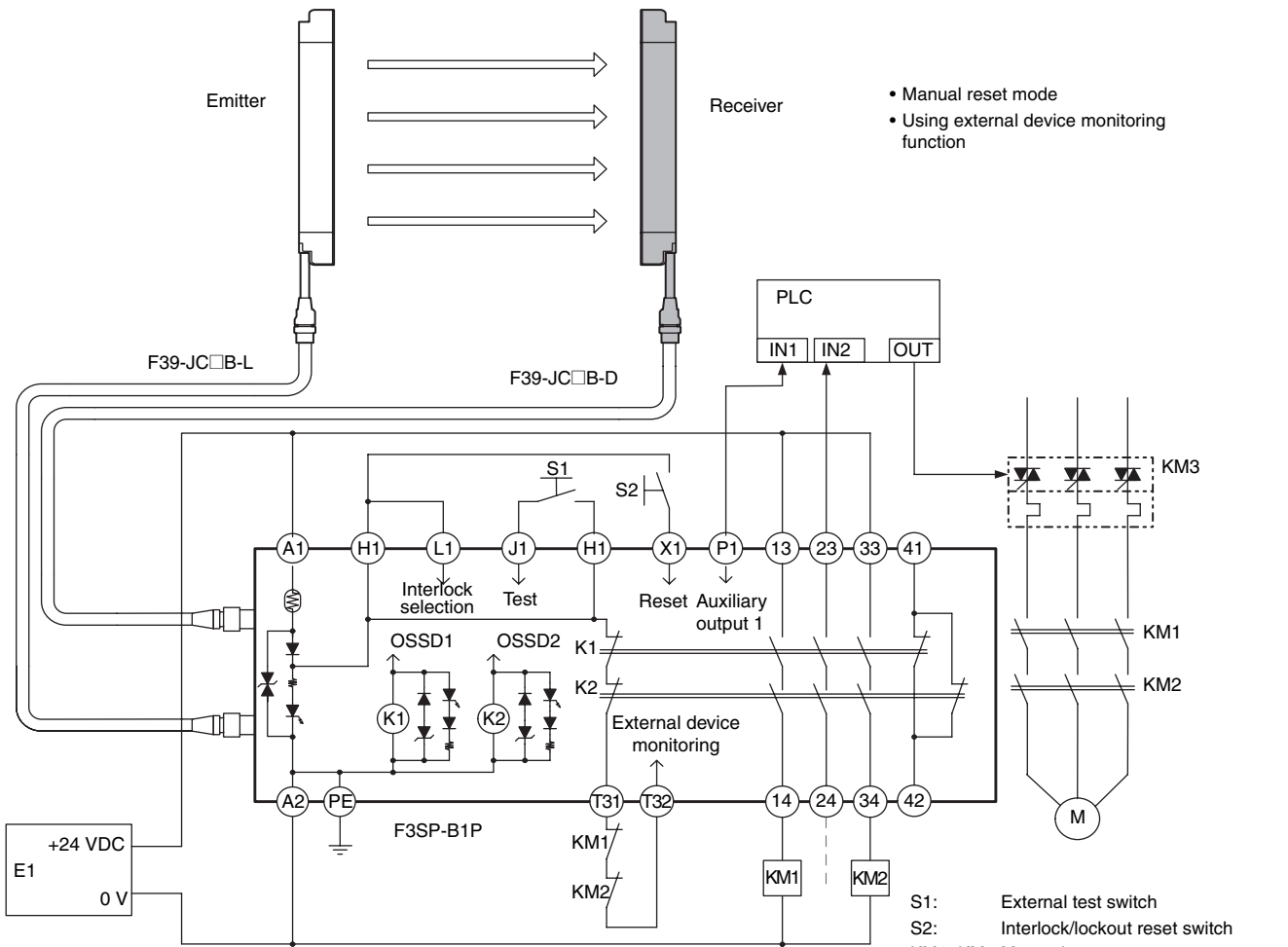


* The output operation mode for auxiliary output 1 is control output data/inverse of control output signals enabled (default setting).

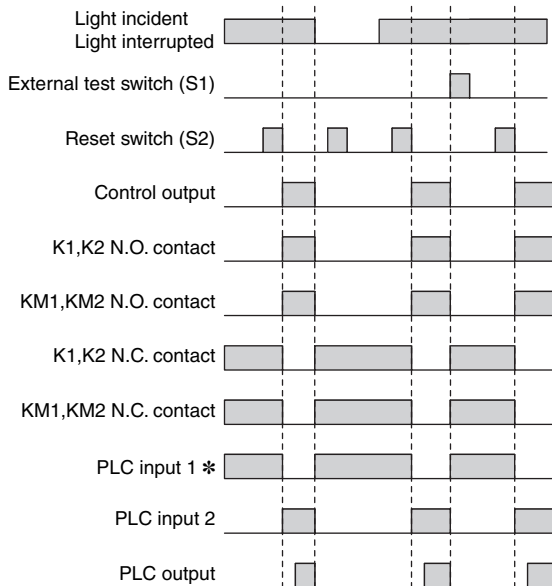
- S1: External test switch (connect to 0 V if the switch is not necessary.)
- S2: Interlock/lockout reset switch
- KM1, KM2: Safety relay with forcibly-guided contacts (G7SA) or magnetic contactor
- KM3: Load, PLC (for monitor)
- KM4: Solid state contactor (G3J)
- M: 3-phase motor
- E1: 24 VDC power supply (S82K)
- PLC: Programmable controller (Used for monitoring -- not related to safety system)

Wiring for connection with a controller F3SP-B1P (category 4) (PNP models only)

- Reduced wiring due to connector connection
- Safety relay included



Timing Chart

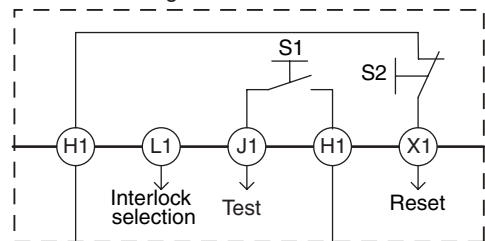


* The output operation mode for auxiliary output 1 is control output data/inverse of control output signals enabled (default setting).

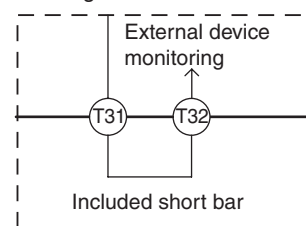
Note: When the F3SP-B1P is used, the system cannot be used as a muting system.

- S1: External test switch
- S2: Interlock/lockout reset switch
- KM1, KM2: Magnetic contactor
- KM3: Solid state contactor (G3J)
- M: 3-phase motor
- E1: 24 VDC power supply (S82K)
- PLC: Programmable controller (Used for monitoring -- not related to safety system)

Wiring for auto reset mode

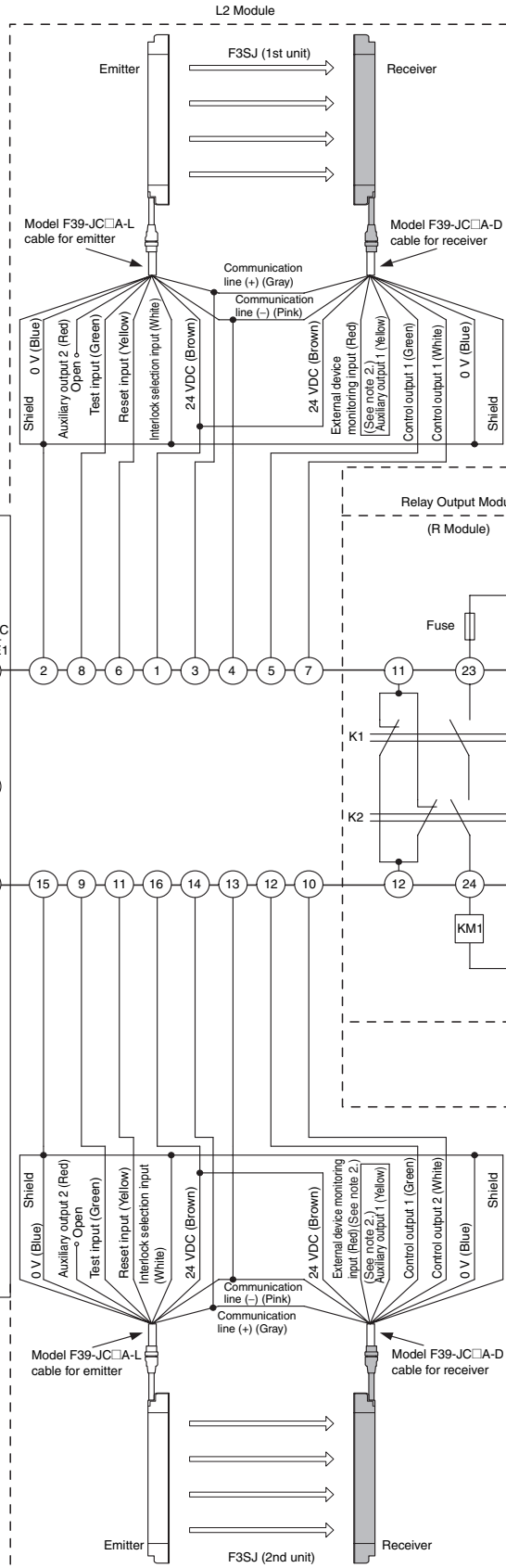
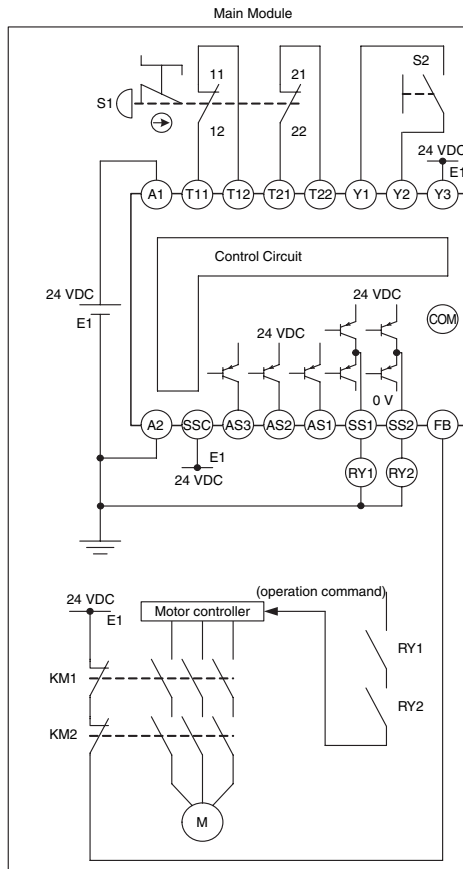
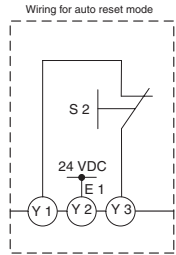
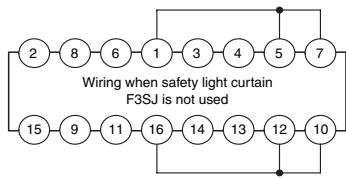


Wiring when the external device monitoring function will not be used

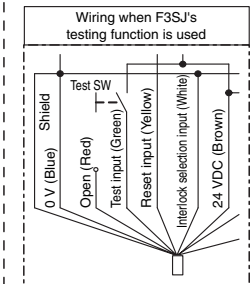
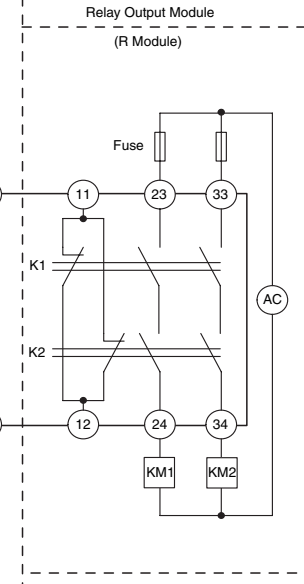


Wiring for connection with a controller F3SX-E-L2R (category 4) (PNP models only)

- 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.

