

Safety Light Curtain

F3SJ-A

High-functional ADVANCED type supports finger protection and special applications.

- Detection capability supports finger protection.
- Equipped with wide variety of functions such as partial muting and blanking functions.
- The system status can be checked with PC tool.



Ordering Information

Main Units

Safety Light Curtain

| Application | Detection capability | Beam gap | Operating range | Protective height (mm) | Model | |
|--|----------------------|----------|-----------------|------------------------|---------------------|---------------|
| | | | | | PNP output | NPN output |
| Finger protection | Dia. 14 mm | 9 mm | 0.2 to 9 m | 245 to 1,271 | F3SJ-A□□□□P14 *2 | F3SJ-A□□□□N14 |
| Hand protection | Dia. 20 mm | 15 mm | 0.2 to 9 m | 245 to 1,505 | F3SJ-A□□□□P20 *2 | F3SJ-A□□□□N20 |
| Hand/arm protection | Dia. 30 mm | 25 mm | 0.2 to 9 m | 245 to 1,620 | F3SJ-A□□□□P30 *1 | F3SJ-A□□□□N30 |
| | | | 0.2 to 7 m | 1,745 to 2,495 | | |
| Leg/body protection, presence detection | Dia. 55 mm | 50 mm | 0.2 to 9 m | 270 to 1,570 | F3SJ-A□□□□P55 *1 | F3SJ-A□□□□N55 |
| | | | 0.2 to 7 m | 1,670 to 2,470 | | |

Note: Connection cables are not included in the products. You must purchase optional connector cable.

*1. Models with S-mark certification have an "-S" at the end of the model number.

Example: F3SJ-A0245P30-S

*2. The F3SJ-A-□□□□-TS series with the suffix "-TS" are auto reset fixed models. Function settings using the setting console F39-MC21 or PC tool F39-GWUM for F3SJ cannot be performed.

(Models with detection capability 25 mm dia. are also available.)

Safety Light Curtain Model List

F3SJ-A14 Series (9 mm gap)

| Model | | Number of Beams | Protective Height (mm) * |
|---------------|---------------|-----------------|--------------------------|
| PNP Output | NPN Output | | |
| F3SJ-A0245P14 | F3SJ-A0245N14 | 26 | 245 |
| F3SJ-A0263P14 | F3SJ-A0263N14 | 28 | 263 |
| F3SJ-A0299P14 | F3SJ-A0299N14 | 32 | 299 |
| F3SJ-A0317P14 | F3SJ-A0317N14 | 34 | 317 |
| F3SJ-A0389P14 | F3SJ-A0389N14 | 42 | 389 |
| F3SJ-A0461P14 | F3SJ-A0461N14 | 50 | 461 |
| F3SJ-A0551P14 | F3SJ-A0551N14 | 60 | 551 |
| F3SJ-A0623P14 | F3SJ-A0623N14 | 68 | 623 |
| F3SJ-A0695P14 | F3SJ-A0695N14 | 76 | 695 |
| F3SJ-A0731P14 | F3SJ-A0731N14 | 80 | 731 |
| F3SJ-A0803P14 | F3SJ-A0803N14 | 88 | 803 |
| F3SJ-A0875P14 | F3SJ-A0875N14 | 96 | 875 |
| F3SJ-A0983P14 | F3SJ-A0983N14 | 108 | 983 |
| F3SJ-A1055P14 | F3SJ-A1055N14 | 116 | 1,055 |
| F3SJ-A1127P14 | F3SJ-A1127N14 | 124 | 1,127 |
| F3SJ-A1199P14 | F3SJ-A1199N14 | 132 | 1,199 |
| F3SJ-A1271P14 | F3SJ-A1271N14 | 140 | 1,271 |

* Protective Height (mm) = Total sensor length

F3SJ-A20 Series (15 mm gap)

| Model | | Number of Beams | Protective Height (mm) * |
|---------------|---------------|-----------------|--------------------------|
| PNP Output | NPN Output | | |
| F3SJ-A0245P20 | F3SJ-A0245N20 | 16 | 245 |
| F3SJ-A0275P20 | F3SJ-A0275N20 | 18 | 275 |
| F3SJ-A0305P20 | F3SJ-A0305N20 | 20 | 305 |
| F3SJ-A0395P20 | F3SJ-A0395N20 | 26 | 395 |
| F3SJ-A0455P20 | F3SJ-A0455N20 | 30 | 455 |
| F3SJ-A0545P20 | F3SJ-A0545N20 | 36 | 545 |
| F3SJ-A0605P20 | F3SJ-A0605N20 | 40 | 605 |
| F3SJ-A0635P20 | F3SJ-A0635N20 | 42 | 635 |
| F3SJ-A0695P20 | F3SJ-A0695N20 | 46 | 695 |
| F3SJ-A0785P20 | F3SJ-A0785N20 | 52 | 785 |
| F3SJ-A0815P20 | F3SJ-A0815N20 | 54 | 815 |
| F3SJ-A0875P20 | F3SJ-A0875N20 | 58 | 875 |
| F3SJ-A0935P20 | F3SJ-A0935N20 | 62 | 935 |
| F3SJ-A1025P20 | F3SJ-A1025N20 | 68 | 1,025 |
| F3SJ-A1115P20 | F3SJ-A1115N20 | 74 | 1,115 |
| F3SJ-A1205P20 | F3SJ-A1205N20 | 80 | 1,205 |
| F3SJ-A1265P20 | F3SJ-A1265N20 | 84 | 1,265 |
| F3SJ-A1445P20 | F3SJ-A1445N20 | 96 | 1,445 |
| F3SJ-A1505P20 | F3SJ-A1505N20 | 100 | 1,505 |

* Protective Height (mm) = Total sensor length

F3SJ-A30 Series (25 mm gap)

| Model | | Number of Beams | Protective Height (mm) * |
|---------------|---------------|-----------------|--------------------------|
| PNP Output | NPN Output | | |
| F3SJ-A0245P30 | F3SJ-A0245N30 | 10 | 245 |
| F3SJ-A0295P30 | F3SJ-A0295N30 | 12 | 295 |
| F3SJ-A0395P30 | F3SJ-A0395N30 | 16 | 395 |
| F3SJ-A0470P30 | F3SJ-A0470N30 | 19 | 470 |
| F3SJ-A0520P30 | F3SJ-A0520N30 | 21 | 520 |
| F3SJ-A0545P30 | F3SJ-A0545N30 | 22 | 545 |
| F3SJ-A0570P30 | F3SJ-A0570N30 | 23 | 570 |
| F3SJ-A0620P30 | F3SJ-A0620N30 | 25 | 620 |
| F3SJ-A0720P30 | F3SJ-A0720N30 | 29 | 720 |
| F3SJ-A0795P30 | F3SJ-A0795N30 | 32 | 795 |
| F3SJ-A0870P30 | F3SJ-A0870N30 | 35 | 870 |
| F3SJ-A0920P30 | F3SJ-A0920N30 | 37 | 920 |
| F3SJ-A0945P30 | F3SJ-A0945N30 | 38 | 945 |
| F3SJ-A0995P30 | F3SJ-A0995N30 | 40 | 995 |
| F3SJ-A1020P30 | F3SJ-A1020N30 | 41 | 1,020 |
| F3SJ-A1095P30 | F3SJ-A1095N30 | 44 | 1,095 |
| F3SJ-A1120P30 | F3SJ-A1120N30 | 45 | 1,120 |
| F3SJ-A1195P30 | F3SJ-A1195N30 | 48 | 1,195 |
| F3SJ-A1270P30 | F3SJ-A1270N30 | 51 | 1,270 |
| F3SJ-A1395P30 | F3SJ-A1395N30 | 56 | 1,395 |
| F3SJ-A1620P30 | F3SJ-A1620N30 | 65 | 1,620 |
| F3SJ-A1745P30 | F3SJ-A1745N30 | 70 | 1,745 |
| F3SJ-A1870P30 | F3SJ-A1870N30 | 75 | 1,870 |
| F3SJ-A1995P30 | F3SJ-A1995N30 | 80 | 1,995 |
| F3SJ-A2245P30 | F3SJ-A2245N30 | 90 | 2,245 |
| F3SJ-A2370P30 | F3SJ-A2370N30 | 95 | 2,370 |
| F3SJ-A2495P30 | F3SJ-A2495N30 | 100 | 2,495 |

* Protective Height (mm) = Total sensor length

F3SJ-A55 Series (50 mm gap)

| Model | | Number 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-A0470P55 | F3SJ-A0470N55 | 10 | 470 |
| F3SJ-A0570P55 | F3SJ-A0570N55 | 12 | 570 |
| F3SJ-A0620P55 | F3SJ-A0620N55 | 13 | 620 |
| F3SJ-A0720P55 | F3SJ-A0720N55 | 15 | 720 |
| F3SJ-A0770P55 | F3SJ-A0770N55 | 16 | 770 |
| F3SJ-A0870P55 | F3SJ-A0870N55 | 18 | 870 |
| F3SJ-A0920P55 | F3SJ-A0920N55 | 19 | 920 |
| F3SJ-A0970P55 | F3SJ-A0970N55 | 20 | 970 |
| F3SJ-A1020P55 | F3SJ-A1020N55 | 21 | 1,020 |
| F3SJ-A1120P55 | F3SJ-A1120N55 | 23 | 1,120 |
| F3SJ-A1170P55 | F3SJ-A1170N55 | 24 | 1,170 |
| F3SJ-A1270P55 | F3SJ-A1270N55 | 26 | 1,270 |
| F3SJ-A1320P55 | F3SJ-A1320N55 | 27 | 1,320 |
| F3SJ-A1420P55 | F3SJ-A1420N55 | 29 | 1,420 |
| F3SJ-A1570P55 | F3SJ-A1570N55 | 32 | 1,570 |
| F3SJ-A1770P55 | F3SJ-A1770N55 | 36 | 1,770 |
| F3SJ-A1920P55 | F3SJ-A1920N55 | 39 | 1,920 |
| F3SJ-A2070P55 | F3SJ-A2070N55 | 42 | 2,070 |
| F3SJ-A2220P55 | F3SJ-A2220N55 | 45 | 2,220 |
| F3SJ-A2370P55 | F3SJ-A2370N55 | 48 | 2,370 |
| F3SJ-A2470P55 | F3SJ-A2470N55 | 50 | 2,470 |

* Protective Height (mm) = Total sensor length

Accessories (Sold separately)

Single-Ended Cable (2 cables per set, one for emitter and one for receiver) *

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

| Appearance | Cable length | Specifications | Model |
|---|--------------|-----------------------|-----------|
|  | 3 m | M12 connector (8-pin) | F39-JD3A |
| | 7 m | | F39-JD7A |
| | 10 m | | F39-JD10A |
| | 15 m | | F39-JD15A |
| | 20 m | | F39-JD20A |

* The cable for emitter and the cable for receiver are available separately. Add '-L' for emitter or '-D' for receiver to the end of the model number when you order.
Single-Ended Cable for Emitter: F39-JD□A-L, Single-Ended Cable for Receiver: F39-JD□A-D

Note: To extend the cable length to 20 m or more, add the F39-JD□B Double-Ended Cable.