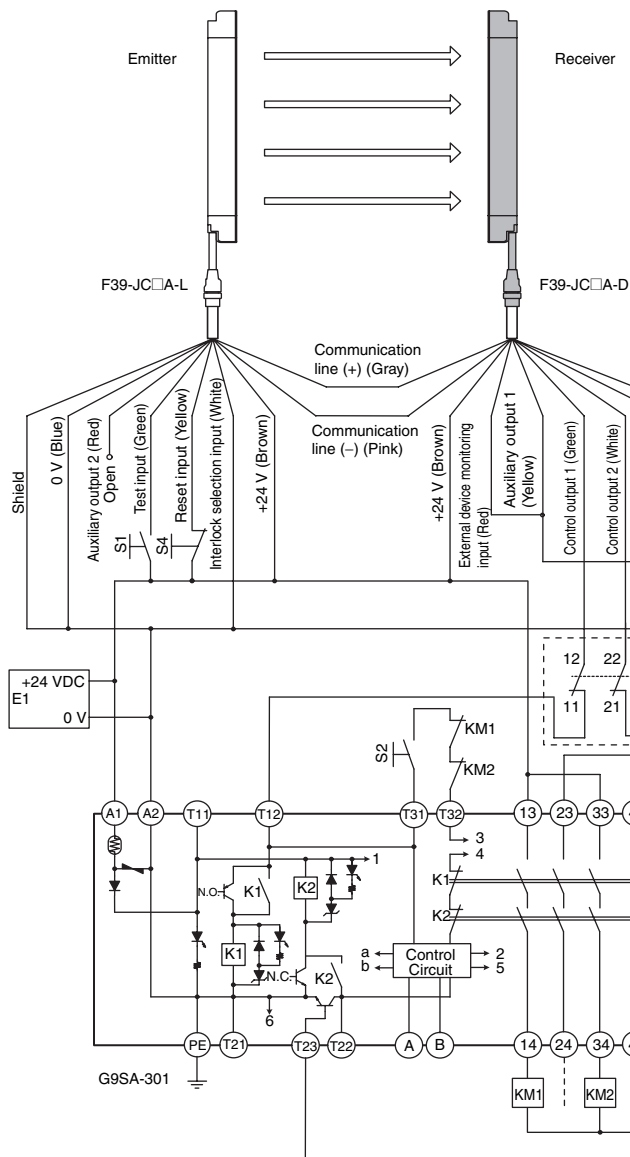


- F3SJ settings
- Auto reset mode
 - External device monitoring function disabled
- F3SX-E-L2R settings
- Manual reset mode
 - Using feedback time monitoring function

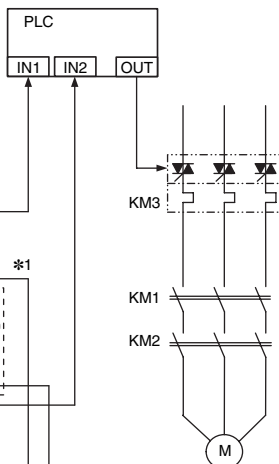


- S1: Emergency stop switch (direct opening contacts)(A165E, A22E)
- S2: Reset switch
- KM1, KM2: Magnetic contactor (LC1D)
- RY1, RY2: Relay
- M: 3-phase motor
- E1: 24 VDC power supply (S82K)
- Note:**
1. This wiring example is for category 4.
 2. This example shows the connection when auxiliary output 1 is in the standard setting (ON when light is interrupted).
 3. When the F3SJ is series-connected, or 5 or more sets are connected to the total system of F3SX, power must be supplied to F3SJ from external source. For details, see instruction manual of F3SX.

Wiring for connection with a controller G9SA-301 (category 4) (PNP models only)



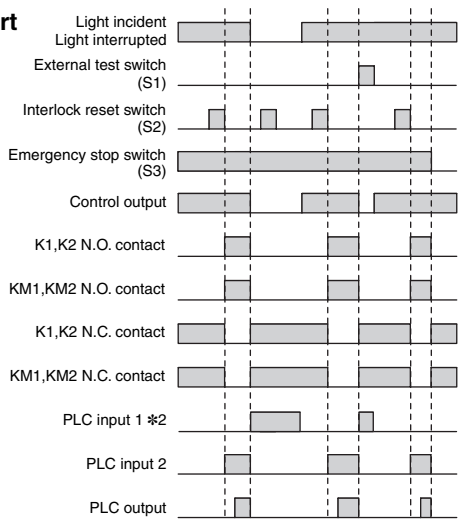
- F3SJ settings
- Auto reset mode
 - External device monitoring function disabled
- G9SA-301 settings
- Manual reset mode
 - Using feedback loop
- Using emergency stop switch



*1. If an emergency stop switch is not used, connect control output 1 to T12 terminal and control output 2 to T23 directly.

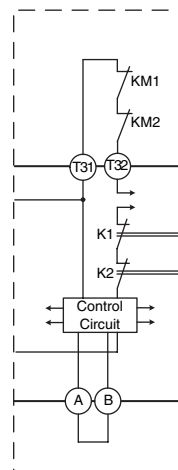
- S1: External test switch (connect to 0 V if the switch is not necessary.)
- S2: Interlock reset switch
- S3: Emergency stop switch (direct opening contacts) (A165E, A22E)
- S4: Lockout reset switch (connect to 24 V if the switch is not necessary.)
- KM1, KM2: Magnetic contactor
- KM3: Solid state contactor (G3J)
- M: 3-phase motor
- E1: 24 VDC power supply (S82K)
- PLC: Programmable controller (Used for monitoring -- not related to safety system)

Timing Chart



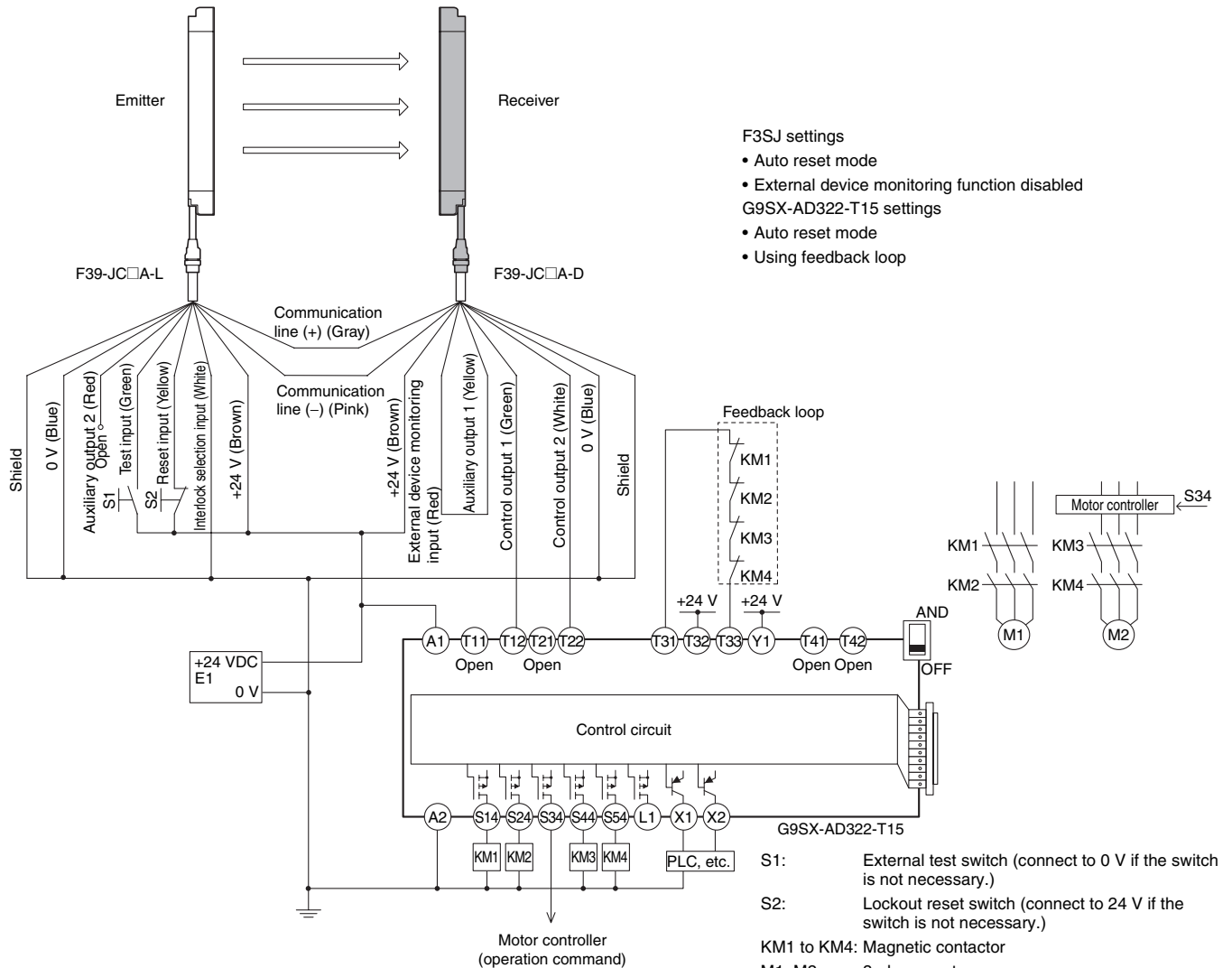
*2. The output operation mode for auxiliary output 1 is control output data/inverse of control output signals enabled (default setting).

Wiring for auto reset mode

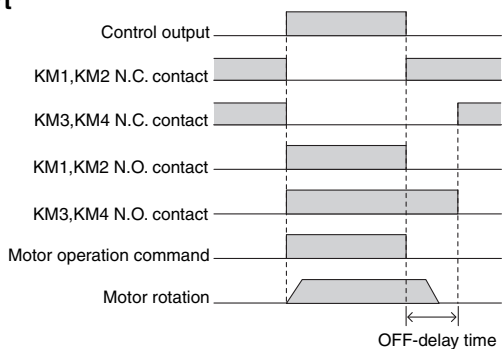


Wiring for connection with a controller G9SX-AD322-T15 (category 4) (PNP models only)

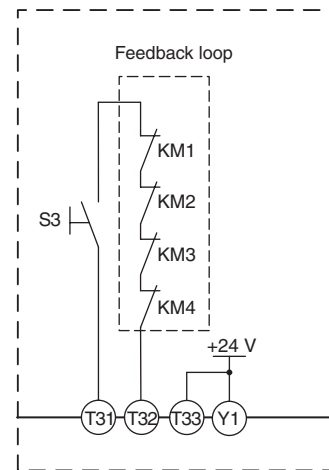
- Can be configured for partial control and total control.
- Can be extended to connect a door switch or a relay unit.