Example: When using a cable of 30 m, connect the F39-JD10A Single-Ended Cable with the F39-JD20B Double-Ended Cable.

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

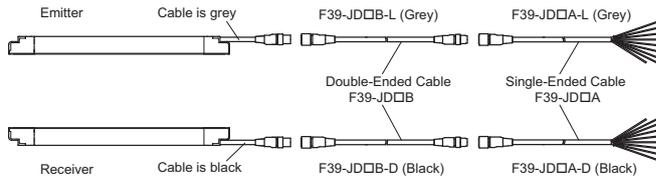
Control unit for connection with F3SP-B1P, to extend the length under series connection (*)

| Appearance | Cable length | Specifications | Model |
|---|--------------|-----------------------|-----------|
|  | 0.5 m | M12 connector (8-pin) | F39-JDR5B |
| | 1 m | | F39-JD1B |
| | 3 m | | F39-JD3B |
| | 5 m | | F39-JD5B |
| | 7 m | | F39-JD7B |
| | 10 m | | F39-JD10B |
| | 15 m | | F39-JD15B |
| | 20 m | | F39-JD20B |

* The cable for emitter and the cable for receiver are available separately. Add '-L' for emitter or '-D' for receiver to the end of the model number when you order.
Double-Ended Cable for Emitter: F39-JD□B-L, Double-Ended Cable for Receiver: F39-JD□B-D

Note: To extend the cable length to 20 m or more, use the Double-Ended Cables in combination.

Example: When using a cable of 30 m, connect the F39-JD10B Double-Ended Cable with the F39-JD20B Double-Ended Cable.



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

| Appearance | Cable Length | Model |
|---|--------------|-----------|
|  | 0.3 m | F39-JJR3K |

Note: This product is for F3SJ-A only.

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 *1 | For series connection *2 When using the Water-resistant Case. *3 |
| Side-by-side Series connection cable |  | 0.06 m | F39-JJR06L *1 | Dedicated cable to materialize series connection with minimum length without connector cable of the main sensor unit |
| | | 0.15 m | F39-JJR15L *1 | |

*1. This product is for F3SJ-A only.

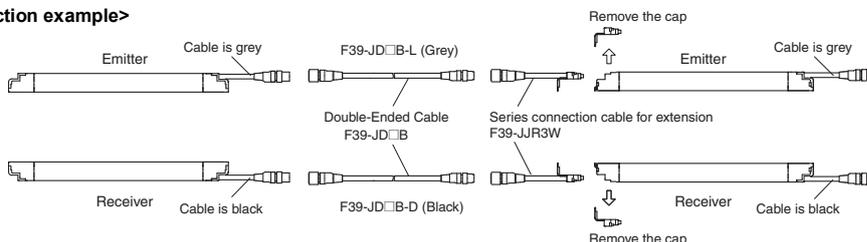
*2. For series connection with minimum length, use F39-JJR06L or F39-JJR15L.

*3. 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 8 for details.

Note: The Double-Ended Cable (up to 15 m: F39-JD15B) can be added to extend the cable length between the series-connected sensors.

Cable length between sensors: 15 m max. (not including series connection cable (F39-JJR3W or F39-JJR□L) and power cable)

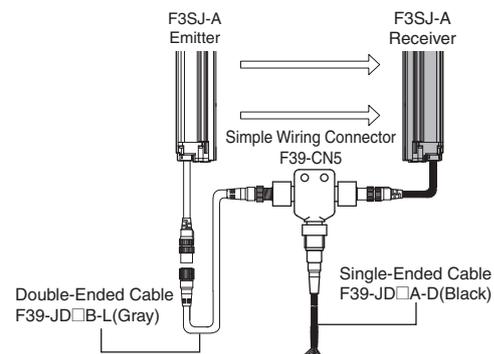
<Connection example>



Simple wiring connector system (Order the F39-CN5 and Cables for Simple Wiring.)

Simple wiring connector

| Appearance | Model | Application |
|---|---------|------------------|
|  | F39-CN5 | To reduce wiring |



Cable for simple wiring * (2 cables per set, one double-ended cable and one single-ended cable)

| Appearance | Contents | | Cable length | Model |
|--|--------------------|-------------|--------------|--------------|
|  | Double-Ended Cable | F39-JD3B-L | 3 m | F39-JD0303BA |
| | Single-Ended Cable | F39-JD3A-D | 3 m | |
| | Double-Ended Cable | F39-JD3B-L | 3 m | F39-JD0307BA |
| | Single-Ended Cable | F39-JD7A-D | 7 m | |
| | Double-Ended Cable | F39-JD3B-L | 3 m | F39-JD0310BA |
| | Single-Ended Cable | F39-JD10A-D | 10 m | |
| | Double-Ended Cable | F39-JD5B-L | 5 m | F39-JD0503BA |
| | Single-Ended Cable | F39-JD3A-D | 3 m | |
| | Double-Ended Cable | F39-JD5B-L | 5 m | F39-JD0507BA |
| | Single-Ended Cable | F39-JD7A-D | 7 m | |
| | Double-Ended Cable | F39-JD5B-L | 5 m | F39-JD0510BA |
| | Single-Ended Cable | F39-JD10A-D | 10 m | |
| | Double-Ended Cable | F39-JD10B-L | 10 m | F39-JD1003BA |
| | Single-Ended Cable | F39-JD3A-D | 3 m | |
| | Double-Ended Cable | F39-JD10B-L | 10 m | F39-JD1007BA |
| | Single-Ended Cable | F39-JD7A-D | 7 m | |
| | Double-Ended Cable | F39-JD10B-L | 10 m | F39-JD1010BA |
| | Single-Ended Cable | F39-JD10A-D | 10 m | |

Note: A double-ended cable and single-ended cable with other cable lengths than those listed above can also be used in combination. Please contact your OMRON sales representative for details.

* Although the double-ended cable for the emitter is used for the emitter in the above figure, it can also be used for the receiver.

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Relays with Forcibly Guided Contacts

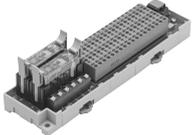
| Type | Appearance | Specifications | Model | Remarks |
|--|---|---|-------------------|---|
| G7SA Relays with Forcibly Guided Contacts |  | <ul style="list-style-type: none"> Nodes: 4 Contact type: 2A2B Rated switch load: 250 VAC 6 A, 30 VDC 6 A | G7SA-2A2B | For details on other models or socket models, refer to the OMRON's website. |
| | | <ul style="list-style-type: none"> Nodes: 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"> Nodes: 6 Contact type: 4NO+2NC Rated switch load: 250 VAC 10 A, 30 VDC 10 A | G7S-4A2B-E | For details on other models or socket models, refer to the OMRON's website. |
| | | <ul style="list-style-type: none"> Nodes: 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 a double-ended cable F39-JD□B. |

* F3SJ for NPN output type cannot be connected.

Wire-saving Devices

| Type | Appearance | Specifications | Model | Remarks |
|---|---|-------------------------------------|-------------------|--|
| Connector Terminal Box/ Muting Terminals |  | 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. For details, refer to the OMRON's website. |
| | | 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 |  | PNP output relay, SPDT-NO | F3SP-T01 * | Significantly reduces amount of wiring between Safety Light Curtains and Muting Sensors. For details, refer to the OMRON's website. |

* F3SJ for NPN output type cannot be connected.

Note: Orders for F39-TC5 Series and F3SP-T01 have been discontinued at the end of May 2020.

Laser Pointer

| Appearance | Output | 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) |

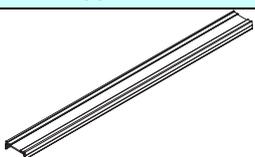
Note: 1. For indication timing (operation mode), see "Specifications" on page 9.
 2. This product is for F3SJ-A only.

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 * |

* This product is for F3SJ-A only.

Spatter Protection Cover (2 cables per set, one for emitter and one for receiver) (10% Operating Range Attenuation)

| Appearance | Model |
|--|----------------------------|
|  | F39-HJ□□□□ *1 *2 |

*1. This product is for F3SJ-A only.

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

Mirrors (12% Operating Range Attenuation)

| Appearance | Mirror material | Width (mm) | Thickness (mm) | Length L (mm) | Model | Remarks |
|---|-----------------|------------|----------------|---------------|--------------------|---|
|  | Glass mirror | 145 | 32 | 445 | F39-MLG0406 | 2 sets of cylinder mounting brackets and 4 screws are included. |
| | | | | 648 | F39-MLG0610 | |
| | | | | 749 | F39-MLG0711 | |
| | | | | 953 | F39-MLG0914 | |
| | | | | 1,105 | F39-MLG1067 | |
| | | | | 1,257 | F39-MLG1219 | |
| | | | | 1,499 | F39-MLG1422 | |
| | | | | 1,702 | F39-MLG1626 | |
| | | | | 1,905 | F39-MLG1830 | |
| | | | | 2,210 | F39-MLG2134 | |

Test rod (Sold separately)

| Diameter | Model |
|-----------|------------------|
| 14mm dia. | F39-TRD14 |
| 20mm dia. | F39-TRD20 |
| 25mm dia. | F39-TRD25 |
| 30mm dia. | F39-TRD30 |

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Sensor Mounting Brackets (Sold separately)

| Appearance | Specifications | Model | Application | Remarks |
|------------|---|------------|---|---|
| | Standard mounting bracket (for top/bottom) | F39-LJ1 | (provided with the F3SJ) | 2 for an emitter, 2 for a 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 an emitter, 2 for a 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. | Two brackets per set (For details about the number of required brackets, refer to page 89.) |
| | 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 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 an emitter, 2 for a 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 an emitter, 2 for a 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 an emitter, 2 for a 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 an emitter, 2 for a receiver, total of 4 per set |
| | Top/bottom 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 an emitter, 2 for a receiver, total of 4 per set |

End Cap

| Appearance | Model | Remarks |
|------------|---------|---|
| | F39-CN9 | For both emitter and receiver. * The End Cap can be purchased if lost. (Case: Black) |

* This product is for F3SJ-A only.