Timing Chart



Wiring for manual reset mode

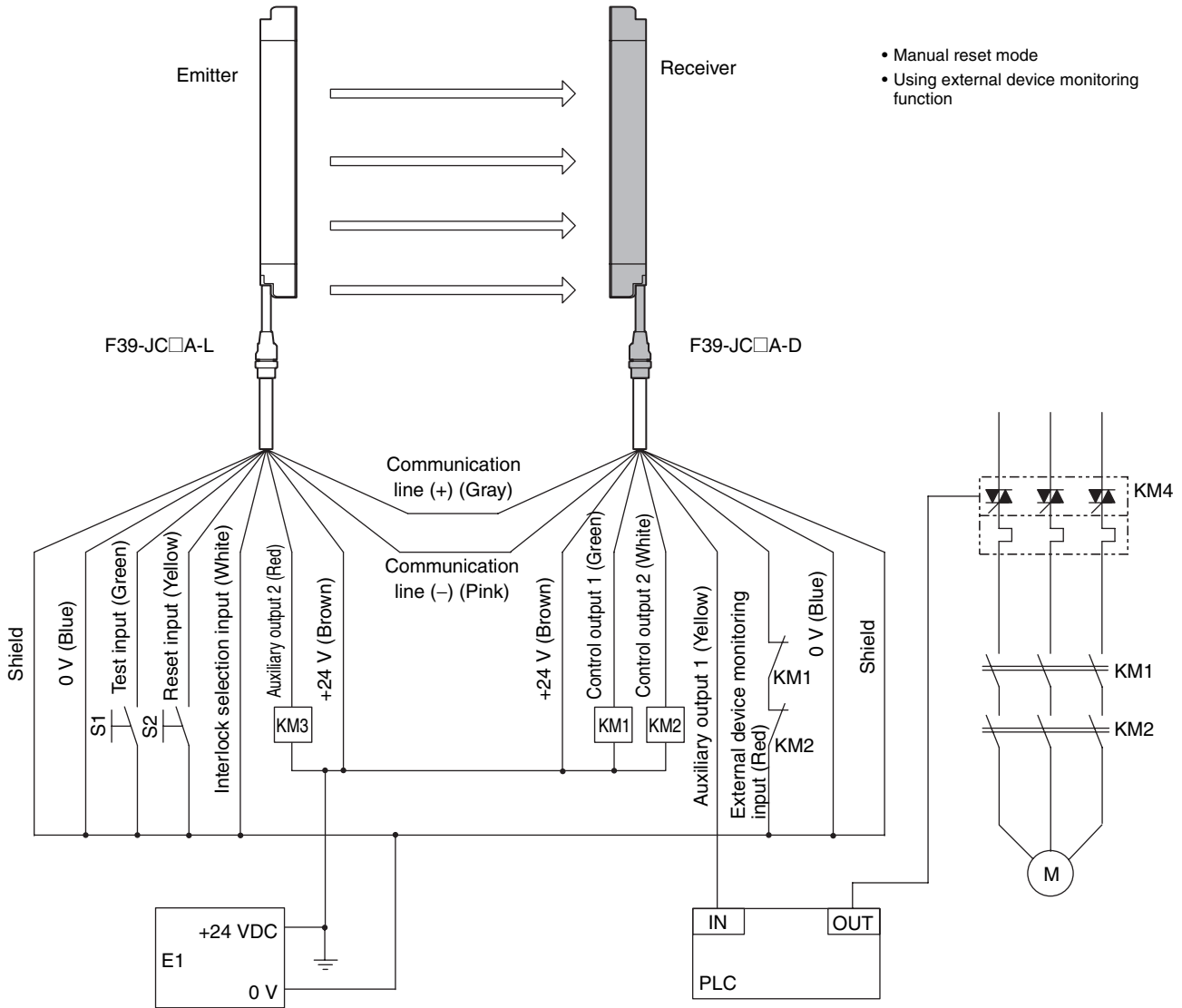


S3: Reset switch

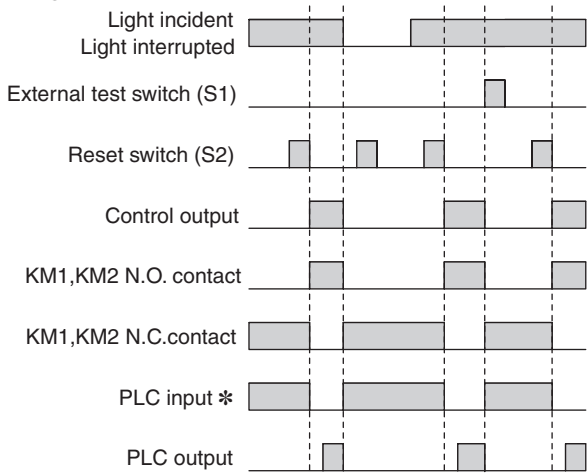
For NPN output (See page 53 for PNP output wiring.)

Wiring for single F3SJ application (category 4)

- Use of relay welded relay contact detection and interlock is possible without a controller or relay unit.



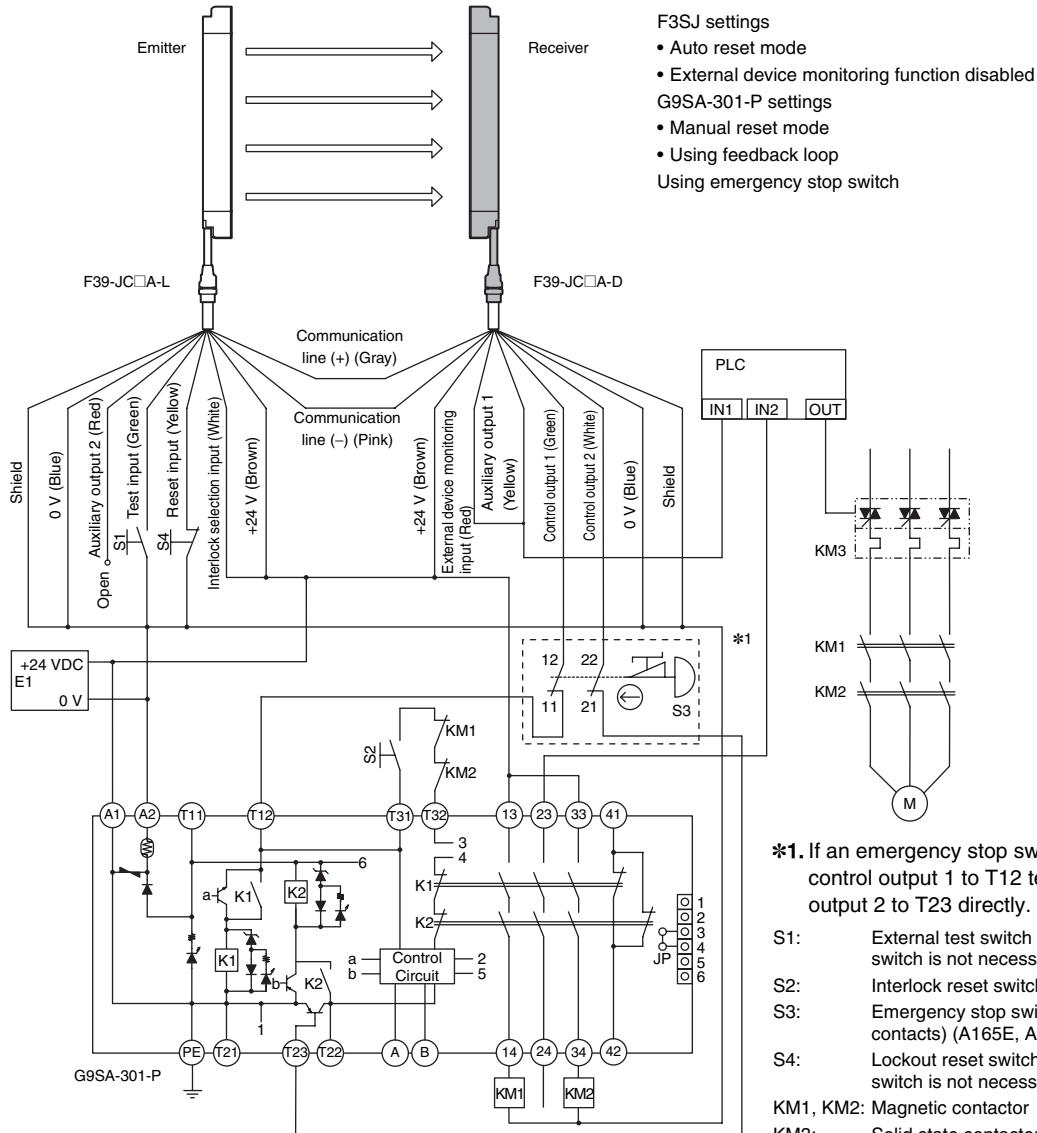
Timing Chart



- S1: External test switch (connect to 24 V if the switch is not necessary.)
- S2: Interlock/lockout reset switch
- KM1, KM2: Safety relay with forcibly-guided contacts (G7SA) or magnetic contactor
- KM3: Load, PLC (for monitor)
- KM4: Solid state contactor (G3J)
- M: 3-phase motor
- E1: 24 VDC power supply (S82K)
- PLC: Programmable controller (Used for monitoring -- not related to safety system)

* The output operation mode for auxiliary output 1 is control output data/inverse of control output signals enabled (default setting).

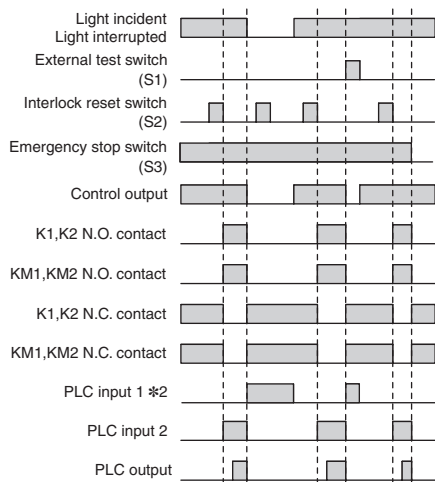
Wiring for connection with a controller G9SA-301-P (category 4) (NPN models only)



*1. If an emergency stop switch is not used, connect control output 1 to T12 terminal and control output 2 to T23 directly.

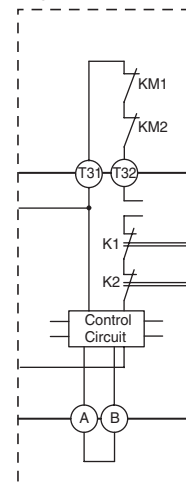
- S1: External test switch (connect to 24 V if the switch is not necessary.)
- S2: Interlock reset switch
- S3: Emergency stop switch (direct opening contacts) (A165E, A22E)
- S4: Lockout reset switch (connect to 0 V if the switch is not necessary.)
- KM1, KM2: Magnetic contactor
- KM3: Solid state contactor (G3J)
- M: 3-phase motor
- E1: 24 VDC power supply (S82K)
- PLC: Programmable controller (Used for monitoring -- not related to safety system)

Timing Chart



*2. The output operation mode for auxiliary output 1 is control output data/inverse of control output signals enabled (default setting).

Wiring for auto reset mode

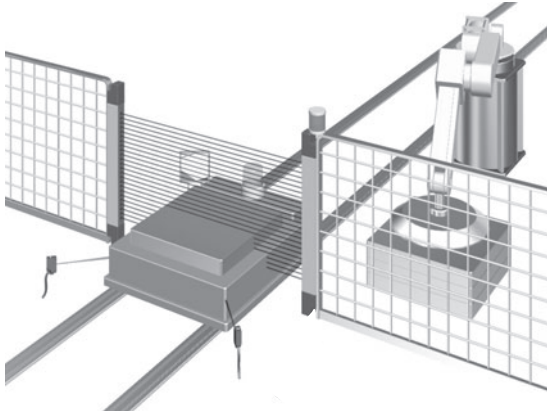


System Configuration and Connection (Muting system)

Muting System

The muting function temporarily disables the safety function of the F3SJ, keeping the control outputs ON even if beams are interrupted. This makes it possible to install safety light curtains for AGV passage, enabling both safety and productivity.

When muting, the muting lamp (external indicator) blinks to notify people in the surrounding area that the safety functions are disabled. For each operation modes, refer to page 73.



⚠ 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.

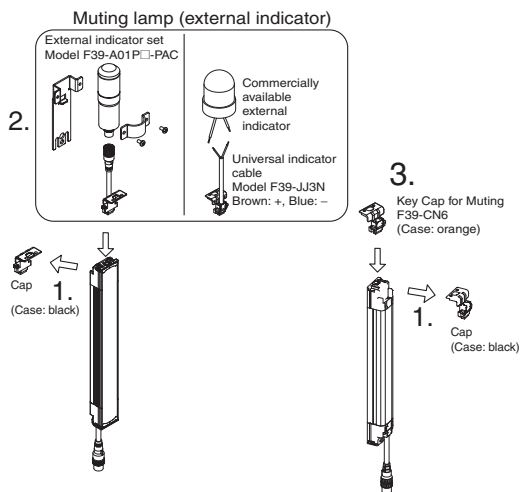
Install muting sensors so that they can distinguish between the object that is being allowed to pass through the detection zone and a person.