Key Cap for Muting

| Appearance | Model | Remarks |
|------------|---------|--|
| | F39-CN6 | A cap to be attached to the main unit to enable muting function. * Attach it to either an emitter or a receiver. (Case: orange) |

* This product is for F3SJ-A only.

Setting Tools *1

| Type | Appearance | Model | Remarks |
|--|---|-------------|---|
| "SD Manager" Setting Support Software for the F3SJ |  | F39-GWUM *2 | 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 *3 | 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. The PC tool supports Windows XP/7.
- *3. This product is for use only with the F3SJ-A. It cannot be connected to conventional models of the F3SJ-E/B or F3SN-A series.

Protective Bar *1 *2

| Type | Appearance | Model | Remarks |
|---|---|-----------------|---|
| Protective Bar |  | F39-PJ□□□□-S *3 | Main unit bracket (1), 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. This product is for F3SJ-A only.
- *2. When using for both emitter and receiver, order two sets.
- *3. 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 *3

| Appearance | Specifications | Model | Remarks |
|---|--|-----------------|--|
|  | For emitter | F39-EJ□□□□-L *4 | Includes gray cable for emitter. |
| | For receiver | F39-EJ□□□□-D *4 | Includes black cable for receiver. |
|  | Rear Mounting Brackets | F39-EJ-R *5 | Top/bottom 1 each, total of 2 |
|  | Side Mounting Brackets | F39-EJ-S *5 | 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. This product is for F3SJ-A only.
- *2. When using for both emitter and receiver, order two sets.
- *3. There are restrictions to the application conditions depending on the protective height of the Curtain. Refer to the *Water-resistant Case* on page 12.
- *4. 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.
- *5. Be sure to purchase brackets with the Case to match the mounting direction (rear or side).

F3SJ-A

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

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

| Model | PNP Output | F3SJ-A□□□□P14 | F3SJ-A□□□□P20 | F3SJ-A□□□□P30 | F3SJ-A□□□□P55 |
|---|---|---|--|----------------------------------|----------------------------|
| | NPN Output | F3SJ-A□□□□N14 | F3SJ-A□□□□N20 | F3SJ-A□□□□N30 | F3SJ-A□□□□N55 |
| Sensor type | Type 4 safety light curtain | | | | |
| Version | Ver. 2 | | | | |
| Setting tool connection | Connectable | | | | |
| Safety category | Safety purpose of category 4, 3, 2, 1, or B | | | | |
| Detection capability | Opaque objects 14 mm in diameter | Opaque objects 20 mm in diameter | Opaque objects 30 mm in diameter | Opaque objects 55 mm in diameter | |
| Beam gap (P) | 9 mm | 15 mm | 25 mm | 50 mm | |
| Number of beams (n) | 26 to 140 | 16 to 100 | 10 to 100 | 6 to 50 | |
| Protective height (PH) | 245 to 1,271 mm | 245 to 1,505 mm | 245 to 2,495 mm | 270 to 2,470 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 76.) | 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 1205: 10 ms to 15 ms max. 1235 or higher: 17.5 ms to 22.5 ms max. | 1 set: 10 ms to 17.5 ms max. | 1 set: 10 ms to 13 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 1205: 40 ms to 60 ms max. 1235 or higher: 70 ms to 90 ms max. | 1 set: 40 ms to 70 ms max. | 1 set: 40 ms to 52 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 | 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 | 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 IEC 61496-2. Within ±2.5° for both emitter and receiver when the detection distance is 3 m or over | | | | |
| Safety 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 Output | 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 2mA max. (This can be different from traditional logic (ON/OFF) because safety circuit is used.) | | | |
| Auxiliary output 1 (Non-safety output) | PNP outputs | 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. Function for Basic System.) | PNP outputs | 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 | Safety output 1, 2: ON when receiving light Auxiliary output 1: Inverse of safety output signals (Operation mode can be changed with the setting tool.) External indicator output 1: Inverse of safety output signals for a basic system (Operation mode can be changed with the setting tool.), ON when muting/override for a muting system (Operation mode can be changed with the setting tool.) | | | |
| | Emitter | Auxiliary output 2: Turns ON when the point of 30,000 operating hours is reached (Operation mode can be changed with the setting tool.) External indicator output 2: ON when lock-out for a basic system (Operation mode can be changed with the setting tool.) ON when muting/override for a muting system (Operation mode can be changed with the setting tool.) | | | |

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

| Model | PNP output | F3SJ-A□□□□P14 | F3SJ-A□□□□P20 | F3SJ-A□□□□P30 | F3SJ-A□□□□P55 |
|---|--|--|---------------|---------------|---------------|
| | NPN output | F3SJ-A□□□□N14 | F3SJ-A□□□□N20 | F3SJ-A□□□□N30 | F3SJ-A□□□□N55 |
| Input voltage | PNP output | Test input, Interlock select input, Reset input, Muting input: ON voltage: 9 V to Vs (short circuit current: approx. 2.0 mA), OFF voltage: 0 to 1.5 V, or open External device monitoring input: ON voltage: 9 V to Vs (short circuit current: approx. 3.5 mA), OFF voltage: open Note: The Vs indicates a voltage value in your environment. | | | |
| | NPN output | Test input, Interlock select input, Reset input, Muting input: ON voltage: 0 to 1.5 V (short-circuit current: approx. 1.5 mA), OFF voltage: 9 V to Vs, or open External device monitoring input: ON voltage: 0 to 1.5 V (short-circuit current: approx. 4.0 mA), OFF voltage: open Note: The Vs indicates a voltage value in your environment. | | | |
| Indicator | Emitter | Light intensity level indicators (green LED x 2, orange LED x 3): ON based on the light intensity Error mode indicators (red LED x 3): Blink to indicate error details Power indicator (green LED x 1): ON while power is on Interlock indicator (yellow LED x 1): ON while under interlock, blinks at lockout. External device monitoring indicator (muting input 1 indicator), Blanking/test indicator (muting input 2 indicator) (green LED x 2): ON/flash according to function | | | |
| | Receiver | Light intensity level indicators (green LED x 2, orange LED x 3): ON based on the light intensity Error mode indicators (red LED x 3): Blink to indicate error details OFF output indicator (red LED x 1): ON when safety output is OFF, blinks at lockout. ON output indicator (green LED x 1): ON while safety output is ON Muting error indicator, Blanking /test indicator (green LED x 2): ON/flash according to function | | | |
| Mutual interference prevention function | Interference light prevention algorithm, sensing distance change function | | | | |
| Series connection | Time division emission by series connection • Number of connections: up to 4 sets (F3SJ-A only) F3SJ-E, F3SJ-B and F3SJ-TS cannot be connected. • Total number of beams: up to 400 beams • Cable length between sensors: 15 m max. (not including series connection cable (F39-JJR3W or F39-JJR□L) and power cable) • Response time under connection: Refer to page 76 | | | | |
| Test function | • Self test (at power-ON and at power distribution) • External test (emission stop function by test input) | | | | |
| Safety-related functions | • 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) | | | | |
| Connection method | Connector method (M12, 8-pin) | | | | |
| Protection circuit | 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% | | | | |
| Operating ambient light intensity | Incandescent lamp: receiving-surface light intensity of 3,000 lx max., Sunlight: receiving-surface light intensity of 10,000 lx max. | | | | |
| Insulation resistance | 20 MΩ min. (at 500 VDC) | | | | |
| Withstand voltage | 1,000 VAC 50/60 Hz, 1 min | | | | |
| Degree of protection | IP65 (IEC 60529) | | | | |
| Vibration resistance | Malfunction: 10 to 55 Hz, Multiple amplitude of 0.7 mm, 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 | | | | |
| Material | Casing (including metal parts on both ends): Aluminum, zinc die-cast Cap: ABS resin, Optical cover: PMMA resin (acrylic), Cable: Oil resistant PVC | | | | |
| Net Weight *1 | Calculate using the following expressions: (1) For F3SJ-A□□□□□14, weight (g) = (protective height) x 1.67 + 215 (2) For F3SJ-A□□□□□20, weight (g) = (protective height) x 1.5 + 217 (3) For F3SJ-A□□□□□30, weight (g) = (protective height) x 1.41 + 220 (4) For F3SJ-A□□□□□55, weight (g) = (protective height) x 1.3 + 220 | | | | |
| Gross Weight *1 | Calculate using the following expressions: (1) For F3SJ-A□□□□□14, weight (g) = (protective height) x 1.7 + α (2) For F3SJ-A□□□□□20/F3SJ-A□□□□□30, weight (g) = (protective height) x 1.5 + α (3) For F3SJ-A□□□□□55, weight (g) = (protective height) x 1.4 + α The values for α are as follows: Protected height 245 to 596 mm: = 1,100 protected height 1,660 to 2,180 mm: = 2,400 Protected height 600 to 1,130 mm: = 1,500 protected height 2,195 to 2,500 mm: = 2,600 Protected height 1,136 to 1,658 mm: = 2,000 | | | | |

*1. The net weight is the weight of an emitter and a receiver.

*2. The gross weight is the weight of an emitter, a receiver, included accessories and a package.

F3SJ-A

| Model | PNP output | F3SJ-A□□□□P14 | F3SJ-A□□□□P20 | F3SJ-A□□□□P30 | F3SJ-A□□□□P55 |
|-------------------------------|--|---------------|---------------|---------------|---------------|
| | NPN output | F3SJ-A□□□□N14 | F3SJ-A□□□□N20 | F3SJ-A□□□□N30 | F3SJ-A□□□□N55 |
| Accessories | Instruction manual, standard mounting bracket (F39-LJ1 bracket for top/bottom mounting), mounting brackets (intermediate) (*), error mode label, Quick Installation Manual (QIM) *. Number of intermediate 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 * | IEC 61496-1, EN 61496-1, UL 61496-1, Type 4 ESPE (Electro-Sensitive Protective Equipment) IEC 61496-2, EN 61496-2, UL 61496-2, Type 4 AOPD (Active Opto-electronic Protective Devices) IEC 61508-1 to -3, EN 61508-1 to -3 SIL3 ISO 13849-1: 2015, EN ISO 13849-1: 2015 (PLe/Safety Category 4) UL 508, UL 1998, CAN/CSA C22.2 No.14, CAN/CSA C22.2 No.0.8 | | | | |

* Refer to Safety Precautions for information about Legislation and Standards.