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

A muting sensor is the sensor that is the trigger for temporarily disabling the safety functions of F3SJ. You can use a through-beam or retro-reflective photoelectric switch, a proximity sensor, or a limit switch as the muting sensor. (OMRON's E3Z-series, E2E-series (3-wire), E2VX-series, and D4N-series Sensors are recommended.) For an F3SJ model with PNP output, use a sensor with a 3-wire PNP transistor output or a NO contact output. For an F3SJ model with NPN output, use a sensor with a 3-wire NPN transistor output or a NO contact output.

Two-wire sensors cannot be used.

Muting Lamp (External indicator)

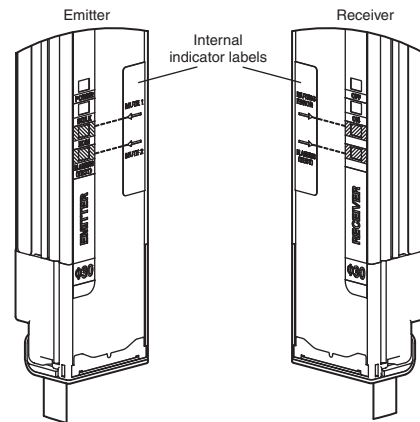
To notify workers that the muting function is working, external lamp(s) must be installed. Use the F39-A01P□-PAC external indicator set or an F39-JJ3N universal indicator cable with a commercially available external indicator.

F3SJ Internal Indicators

- The muting input 1 indicator turns ON when input is applied to muting input 1.
- The muting input 2 indicator turns ON when input is applied to muting input 2.
- The muting input 1 indicator and muting input 2 indicator blink under muting override.
- The muting error indicator on the receiver side turns ON when there is a muting error.

Attachment Positions for Included Labels

Internal indicator labels are included with the F39-CN6 Key Cap for Muting. When using a muting system, attach the internal indicator labels so the arrows will be in line with the positions of the indicators, as shown by the shading below.



Standard Muting Mode

The F3SJ is set to this operation mode when it is shipped from the factory. The muting function is enabled by providing a time lag between muting inputs 1 and 2. Use a separately purchased setting tool to change parameters related to muting time, or to select other muting operation modes.

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 control output is ON.
2. After muting input 1 is turned ON (connected to 9 to 24 V for PNP types, or to 0 to 1.5 V for NPN types), muting input 2 is turned ON (connected to 9 to 24 V for PNP types, or to 0 to 1.5 V for NPN types) within the muting input time limit T1 min. to T1 max. (0.03 to 3 s).

Once the conditions in item 2 above are met, the muting function will be enabled in 0.15 s max.

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. However, the F3SJ safety functions will continue operating and the F3SJ will operate normally even during a muting error.

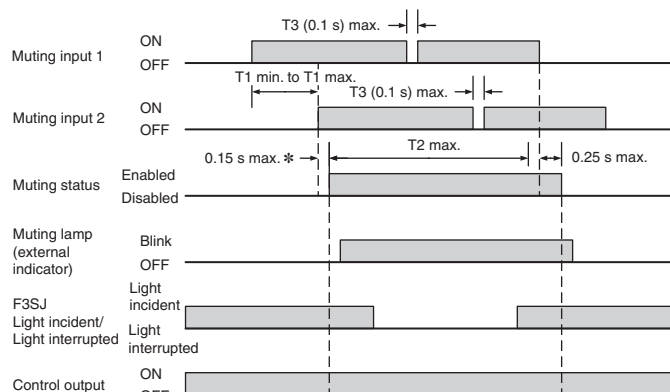
A muting error is released when either of the following occurs:

- 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 T3 (0.1 s) or longer.
2. When the muting continuation time exceeds the muting time limit of T2 (60 s) (a setting tool can be used to change the limit in the range of 1 to 600 s, or to eliminate the time limit)



* This value is the time when the F3SJ is used singly. When used in a series, this time is as shown in the table below.

Number of Connected Units	* Time (s)
1	0.15
Series of 2	0.26
Series of 3	0.29
Series of 4	0.32

- T1 min: Muting input time limit (min.)
This is the minimum input time lag between muting inputs 1 and 2, and is set to 0.03 s. If the time lag between muting inputs 1 and 2 are shorter than this value, a muting error is generated.
- T1 max: Muting input time limit (max.)
This is the maximum input time lag between muting inputs 1 and 2, and is set to 3 s. The minimum value must be less than the maximum value (min. < max.).

- T2: Muting time limit
This is the continuous time of the muting function, and is set to 60 s. If the muting status exceeds this time, muting is cancelled.
- T3: Allowable pulse-change time for muting input signals
This is the maximum time allowed for a change in the waveform pulse of muting inputs 1 and 2 while in the muting status.

Note: The muting status can be released even when the system enters lockout.

The following values can be changed using the Setting Support Software for the F3SJ:

- T1 min: Muting input time limit (min.)
- T1 max: Muting input time limit (max.)
- T2: Muting time limit

The following values can be changed using the Setting Console:

- T2: Muting time limit

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.
- When objects pass through the muting area at different speeds, consider limiting the muting time.
- For a muting sensor installation example, see the instruction manual.
- For details about the override function, see the instruction manual.

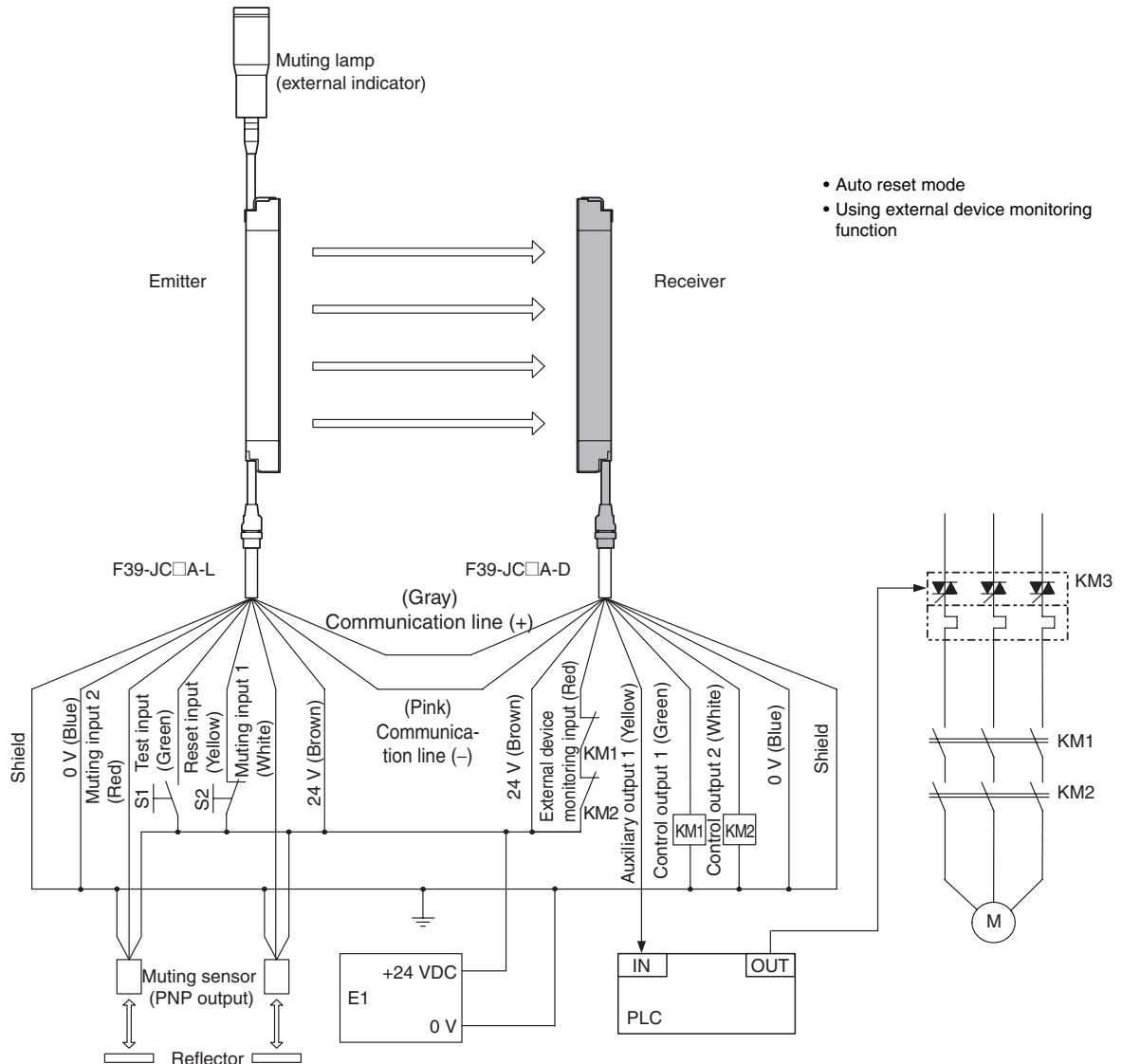
Example of a Safety Circuit with the Muting System

For PNP output

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

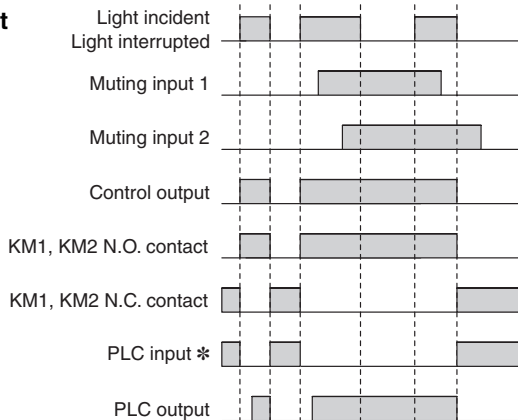
When two muting sensors are connected

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



- Auto reset mode
- Using external device monitoring function

Timing Chart



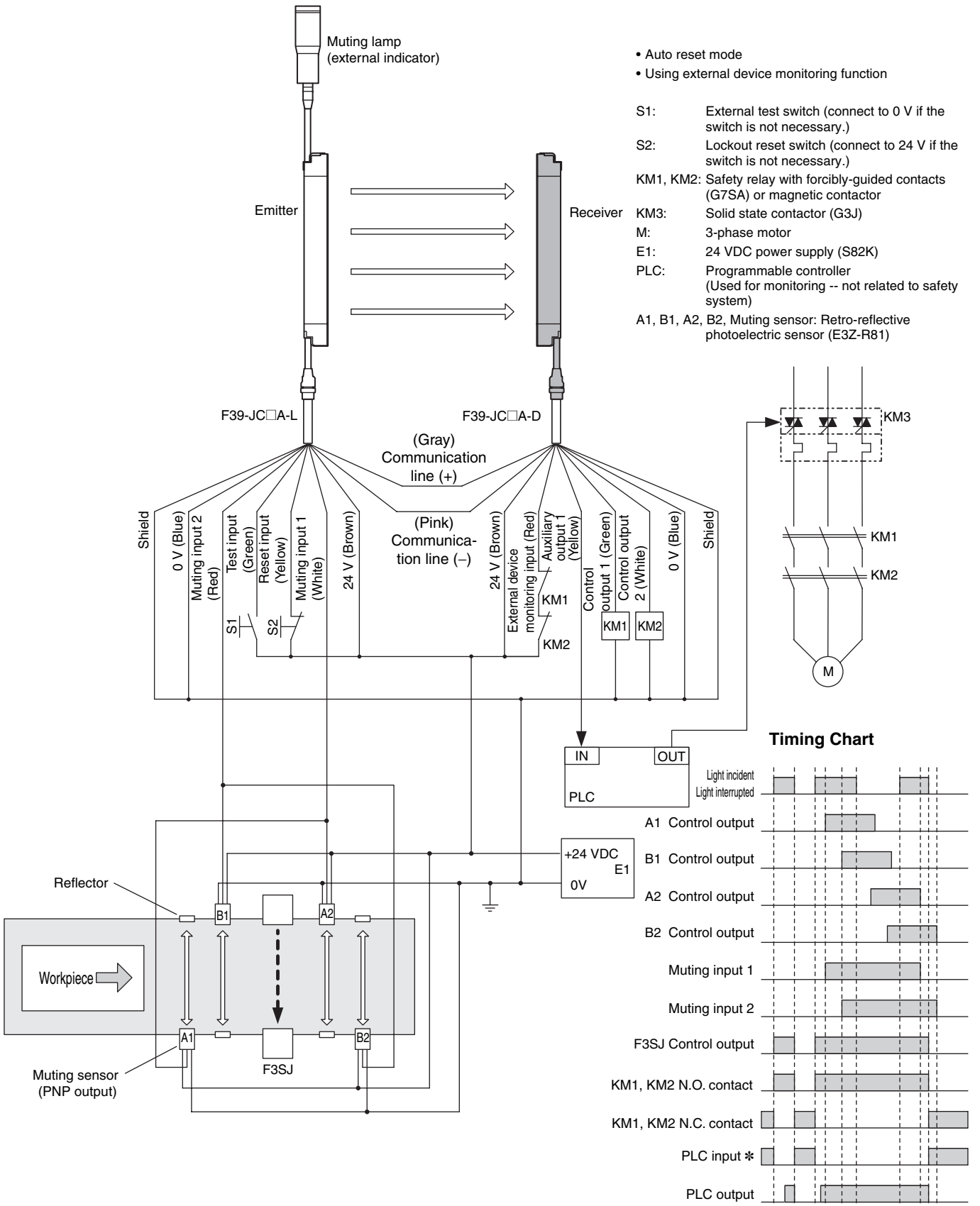
- S1: External test switch (connect to 0 V if the switch is not necessary.)
- S2: Lockout reset switch (connect to 24 V if the switch is not necessary.)
- KM1, KM2: Safety relay with forcibly-guided contacts (G7SA) or magnetic contactor
- KM3: Solid state contactor (G3J)
- M: 3-phase motor
- E1: 24 VDC power supply (S82K)
- PLC: Programmable controller (Used for monitoring -- not related to safety system)
- Muting sensor: Retro-reflective photoelectric sensor (E3Z-R81)