Response Time

| Model | Protected Height (mm) | Number of Beams | Response time ms (ON to OFF) | Response time ms (OFF to ON) |
|-------------------------|-----------------------|-----------------|------------------------------|------------------------------|
| F3SJ-A□14 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 |
| F3SJ-A□20 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 1,505 | 82 to 100 | 17.5 | 70 |
| 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 1,420 | 17 to 29 | 11 | 44 |
| | 1,470 to 2,070 | 30 to 42 | 12 | 48 |
| | 2,120 to 2,470 | 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.

* The F39-A01P□-PAC Dedicated External Indicator Set uses LEDs. Refer to the cable extension lengths for "Not using incandescent lamp".

Accessories

Control Unit

| Item | Model | F3SP-B1P |
|-----------------------|--------------------|---|
| Applicable sensor | | F3SJ-B/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 (cos φ = 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 Series |
| Power supply voltage | | 4.65 or 4.5 VDC |
| Battery | | 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) |
| Material | | 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), instruction manual |

* Battery life varies depending on a battery used.

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 details | | Indicator (red), Dedicated connector cable (0.1 m), Dedicated mounting bracket (1 for each) | Indicator (green), Dedicated connector cable (0.1 m), Dedicated mounting bracket (1 for each) | Indicator (yellow), Dedicated connector cable (0.1 m), Dedicated mounting bracket (1 for each) |

Water-resistant Case

| Item | Model | F39-EJ□□□□-L, F39-EJ□□□□-D |
|-----------------------|-------|---|
| Applicable sensor | | F3SJ-A Series Curtains with a protective height of 600 mm or shorter. |
| Ambient temperature | | -10 to 55°C (operation and storage) |
| Mounting direction | | No restrictions |
| 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 (IEC 60529) (When assembled according to the application precautions) |
| Material | | 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. Operating range
When using these cases, the operating range of the applicable sensor is reduced. Check the specifications prior to use.

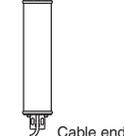
3. Mounting direction
When using Curtains with a protective height of 605 mm or more, some slackness occurs due to the weight of the Curtain. For this reason, mount these Curtains only in the vertical direction.

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

Horizontal direction
Terminating end Cable end



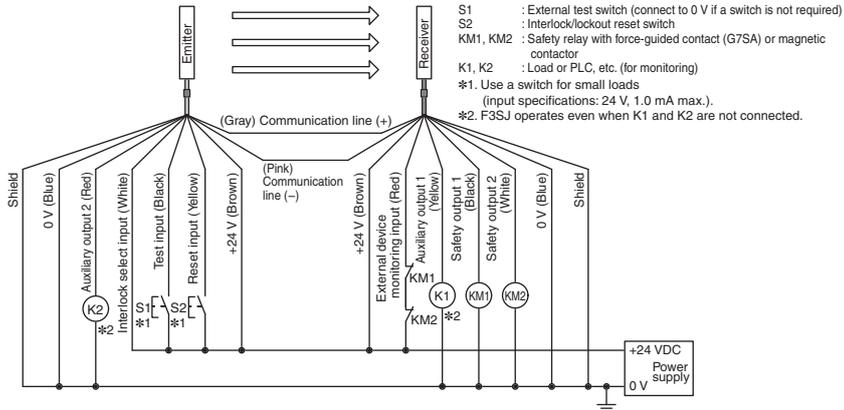
Vertical direction
Terminating end



Basic Wiring Diagram

[PNP Output]

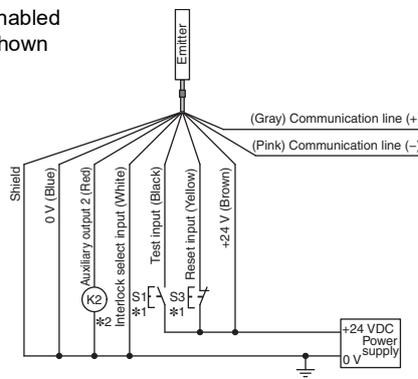
Wiring when using manual reset mode, external device monitoring



Wiring for auto reset mode

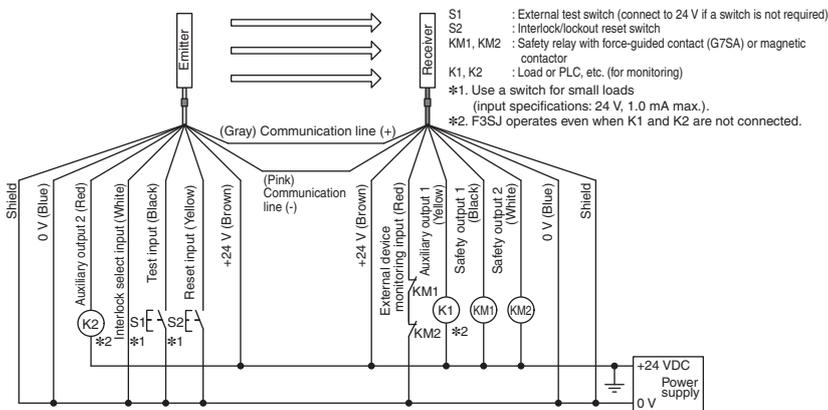
- The auto reset mode will be enabled when the emitter is wired as shown below.

- S1 : External test switch
(connect to 0 V if a switch is not required)
- S3 : Lockout reset switch
(connect to 24 V if a switch is not required)
- K2 : Load or PLC, etc. (for monitoring)
- *1. Use a switch for small loads
(input specifications: 24 V, 1.0 mA max.).
- *2. F3SJ operates even when K2 is not connected.



[NPN Output]

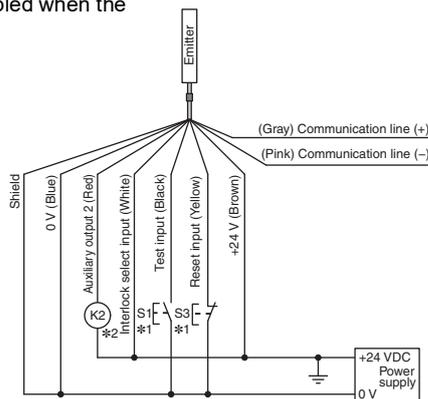
Wiring when using manual reset mode, external device monitoring



Wiring for auto reset mode

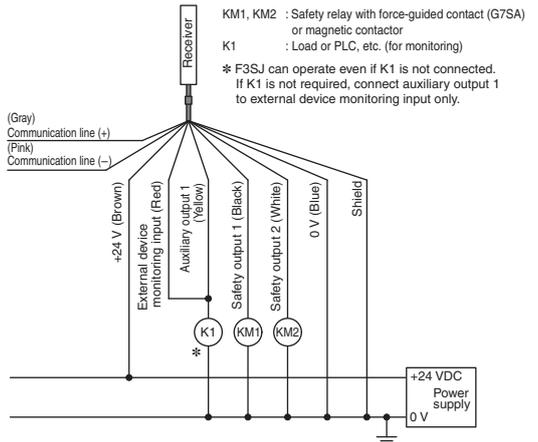
- The auto reset mode will be enabled when the emitter is wired as shown below.

- S1 : External test switch
(connect to 24 V if a switch is not required)
- S3 : Lockout reset switch
(connect to 0 V if a switch is not required)
- K2 : Load or PLC, etc. (for monitoring)
- *1. Use a switch for small loads
(input specifications: 24 V, 1.0 mA max.).
- *2. F3SJ operates even when K2 is not connected.



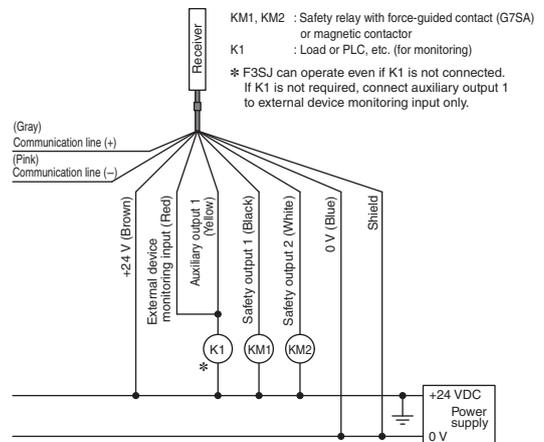
Wiring when the external device monitoring function will not be used

- 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 "Safety Output Information," and reverse output mode 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.



Wiring when the external device monitoring function will not be used

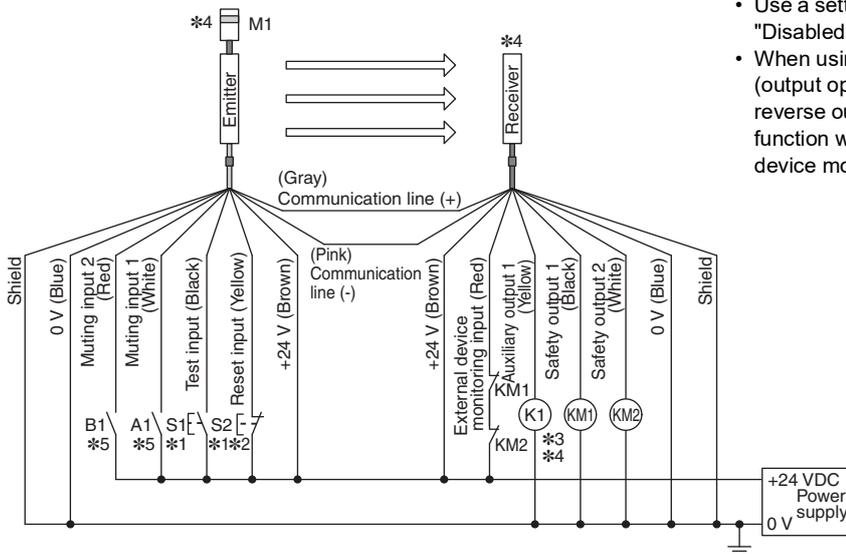
- Use a setting tool to set the external device monitoring function to "Disabled."
- When using an auxiliary output 1 that has not been changed (output operation mode is "Safety Output Information," and reverse output mode is "Enabled"), the external device monitoring function will be disabled when auxiliary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



Basic Wiring Diagram for Muting System

[PNP Output]

Wiring when using muting and external device monitoring functions



- S1 : External test switch (connect to 0 V if a switch is not required)
- S2 : Lockout reset switch (connect to 24 V if a switch is not required)
- A1 : Contact by muting sensor A1
- B1 : Contact by muting sensor B1
- KM1, KM2 : Safety relay with force-guided contact (G7SA) or magnetic contactor
- K1 : Load or PLC, etc. (for monitoring)
- M1 : Muting lamp