* The output operation mode for auxiliary output 1 is control output data/inverse of control output signals enabled (default setting).

Note: Start interlock and restart interlock can be used with a setting tool.

When four muting sensors are connected

- The muting function can be used by attaching the F39-CN6 Key Cap.



* The output operation mode for auxiliary output 1 is control output data/inverse of control output signals enabled (default setting).

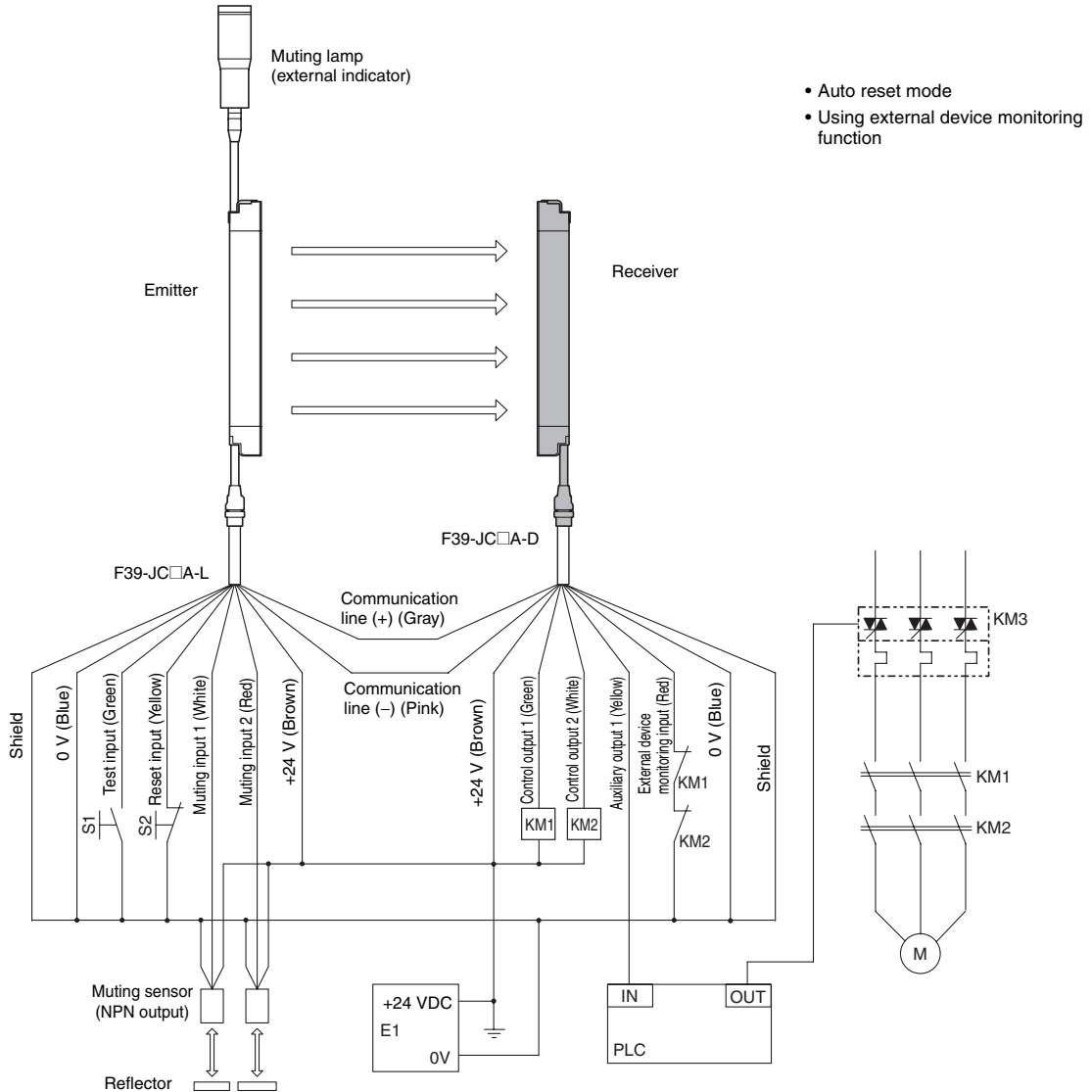
Note: Start interlock and restart interlock can be used with a setting tool.

For NPN output

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

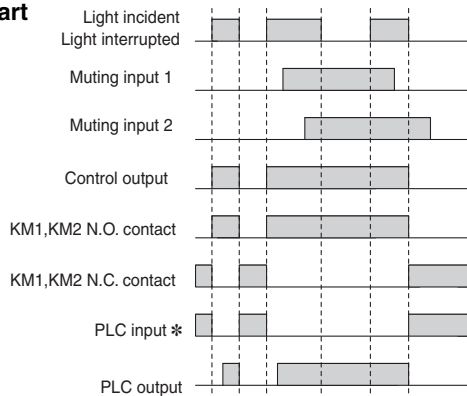
When two muting sensors are connected

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



- Auto reset mode
- Using external device monitoring function

Timing Chart



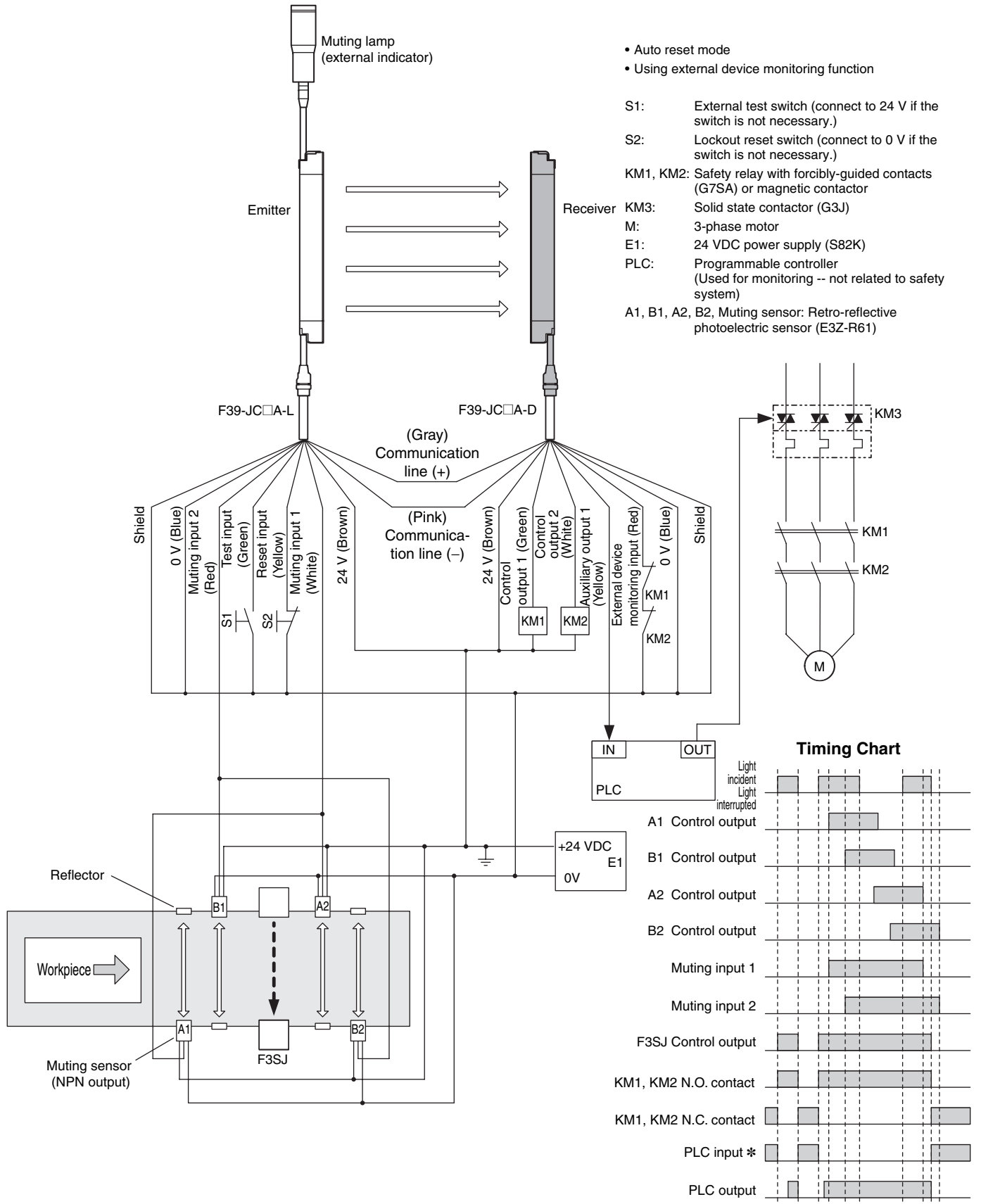
- S1: External test switch (connect to 24 V if the switch is not necessary.)
- S2: Lockout reset switch (connect to 0 V if the switch is not necessary.)
- KM1, KM2: Safety relay with forcibly-guided contacts (G7SA) or magnetic contactor
- KM3: Solid state contactor (G3J)
- M: 3-phase motor
- E1: 24 VDC power supply (S82K)
- PLC: Programmable controller (Used for monitoring -- not related to safety system)
- Muting sensor: Retro-reflective photoelectric sensor (E3Z-R61)

* The output operation mode for auxiliary output 1 is control output data/inverse of control output signals enabled (default setting).

Note: Start interlock and restart interlock can be used with a setting tool.

When four muting sensors are connected

- The muting function can be used by attaching the F39-CN6 Key Cap.