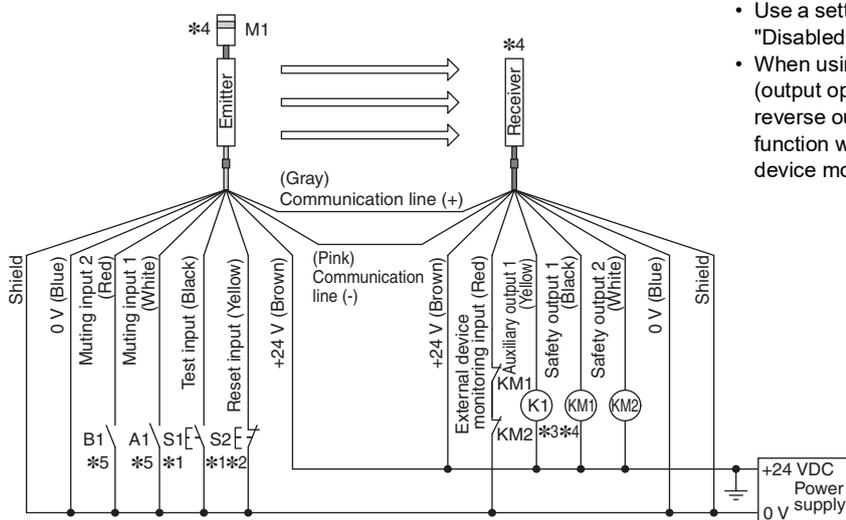
- *1. Use a switch for small loads (input specifications: 24 V, 1.0 mA max.).
- *2. When using the interlock function, this also functions as an interlock reset switch. (Must be set with a setting tool.)
- *3. F3SJ operates even when K1 is not connected.
- *4. Connect the muting lamp to either the external 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 type muting sensor cannot be used.

When external device monitoring function is not required

- 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 "Safety Output Information," and reverse output mode is "Enabled"), the external device monitoring function will be disabled when auxiliary output 1 and the external device monitoring input are connected.

[NPN Output]

Wiring when using muting and external device monitoring functions



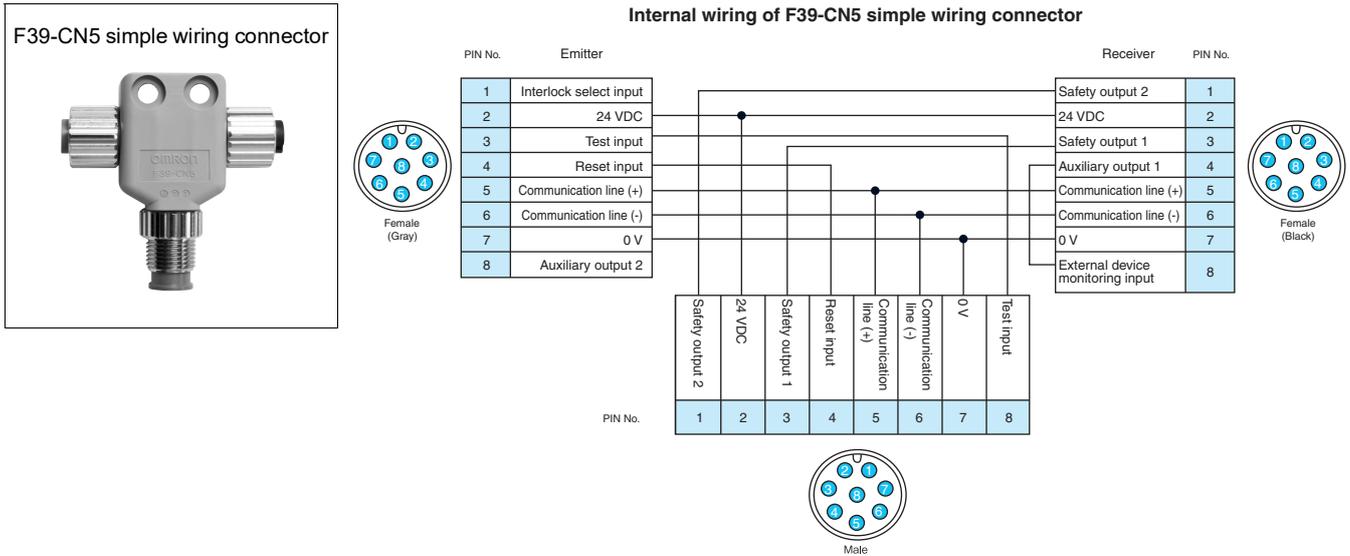
- S1 : External test switch (connect to 24 V if a switch is not required)
- S2 : Lockout reset switch (connect to 0 V if a switch is not required)
- A1 : Contact by muting sensor A1
- B1 : Contact by muting sensor B1
- KM1, KM2 : Safety relay with force-guided contact (G7SA) or magnetic contactor
- K1 : Load or PLC, etc. (for monitoring)
- M1 : Muting lamp

- *1. Use a switch for small loads (input specifications: 24 V, 1.0 mA max.).
- *2. When using the interlock function, this also functions as an interlock reset switch. (Must be set with a setting tool.)
- *3. F3SJ operates even when K1 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 type muting sensor cannot be used.

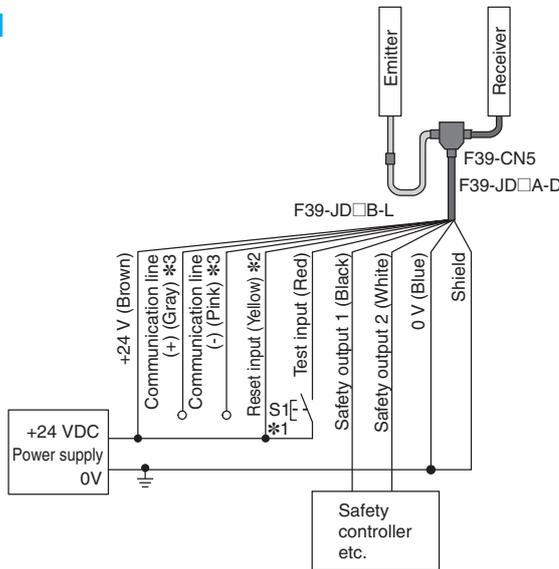
When external device monitoring function is not required

- 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 "Safety Output Information," and reverse output mode is "Enabled"), the external device monitoring function will be disabled when auxiliary output 1 and the external device monitoring input are connected.

Wiring Diagram When Using Simple Wiring System



[PNP Output]

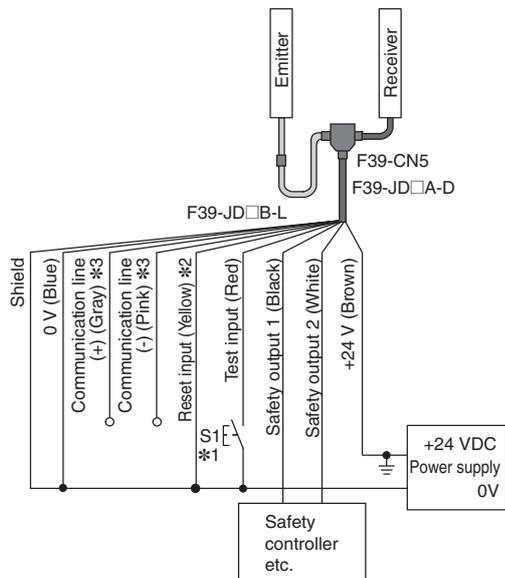


- S1 : External test switch (connect 0 V if a switch is not required)
- *1. Use a switch for small loads (input specifications: 24 V, 1.0 mA max.).
 - *2. When the lockout reset function is used, connect to 24 V via a lockout reset switch (N.C. contact).
 - *3. Make sure the Communication lines are insulated. If the lines are shorted, the F3SJ-A enters the lockout state.

Controllers connectable with PNP output F3SJ series

| Safety controller | Model |
|---------------------------|-------------|
| Safety Network Controller | NE1A series |
| Safety Controller | G9SP series |
| Flexible Safety Unit | G9SX series |
| Safety Relay Unit | G9SA series |

[NPN Output]



- S1 : External test switch (connect 24 V if a switch is not required)
- *1. Use a switch for small loads (input specifications: 24 V, 1.0 mA max.).
 - *2. When the lockout reset function is used, connect to 0 V via a lockout reset switch (N.C. contact).
 - *3. Make sure the Communication lines are insulated. If the lines are shorted, the F3SJ-A enters the lockout state.

Controller connectable with NPN output F3SJ series

| Safety controller | Model |
|-------------------|------------|
| Safety Relay Unit | G9SA-301-P |

Note: When using the Simple Wiring Connector (F39-CN5), the following functions are not available.

- Manual Reset
- External Device Monitoring
- Auxiliary Outputs 1, 2
- Muting/Override

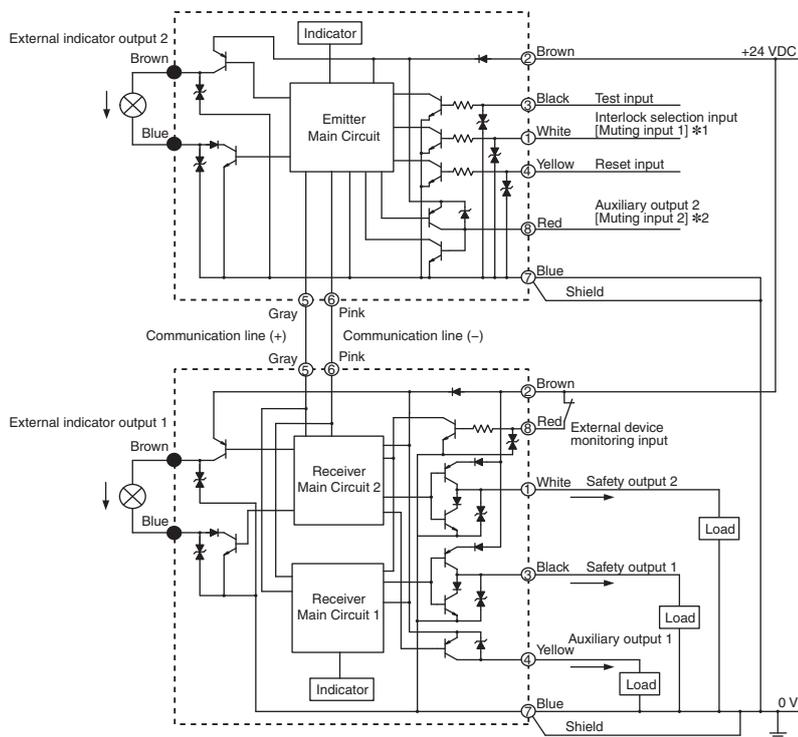
When using the setting tools, make sure to keep the settings in the factory default.