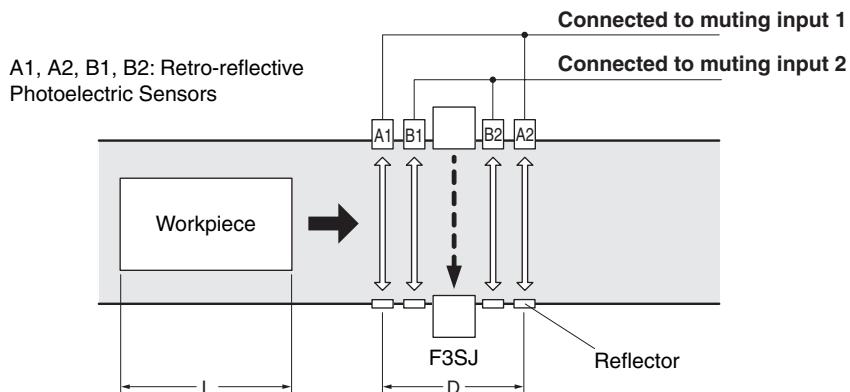


* The output operation mode for auxiliary output 1 is control output data/inverse of control output signals enabled (default setting).

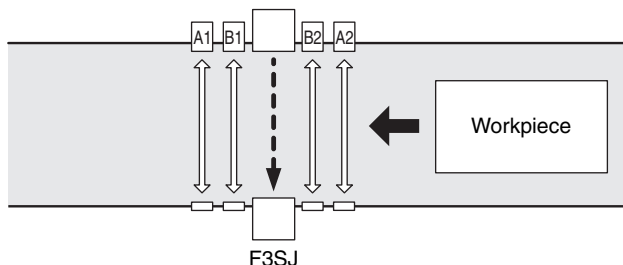
Note: Start interlock and restart interlock can be used with a setting tool.

Setting Bi-directional Muting

- Connect the outer muting sensors A1 and A2 to muting input 1 and the inner muting sensors B1 and B2 to muting input 2.
- When muting sensors A1 and then B1 (or A2 and then B2) turn ON in that order, the F3SJ will enter the muting state.



- Muting from the opposite direction is also possible.



- Note:**
1. This example arrangement uses E3Z-R□□ Retro-reflective Photoelectric Sensors as the muting sensors. Mutual interference must be taken into account when installing these Sensors.
 2. The muting sensors must be installed so that distance D between muting sensors A1 and A2 is smaller than workpiece length L.
 3. Through-beam or Retro-reflective Photoelectric Sensors, Proximity Sensors, or Limit Switches can be used as the muting sensors. Two-wire sensors cannot be used.

Safety Precautions

This catalog is intended as a guide for product selection. Be sure to use the instruction manual provided with the product for actual operation.

Regulations and Standards

- Application of an F3SJ-A sensor alone cannot receive type certification 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 certification.
- The F3SJ-A is electro-sensitive protective equipment (ESPE) in accordance with European Union (EU) Machinery Directive Index Annex V Item 2.
- The F3SJ-A complies with the following legislation and standards:
 - EU Regulations
Machinery Directive: Directive 2006/42/EC
EMC Directive: Directive 2004/108/EC
 - European standards:
EN61496-1 (TYPE 4 ESPE),
CLC/TS61496-2 (TYPE 4 AOPD),
EN61508-1 to -3 (SIL3)
EN ISO 13849-1 (PLe, Cat.4)
 - International standards:
IEC61496-1 (TYPE 4 ESPE),
IEC61496-2 (TYPE 4 AOPD),
EN61508-1 to -3 (SIL3)
 - JIS standards:
JIS B9704-1 (TYPE 4 ESPE),
JIS B9704-2 (TYPE 4 AOPD)
- The F3SJ-A received the following certification from the EU-accredited body, TÜV SÜD:
 - EC type test based on machinery directive
Type 4 ESPE (EN61496-1),
Type 4 AOPD (CLC/TS61496-2)
 - TÜV SÜD Type Certification
Type 4 ESPE (EN61496-1),
Type 4 AOPD (CLC/TS61496-2),
 - SIL1, 2, 3 (EN61508-1 to -3)
 - PLe, Cat.4 (EN ISO 13849-1: 2008)
- 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)
- 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, 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

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 an alert symbol are used in this catalog 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 symbol used in this catalog are shown below.

WARNING

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.

CAUTION

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

Definition of Symbol



Prohibited
Indicates a prohibited action.

Warning Labels

For users

WARNING

The F3SJ must be installed, set, and integrated into the mechanical control system by a qualified technician who has received the appropriate training. Failure to make correct settings may prevent detection of people and result in serious injury.

When changing parameters with a setting tool (F39-GWUM or F39-MC21), the change must be made and the contents of the change must be managed by the person in charge of the system. Unintentional or mistaken parameter changes may prevent detection of people and result in serious injury.

For machines

WARNING

Do not use this sensor for machines that cannot possibly 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

Make sure to test the operation of the F3SJ after installation to verify that the F3SJ operates as intended. Do not operate the machine until the test has been completed and F3SJ operation has been verified. Unintended function settings may cause a person to go undetected, resulting in serious injury.

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 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).

When detection of an area has been disabled by the fixed blanking function, provide a protective structure around the entire area that will prevent a person from passing through it and reaching the hazardous part of the machinery. Failure to do so may prevent detection of people and result in serious injury.

After setting the fixed blanking function, be sure to confirm that a test rod is detected within all areas that require detection. Failure to do so may prevent detection of people and result in serious injury.

When the fixed blanking function or the floating blanking function is used, the diameter for the smallest detectable object becomes larger. Be sure to use the diameter for the smallest detectable object for the fixed blanking function or the floating blanking function when calculating the safety distance. Failure to do so may prevent the machinery from stopping before a person reaches the hazardous part of the machinery, and result in serious injury.

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 be 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.

Muting times must be precisely set according to the application by qualified personnel who have received appropriate training. In particular, if the muting time limit is to be set to infinity, the person who makes the setting must bear responsibility.

Use two independent input devices for the muting inputs.

Install the F3SJ, Muting Sensors, or a protective wall so that workers cannot enter hazardous areas while muting is in effect, and set muting times.

Position the switch that is used to activate the override function in a location where the entire hazardous area can be seen, and where the switch cannot be operated from inside the hazardous area. Make sure that nobody is in the hazardous area before activating the override function.

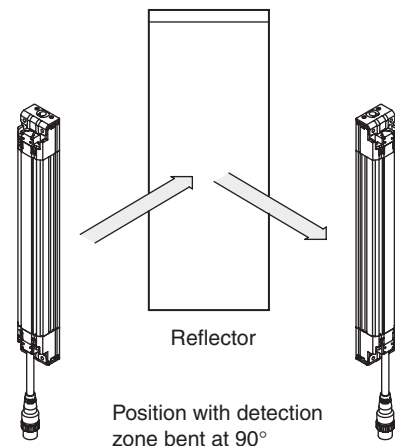
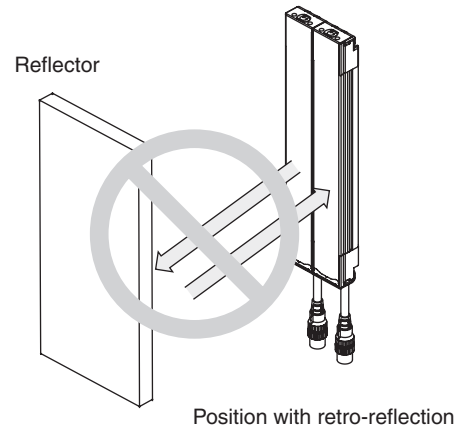
Install the sensor system so that it is not affected by reflective surfaces. Failure to do so may hinder detection, resulting in serious injury.

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 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.

Do not use the sensor system with mirrors in as retro-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 0 V line. For NPN output, connect the load between the output and +24 V line. Connecting the load between the +24 V and 0 V lines results in a dangerous condition because the operation mode is reversed to "ON when light is interrupted".

[For PNP output]
Do not short-circuit an output line to +24 V line. Otherwise, the output is always ON, creating a dangerous situation. Also, 0 V 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 0 V line. Otherwise, the output is always ON, creating a dangerous situation. Also, the +24 V 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 control outputs that satisfy the requirements of the necessary safety category.

Do not connect each line of F3SJ to a DC power supply higher than 24 V+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 (24 VDC±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 20 ms 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.

Installation Conditions

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

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.

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

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.



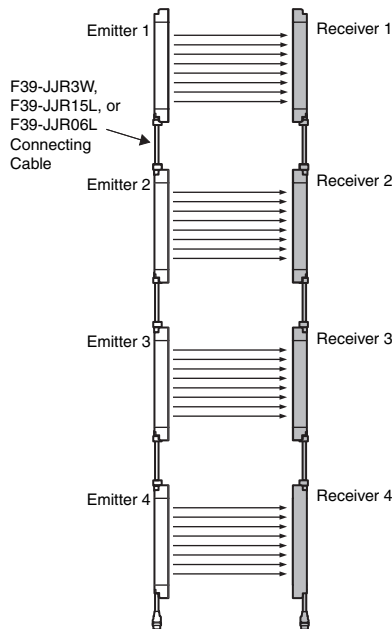
When using more than 1 set of F3SJ, install them so that mutual interference does not occur, such as by configuring series connections or using physical barriers between adjacent sets.



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

For series connection

Series connections can prevent mutual interference when multiple sensors are used. Up to 4 sets, 400 beams, can be connected (except for the F3SJ-A□-TS Series, for which up to 3 sets, 240 beams, can be connected). The emission of series-connected F3SJ is time-divided, so mutual interference does not occur and safety is ensured.



No Series Connections

Refer to “Precautions for All Safety Sensors” for information on preventing mutual interference of Safety Light Curtains that are not connected in series.

Using Setting Tools

The following setting tools (sold separately) can be purchased in order to change or confirm various F3SJ-series parameters.

- F39-MC21 Setting Console
 - F39-GWUM SD Manager Setting Support Software for the F3SJ
- The Setting Console cannot be used with the F3SJ-A□-TS Series.

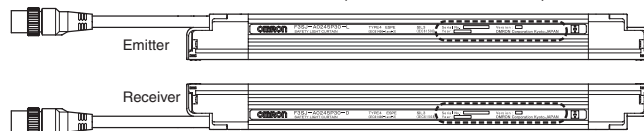
WARNING

The FS3J must be installed, set, and integrated into the mechanical control system by a qualified technician who has received the appropriate training. Failure to make correct settings may prevent detection of people and result in serious injury.

F3SJ Versions

Setting tools can be used with Version 2 and later versions of the F3SJ. The setting tools cannot be used with Version 1. The setting tools cannot be used even if a Version 1 F3SJ is combined in series with compatible F3SJ Units. (A communications error lockout will occur.) Unfortunately, the F3SJ's version cannot be upgraded. The F3SJ's version number appears on its label, as shown in the following diagram.

Location of the F3SJ's Version Number (Within Dashed-line Box)



Close-up View of Dashed-line Box



- ① : Serial number
- ② : Year of manufacture
- ③ : F3SJ's version number (Verify that the version is Version 2 or later.)

Functions Editable with Setting Tools

- : Can be used.
- ×: Cannot be used.

Function or monitored item		F39-MC21 Setting Console	F39-GWUM SD Manager Setting Support Software for the F3SJ
Settings for individual applications	Fixed blanking function *1	○	○
	Floating braking function *1	○	○
	Warning zone function *1	○	○
	Muting function *2 (when using the muting system)	○	○
	Override function *2 (when using the muting system)	○	○
Indicator and I/O settings	Auxiliary output *2	○	○
	Specified light beam output function *1	×	○
	External indicator output *2	○	○
	Interlock function *2	○	○
	External device monitoring function *2	○	○
Changing detection distance	Change detection distance function *1	○	○
Monitoring operation	Light intensity indicators *1	○	○
	Ambient light intensity indicators *1	○	○
	Status indicators *1	×	○
Maintenance information	Error log *1	○	○
	Power ON time *1	○	○
	Number of load switching operations *1	○	○
Recovering settings	Recover settings function *1	○	○
Other functions	Safety distance calculation function *1	×	○
	Power cable length calculation Function *1	×	○
	Rated response time check *1	○	○

- *1. These functions were newly added in Version 2. A setting tool can be used to enable these functions or read the function settings.
- *2. These functions can be used even without a setting tool. A setting tool can be used to make more detailed settings.

Two Kinds of Setting Tools

The following accessories (sold separately) can be purchased in order to use various F3SJ-series functions and change settings.

- F39-MC21 Setting Console
 - A Setting Console can easily make settings onsite.
- F39-GWUM SD Manager Setting Support Software for the F3SJ
 - With this software, a personal computer can be connected to make settings. The SD Manager Setting Support Software for the F3SJ can make more detailed settings than the Setting Console.

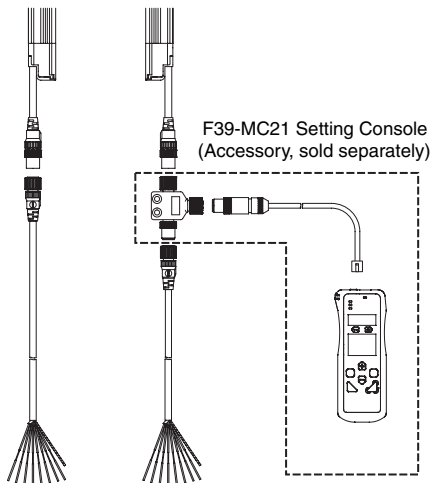
Setting Console

The following items are included with the F39-MC21 Setting Console.

- Setting Console
- Branch Connector (with Connector Cap)
- Special Cable
- Special Cable with Plug
- Error Mode Label
- Instruction Manual

Connecting the Setting Console

Connect the F3SJ to the Setting Console as shown in the following diagram. The Branch Connector can be used on either the emitter side or receiver side. After the F3SJ has been wired, turn ON the power and change parameters as required. If it is not possible to connect a branch connector because the connector is concealed by equipment or otherwise inaccessible, use the Special Cable with Plug to connect to the + and - communications lines. For details, refer to the F39-MC21 Instruction Manual.



SD Manager Setting Support Software for the F3SJ

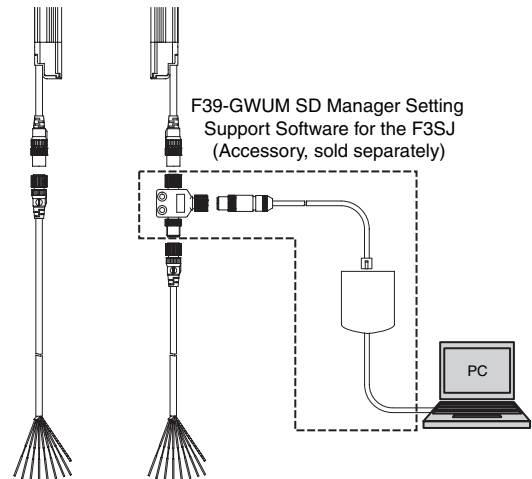
The following items are included with the F39-GWUM SD Manager Setting Support Software for the F3SJ.

- CD-ROM (SD Manager Setting Support Software for the F3SJ, Communications Unit Driver)
- Communications Unit
- Branch Connector (with Connector Cap)
- Special Cable
- Instruction Manual (Installation Guide)
- Special Cable with Plug

The F3SJ's operating status can be checked and its parameters can be changed in the SD Manager Setting Support Software for the F3SJ.

Connecting the SD Manager Setting Support Software

Connect the F3SJ, Communications Unit, and personal computer as shown in the following diagram. The branch connector can be used on either the emitter side or receiver side. After the F3SJ has been wired, turn ON the power and start the Setting Support Software. If it is not possible to connect a branch connector because the connector is concealed by equipment or otherwise inaccessible, use the Special Cable with Plug to connect to the + and - communications lines. For details, refer to the SD Manager's Help function.



Applications Supported by the Setting Tools

Fixed Blanking Function

Summary

Disables specific F3SJ light beams.



When the fixed blanking function is used to disable detection in an area, install blocking structures or shielding to prevent passage into the entire hazardous area where detection has been disabled. Failure to do so may prevent detection of people and result in serious injury.

When an allowable range of light beams has been set for fixed blanking, the size of the smallest detectable object will be larger in the vicinity of interrupting objects. Calculate the safety distance to match the settings.

After setting the fixed blanking function, you must verify that the F3SJ detects a test rod at any position in the entire area where intrusion must be detected. Failure to do so may prevent detection of people and result in serious injury.

Example Application

In this example, there is always an object such as a conveyor belt in the detection area, and we want to ignore the conveyor belt.

Description of Functions

Fixed Blanking Function

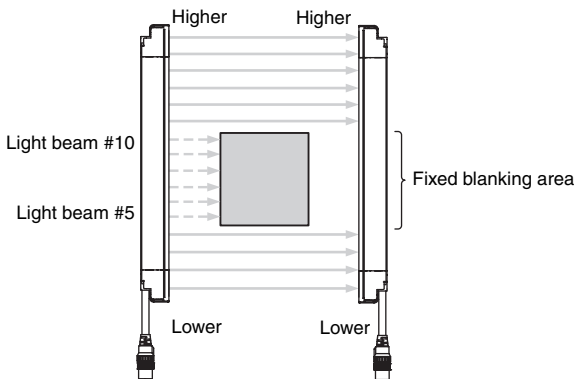
This function disables part of the F3SJ's detection area and maintains the control output's ON status even if there is an object in the disabled area.

The light beams set for fixed blanking must be one area of consecutive light beams and up to five areas can be set (areas 1 to 5). Fixed blanking cannot be set for all of the light beams.

Setting the Fixed Blanking Area

Set the area that will be subject to fixed blanking.

An interrupting object can be placed in the detection area to perform teaching and specify light beams for manual settings.



- Note:**
1. When the Setting Console is being used, only one area can be set as a fixed blanking area.
 2. When the SD Manager Setting Support Software is being used, up to five areas can be set as fixed blanking areas.

Floating Blanking Function

Summary

Increases the diameter of the F3SJ's smallest detectable object and turns OFF the control output when multiple objects are detected.



When the floating blanking function is used, it increases the diameter of the F3SJ's smallest detectable object. Always use the larger diameter when calculating the safety distance. If the incorrect diameter is used in the calculation, the machinery may fail to stop before an operator reaches the hazardous area, resulting in serious injury.

After setting the floating blanking function, always verify that the F3SJ system operates as expected. Serious injury may result if an individual is not detected.

Example Application

When there is a moving object with a fixed width in the detection area that we do not want to detect, the detection function can be disabled.

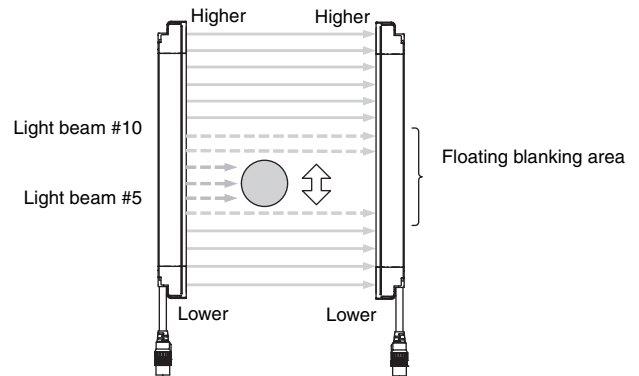
Description of Functions

Floating Blanking Function

This function increases the diameter of the smallest detectable object to allow passage of objects of a certain size or allow interrupting objects in multiple locations.

Setting the Floating Blanking Area

When the Setting Console is being used, all of the light beams are set as the floating blanking area. When the SD Manager Setting Support Software is being used, just one area can be set but the range of the area can be specified. In the following example, the floating blanking area is set from the 5th light beam to the 10th light beam (counting from the bottom). An interrupting object can be placed in the detection area to perform teaching and specify light beams for manual settings.



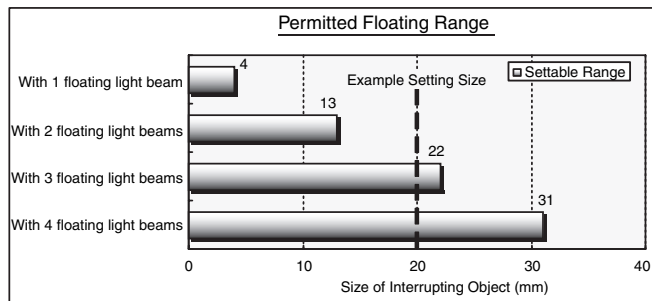
Floating Light Beams

The following charts show the relationship between the number of floating light beams and the safety output operation (safety output not going OFF). Measure the size of the interrupting object (maximum diameter) and set the number of floating light beams so that the object's size is less than the corresponding dimension shown in the chart.

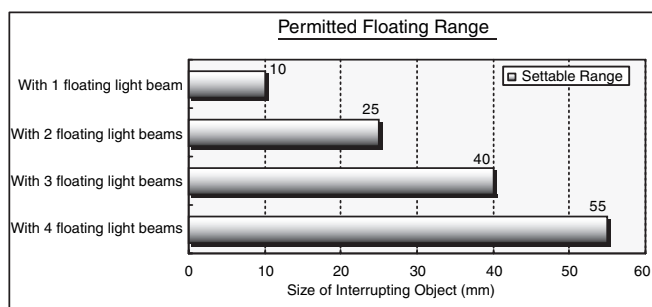
Example Setting

When an F3SJ-A□14 is being used with an interrupting object that is 20 mm in diameter, set three light beams as floating light beams. With this setting, the F3SJ's safety output will not turn OFF even if there is an interrupting object up to 22-mm wide in the floating blanking area.

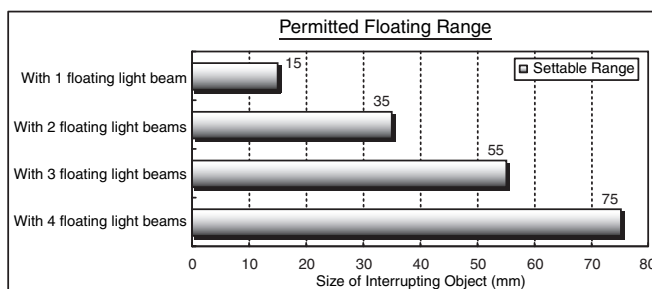
Effective Range vs. Number of Floating Light Beams
F3SJ-A□14 Series



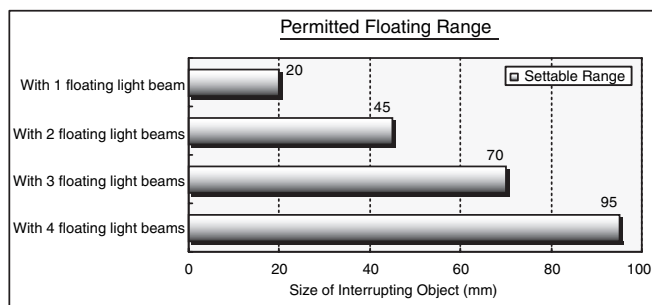
F3SJ-A□20 Series



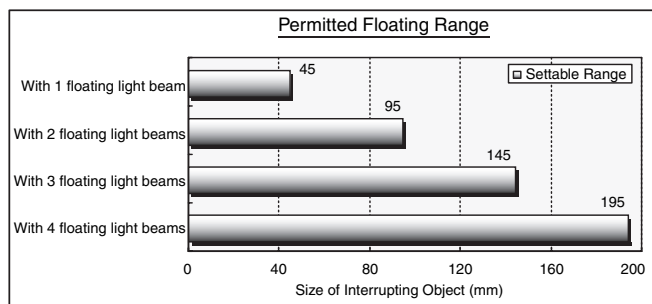
F3SJ-A□25 Series



F3SJ-A□30 Series



F3SJ-A□55 series



Floating Blanking Mode

The floating blanking function has two operation modes.

- 1. Continuous Light Beam Mode**
 The safety output will not go OFF if the interrupting object is smaller than the set size, although the safety output will go OFF if objects pass through several areas in the detection area. The floating blanking monitor function can be set in this mode. Refer to the User's Manual for details.
- 2. Discontinuous Light Beam Mode**
 A light blockage is detected when the number of light beams blocked in the area is equal to or greater than the preset number of light beams.