Input/Output Circuit Diagram

Entire Circuit Diagram

[PNP Output]

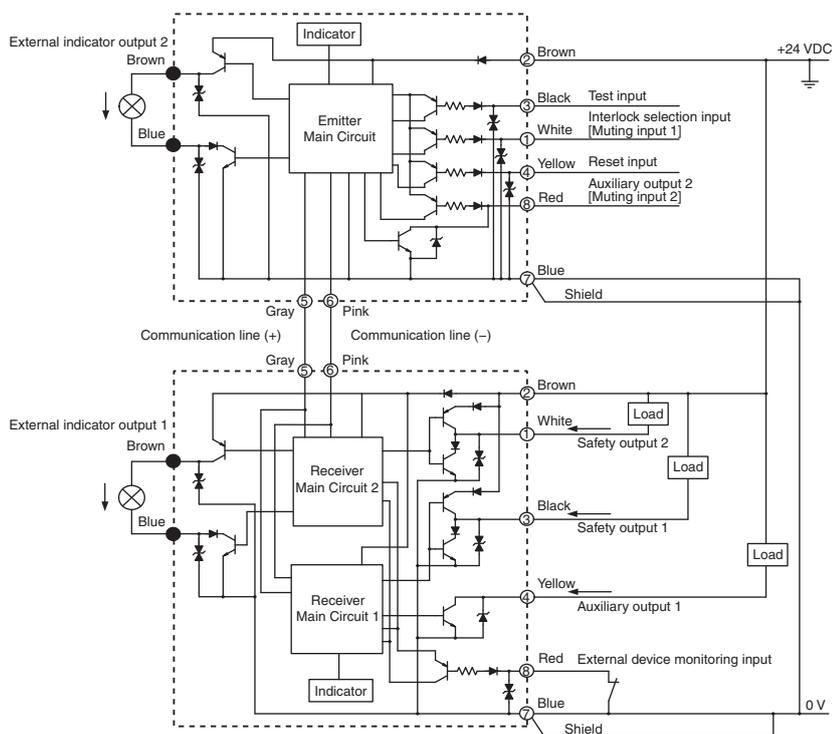
The numbers in circles indicate the connectors' pin numbers.
 The black circles indicate connectors for series connection.
 The words in brackets ([]) indicate the signal name for muting system.



- *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]

The numbers in circles indicate the connectors' pin numbers.
 The black circles indicate connectors for series connection.
 The words in brackets ([]) indicate the signal name for muting system.



F3SJ-A

Connection Circuit Examples

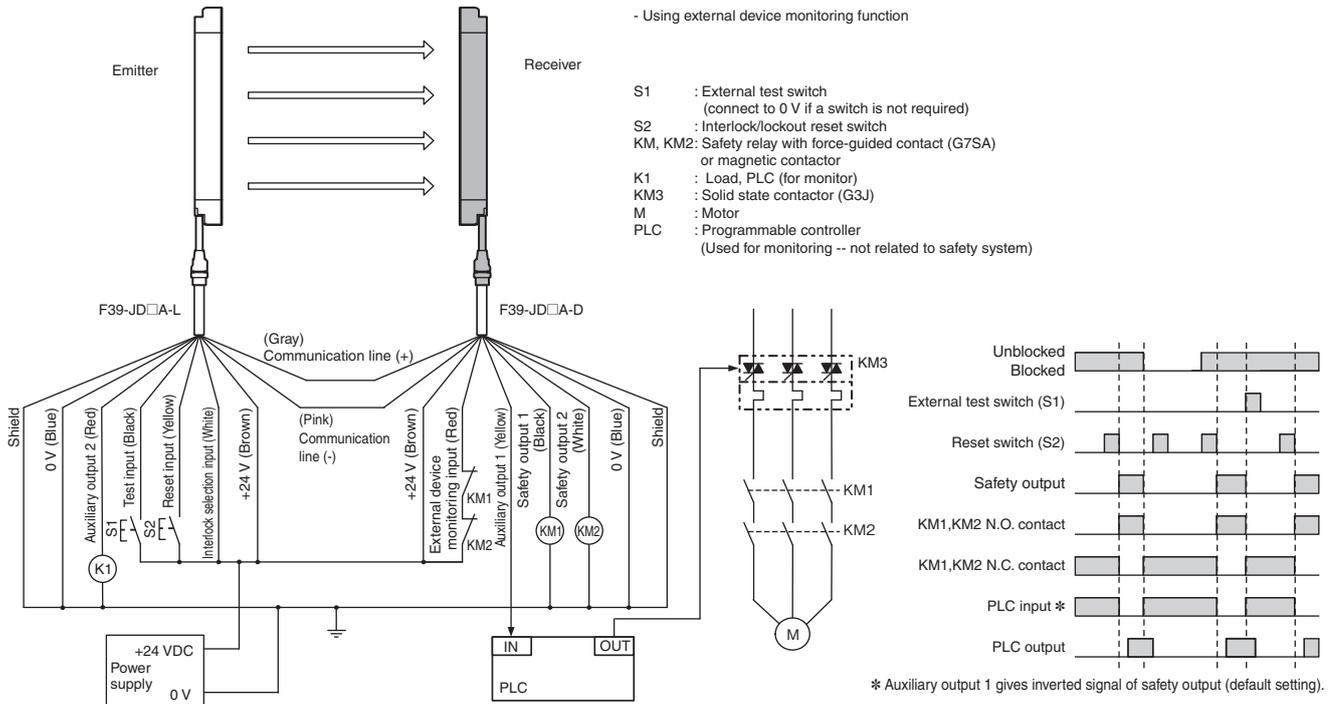
Wiring for single F3SJ-A application [PNP Output]

| Highest achievable PL/ safety category | Model | Stop category | Reset |
|--|--|---------------|--------|
| PLe/4 equivalent | Safety Light Curtain F3SJ-A□□□□P□□□ Safety Relay G7SA | 0 | Manual |

Note: The above PL is only the evaluation result of the example. The PL must be evaluated in an actual application by the customer after confirming the usage conditions.

● Application Overview

- The power supply to the motor M is turned OFF when the beam is blocked.
- The power supply to the motor M is kept OFF until the beams are unblocked and the reset switch S2 is pressed.



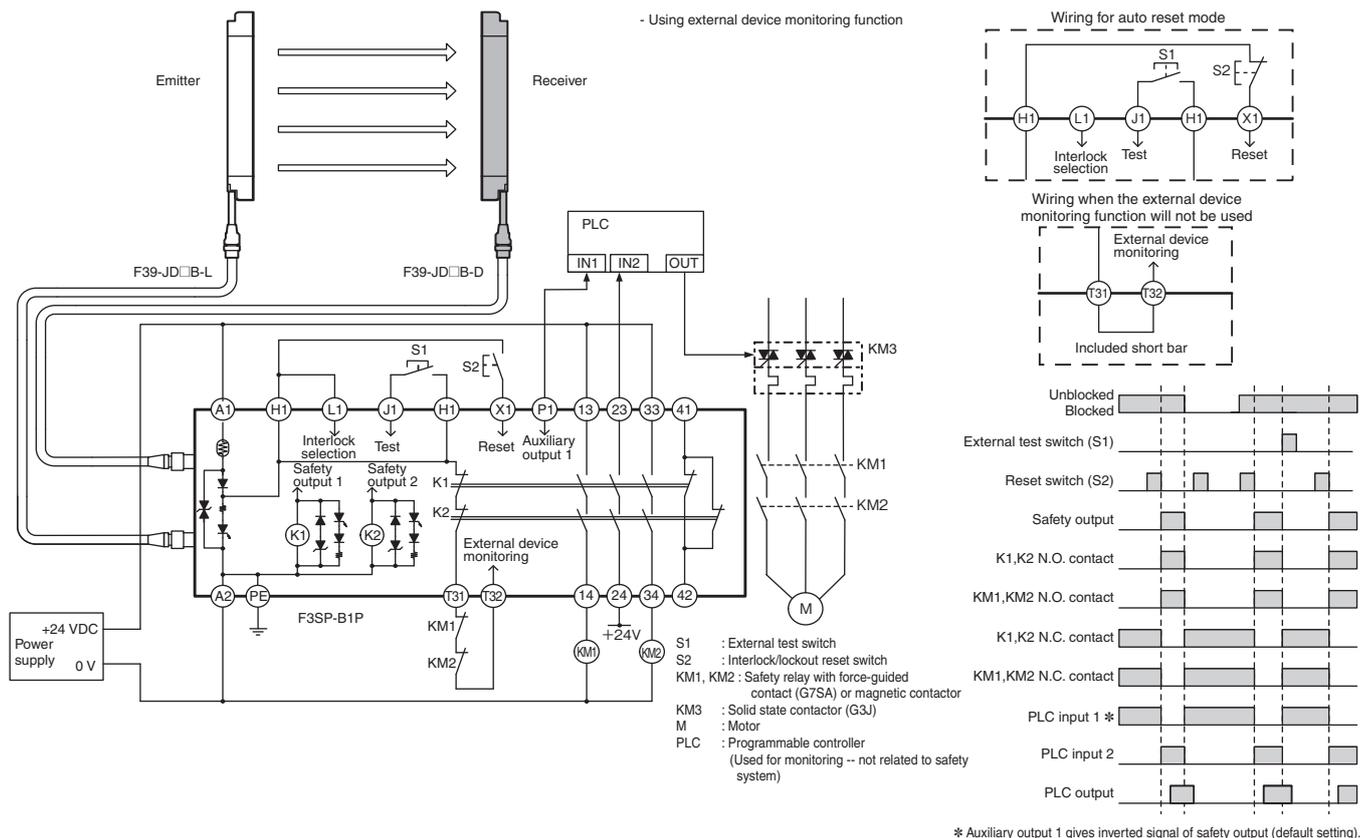
Wiring for connection with a controller F3SP-B1P [PNP Output]

| Highest achievable PL/ safety category | Model | Stop category | Reset |
|--|--|---------------|--------|
| PLe/4 equivalent | Safety Light Curtain F3SJ-A□□□□P□□ Control Unit F3SP-B1P Safety Relay G7SA | 0 | Manual |

Note: The above PL is only the evaluation result of the example. The PL must be evaluated in an actual application by the customer after confirming the usage conditions.

● Application Overview

- The power supply to the motor M is turned OFF when the beam is blocked.
- The power supply to the motor M is kept OFF until the beams are unblocked and the reset switch S2 is pressed.



Note: It cannot be used as a muting system when F3SP-B1P is used.

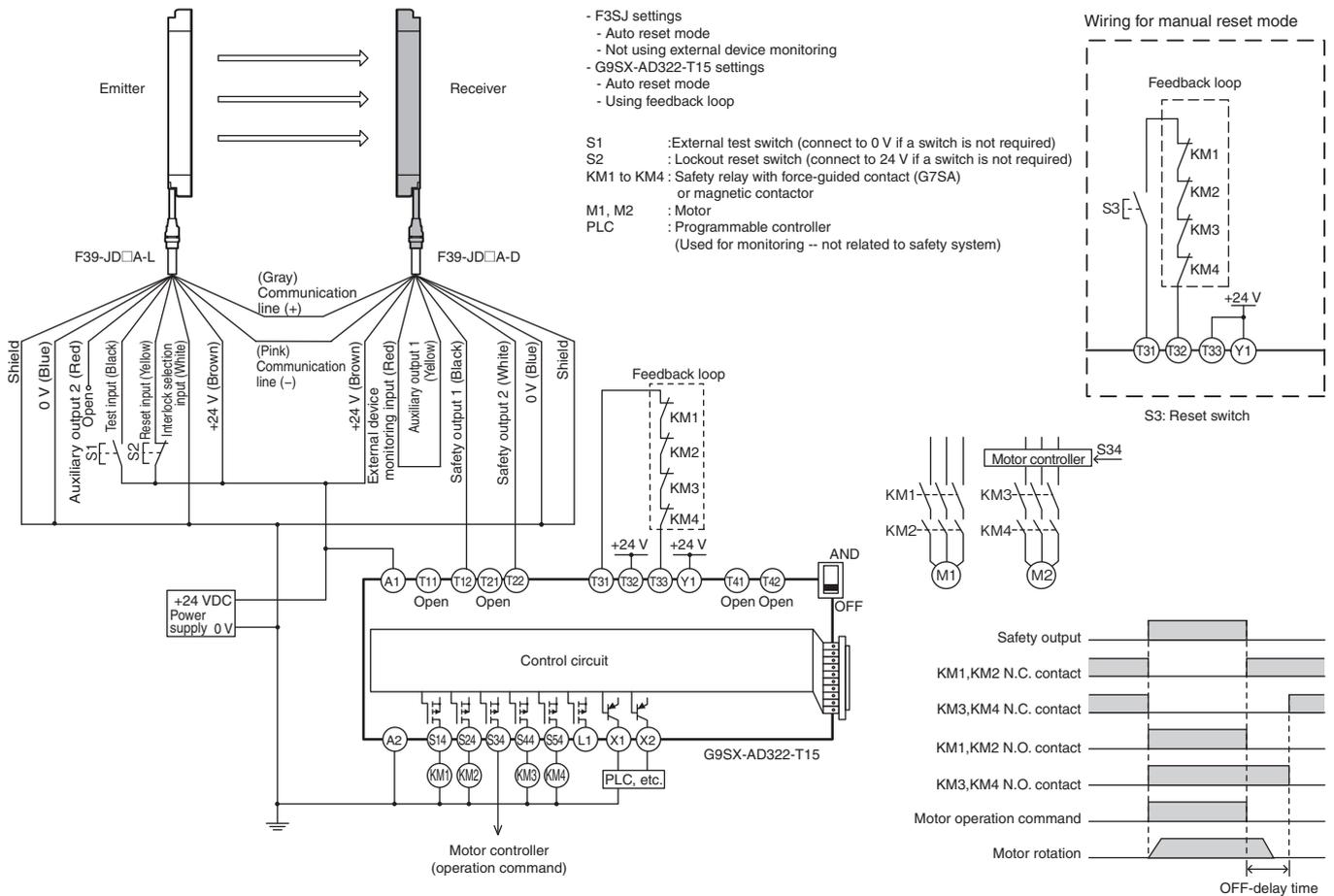
Wiring for connection with a controller G9SX-AD322-T15 [PNP Output]

| Highest achievable PL/ safety category | Model | Stop category | Reset |
|--|--|----------------|-------|
| PLe/4 equivalent | Safety Light Curtain F3SJ-A□□□□P□□ Flexible Safety Unit G9SX-AD322-T15 Safety Relay G7SA | M1: 0 M2: 1 | Auto |

Note: The above PL is only the evaluation result of the example. The PL must be evaluated in an actual application by the customer after confirming the usage conditions.

Application Overview

- The power supply to the motor M1 is turned OFF immediately when the beam is blocked, and stop command is sent to the motor controller for the motor M2.
- The power supply to the motor M2 is turned OFF after OFF-delay time.
- The power supply to the motor M1 and M2 is kept OFF until the beams are unblocked.



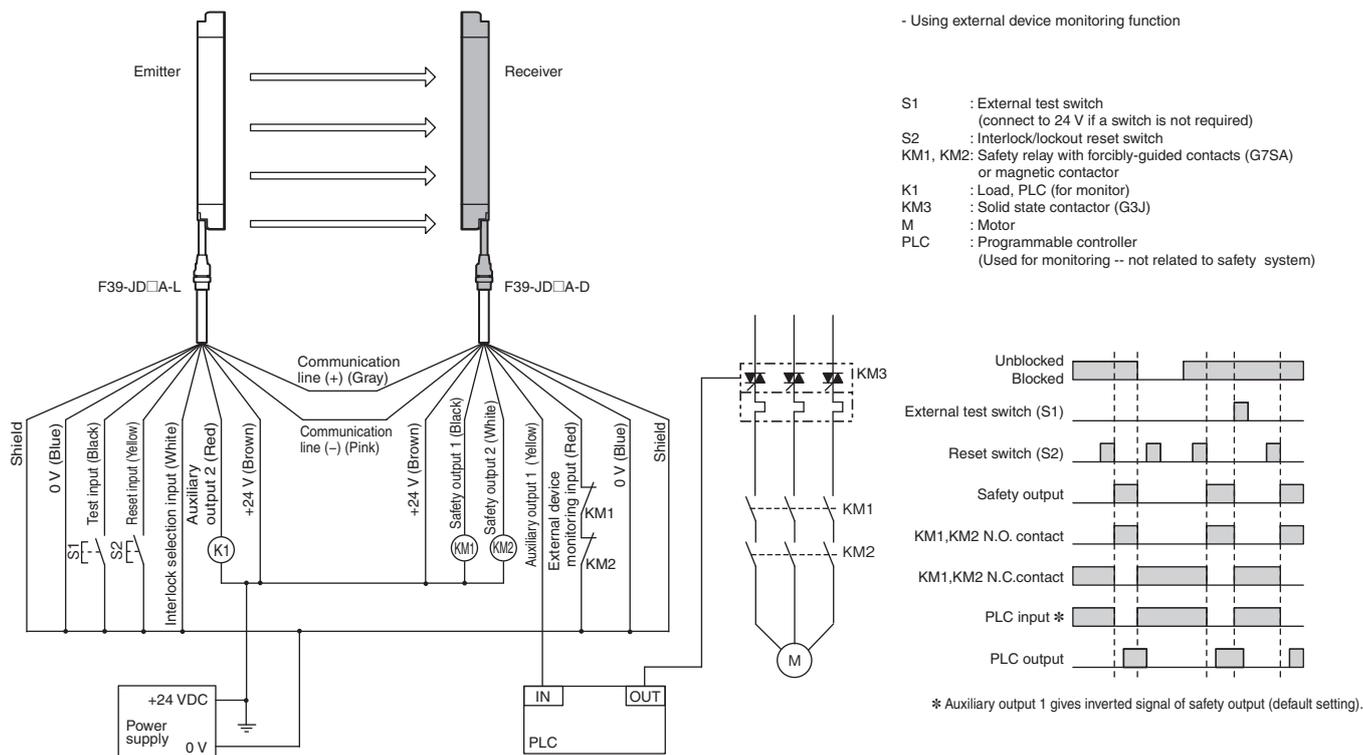
Wiring for single F3SJ-A application [NPN Output]

| Highest achievable PL/ safety category | Model | Stop category | Reset |
|--|--|---------------|--------|
| PLe/4 equivalent | Safety Light Curtain F3SJ-A□□□□N□□□ Safety Relay G7SA | 0 | Manual |

Note: The above PL is only the evaluation result of the example. The PL must be evaluated in an actual application by the customer after confirming the usage conditions.

● Application Overview

- The power supply to the motor M is turned OFF when the beam is blocked.
- The power supply to the motor M is kept OFF until the beams are unblocked and the reset switch S2 is pressed.