Warning Zone Function

Summary

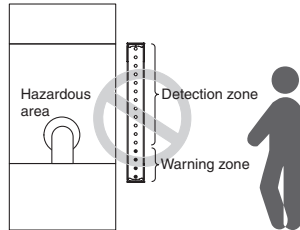
The detection zone can be divided into the detection zone and a warning zone.

WARNING

The warning zone output is not a safety output. Do not include this area in the safety distance calculation. Shortening the safety distance may result in serious injury.

The warning zone cannot be used for safety purposes. Always install the system so that the hazard is reached by passing through the detection zone.

The warning zone function can be used only when the F3SJ is installed horizontally. This function cannot be used when the F3SJ is installed vertically.



Example Application

When an individual enters, a warning lamp lights or buzzer sounds without stopping the equipment.

Description of Function

Warning Zone Function

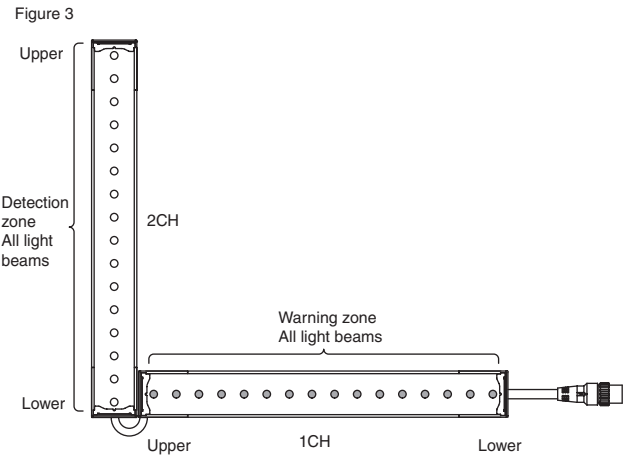
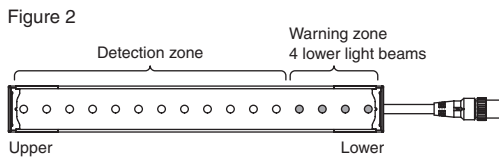
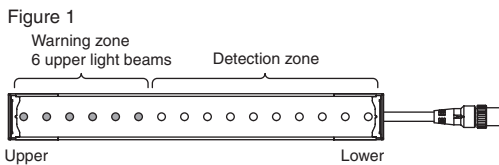
Use teaching to set the light beams that you want to set as the warning zone or manually specify the light beams from the lowest or highest beam. (See figures 1 and 2.)

To indicate that the warning zone is blocked, allocate the auxiliary output or external indicator output as the warning zone information. The following settings cannot be made:

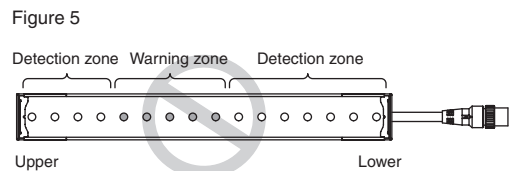
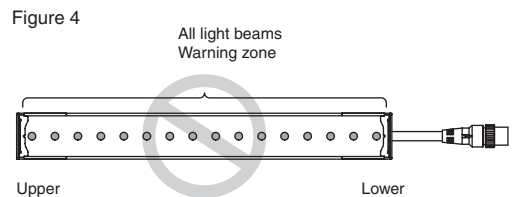
- Setting all light beams as the warning zone (figure 4)
- Setting a warning zone that does not include one of the outer light beams (figure 5)

If Safety Light Curtains are connected in series, and at least one of an F3SJ's light beams is a normal light beam, all of a Light Curtain's light beams can be set as a warning zone (figure 3).

Example Warning Zone Settings (Figures 1 to 3)

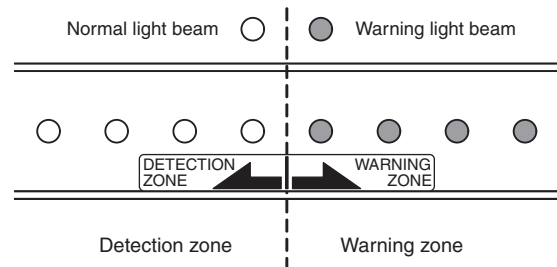


Examples of Unacceptable Warning Zone Settings (Figures 4 and 5)



Warning Zone Display Label

When the warning zone is set, affix this label to indicate which areas belong to the normal detection zone and the warning zone.



Muting Function

Summary

Makes settings related to the muting function.

WARNING

The muting function disables the safety functions of the device. Additional safety measures must be taken to ensure safety while this function is working.

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

Muting lamps (external indicators) that indicate the status of the muting function must be installed where they are clearly visible to workers from all the operating positions.

Muting times must be precisely set according to the application by qualified personnel who have received appropriate training. In particular, if the muting time limit is to be set to infinity, the person who makes the setting must bear responsibility.

Use two independent input devices for the muting inputs. (For the PNP output-type F3SJ, use a sensor with a PNP transistor output or N.O. contact. For the NPN output-type F3SJ, use a sensor with an NPN transistor output or N.O. type contact.)

To prevent a worker from entering the hazardous area while the muting function is engaged, install the F3SJ, muting sensor, and then a protective barrier and set a limited muting time.

Example Applications

- Allowing only work pieces to pass into the conveyor entrance
- Operating the muting function in a specific area only
- Setting a different muting mode when standard muting is not appropriate for the application

Description of Functions (See User's Manual for details.)

Operation Modes

When the SD Manager Setting Support Software is being used, any one of the following three operation modes can be selected for the muting function.

1. Standard Muting Mode
This is the default operation mode, which is set when the F3SJ is shipped from the factory.
The muting function is enabled by turning ON muting inputs 1 and 2 with a time lag.

Note: Settings such as the muting time limit value can be changed.

2. Specialized Exit Muting Mode (Can be set with the SD Manager Setting Support Software only.)
The muting function is enabled by turning ON muting inputs 1 and 2 with a time lag.
Installation of the muting input sensors is simpler than standard mode because the Safety Light Curtain's blocked light status is used to end muting.
3. Position Detection Muting Mode (Can be set with the SD Manager Setting Support Software only.)
Sensors such as limit switches are used for the muting inputs and the muting function is enabled by turning muting input from OFF to ON and then turning muting input 2 from ON to OFF within time difference T1 max. Use hybrid redundant inputs such as a combination of an N.O. contact input and an N.C. contact input. (When using a PNP-output photoelectric switch, use L/ON operation on one side and D/ON operation on the other side.)
This mode is useful when you want to disable the F3SJ temporarily, such as when a person is placing an object at the conveyor entrance.

Partial Muting (Muting area) Settings

The light beams controlled by the muting function can be specified with a setting tool. (When the F3SJ is shipped, all light beams are set.) The light beams can be specified by teaching/recording the blocked light beams as muting light beams or manually specifying the desired light beams.

Indicator and I/O Settings

Auxiliary Output (Non-safety) and External Indicator Output (Non-safety)

Summary

A setting tool can be used to change the allocation of auxiliary outputs 1 and 2, and external indicator outputs 1 and 2.

WARNING

Do not use the auxiliary outputs or external indicator outputs for safety purposes. Serious injury may result if an output fails and a person is not detected.

Example Applications

- Allocating a lockout output or warning zone output to an auxiliary output
- Connecting an external indicator to an auxiliary output and making it flash

An auxiliary output or external indicator output can be connected to an incandescent light to function as a broken-wire or short-circuit detector. Refer to the User's Manual for details.

Output Operation Modes (when allocated to an auxiliary output or external indicator output)

Output operation mode	Description of operation (Output will go ON in the following situation.)	Setting Console	SD Manager Setting Support Software
Control output	The control output is ON	<input type="radio"/>	<input type="radio"/>
Light intensity diagnosis *1	The F3SJ is ON and the received light intensity is 100% to 130% of the threshold value for more than 10 seconds.	<input type="radio"/>	<input type="radio"/>
Error/Lockout	The F3SJ is in error or lockout status.	<input type="radio"/>	<input type="radio"/>
Muting/Override	The F3SJ is in muting or override status.	<input type="radio"/>	<input type="radio"/>
Blanking/Warning Zone *2	The fixed blanking, floating blanking, or warning zone function is enabled.	<input type="radio"/>	<input type="radio"/>
Specified light beam output *3	A specified light beam is blocked.	<input type="checkbox"/>	<input type="radio"/>
Power ON time	The power ON time has exceeded the threshold value.	<input type="radio"/>	<input type="radio"/>
Warning zone *4	Light is blocked in the warning zone.	<input type="radio"/>	<input type="radio"/>
Test input ON	The test input went ON.	<input type="radio"/>	<input type="radio"/>
Blanking light beam incident light	A fixed or floating light beam is receiving incident light.	<input type="radio"/>	<input type="radio"/>
Interlock	The F3SJ is in interlock status.	<input type="radio"/>	<input type="radio"/>
Muting error	The F3SJ is in muting error status.	<input type="radio"/>	<input type="radio"/>
Number of load switching operations exceeded	The number of load switching operations exceeded the threshold value.	<input type="radio"/>	<input type="radio"/>
Information trigger	An interlock, lockout, or muting error has occurred.	<input type="checkbox"/>	<input type="radio"/>
Individual linked sensor output (channel 1)	Channel 1 control output is ON when Units are linked in series.	<input type="radio"/> (Auxiliary output 1 only)	<input type="radio"/> (Auxiliary output 1 only)
Individual linked sensor output (channel 2)	Channel 2 control output is ON when Units are linked in series.	<input type="radio"/> (Auxiliary output 1 only)	<input type="radio"/> (Auxiliary output 1 only)
Individual linked sensor output (channel 3)	Channel 3 control output is ON when Units are linked in series.	<input type="radio"/> (Auxiliary output 1 only)	<input type="radio"/> (Auxiliary output 1 only)
Individual linked sensor output (channel 4)	Channel 4 control output is ON when Units are linked in series.	<input type="radio"/> (Auxiliary output 1 only)	<input type="radio"/> (Auxiliary output 1 only)

Note: When "specified light beam output" is allocated as the output operation mode for auxiliary output 1 or 2 or external indicator output 1 or 2, that mode cannot be allocated to the other output operations.

*1. A light blockage was detected even though the output is not turned OFF because the blockage occurred at a light beam subject to fixed blanking, floating blanking, or muting. Blockages are also not processed during overrides.

*2. The fixed blanking light beams or floating blanking light beams must be set.

*3. The specified light beam must be set.

*4. The warning zone light beams must be set.

Changing the Detection Distance

Change detection distance function

Summary

The F3SJ's detection distance can be shortened.

Example Application

The F3SJ's detection distance can be shortened to avoid affecting other photoelectric sensors.

When devices are installed close together, shortening the detection distance can reduce mutual interference.

Description of Function

The detection distance can be set to 0.5 m, 1 m, 2 m, 3 m, 5 m, or MAX (either 7 m or 9 m).

The most suitable detection distance can be set to match the installation distance.

Note: MAX represents the rated detection distance.

Monitoring Operation

Received Light Intensity Indicator

Summary

It is possible to read the F3SJ's received light intensity.

Example Application

Adjust the light beams while checking the F3SJ's received light intensity.

Description of Function

Indicates the F3SJ's received light intensity.

The F3SJ's received light intensity level can be checked with a setting tool.

Ambient Light Intensity Indicator

Summary

It is possible to read the intensity of the light received by the F3SJ from ambient sources, such as other photoelectric sensors.

Example Application

Display the ambient light level while taking steps to reduce light interference from sources such as photoelectric switches in the area and neighboring F3SJ Units.

Description of Function

Indicates the ambient light level at the F3SJ from other light sources such as photoelectric sensors.

This function can help identify the photoelectric sensors that are the source of the light interference and identify the light beams being affected by the ambient light.

Other Functions

The F3SJ is also equipped with the following functions.

Refer to the User's Manual for details on using these functions.

- Status indicators
- Error log
- Power ON time
- Number of load switching operations
- Safety distance calculation function
- Power cable length calculation function
- Rated response time check function

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