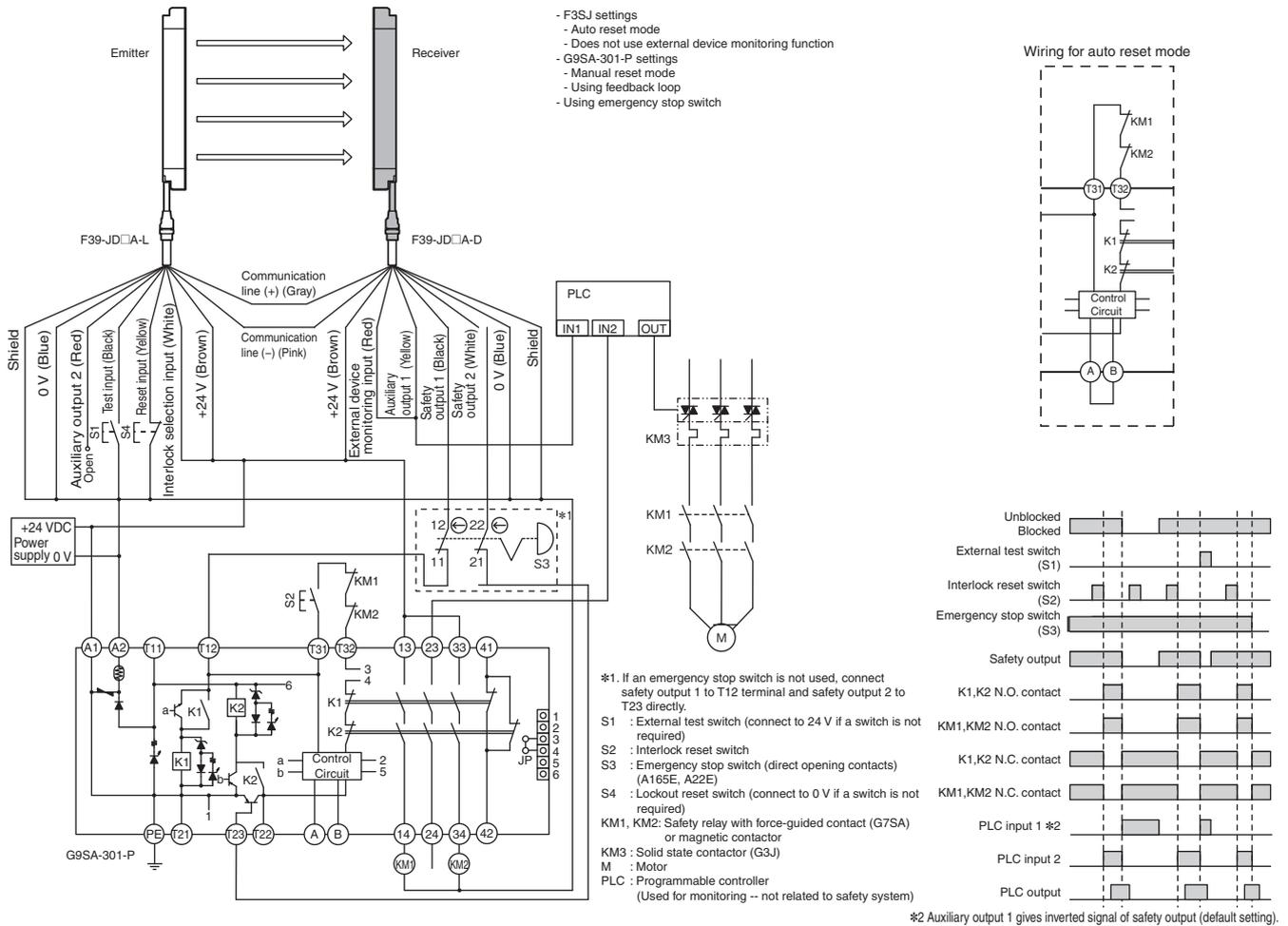
Wiring for connection with a controller G9SA-301-P [NPN Output]

| Highest achievable PL/ safety category | Model | Stop category | Reset |
|--|---|---------------|--------|
| PLe/4 equivalent | Safety Light Curtain F3SJ-A□□□□□□□□ Safety Relay Unit G9SA-301-P 24V DC Safety Relay G7SA Emergency Stop Switch A165E/A22E | 0 | Manual |

Note: The above PL is only the evaluation result of the example. The PL must be evaluated in an actual application by the customer after confirming the usage conditions.

● Application Overview

- The power supply to the motor M is turned OFF when the beam is blocked.
- The power supply to the motor M is turned OFF when the emergency stop switch is pressed.
- The power supply to the motor M is kept OFF until the beams are unblocked and the reset switch S2 is pressed while the emergency stop switch is released.

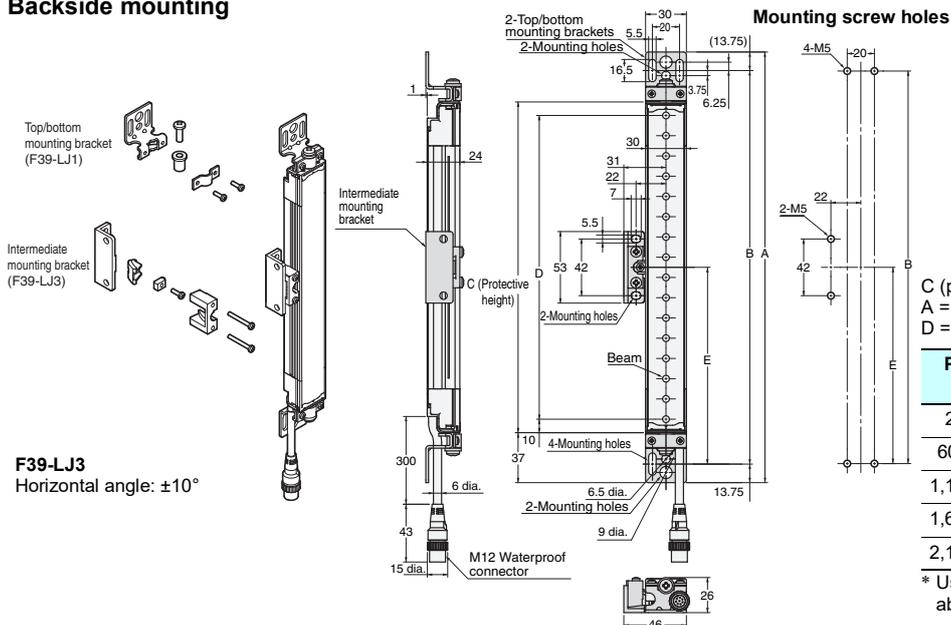


Dimensions

Main Units

When Using Standard Mounting Brackets

Backside mounting



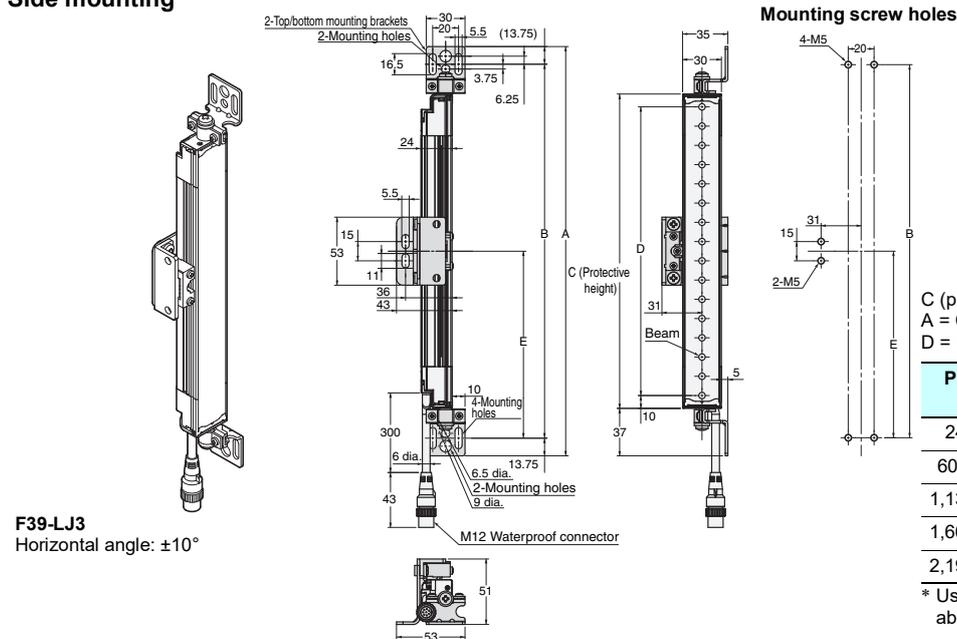
F39-LJ3
Horizontal angle: $\pm 10^\circ$

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 * |
|-------------------|---------------------------------|-----------|
| 245 to 596 | 0 | --- |
| 600 to 1,130 | 1 | $E = B/2$ |
| 1,136 to 1,658 | 2 | $E = B/3$ |
| 1,660 to 2,180 | 3 | $E = B/4$ |
| 2,195 to 2,500 | 4 | $E = B/5$ |

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

Side mounting



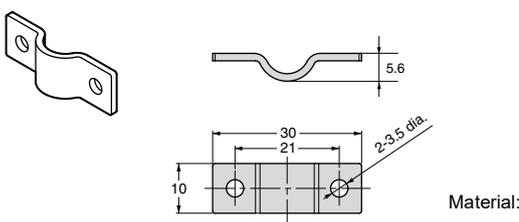
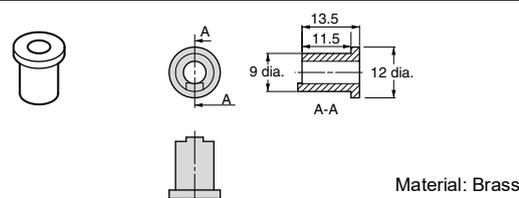
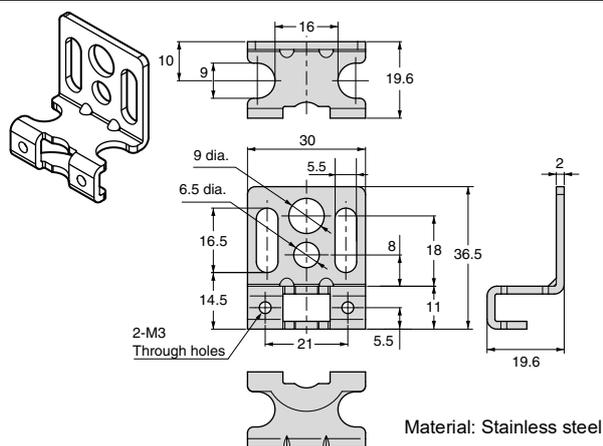
F39-LJ3
Horizontal angle: $\pm 10^\circ$

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 * |
|-------------------|---------------------------------|-----------|
| 245 to 596 | 0 | --- |
| 600 to 1,130 | 1 | $E = B/2$ |
| 1,136 to 1,658 | 2 | $E = B/3$ |
| 1,660 to 2,180 | 3 | $E = B/4$ |
| 2,195 to 2,500 | 4 | $E = B/5$ |

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

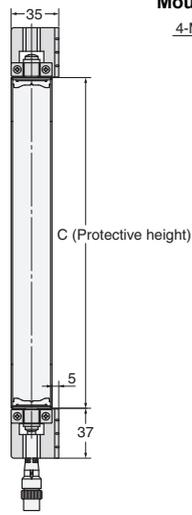
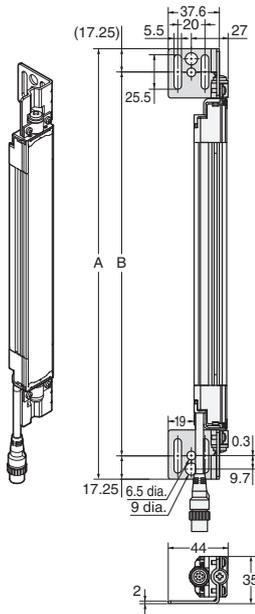
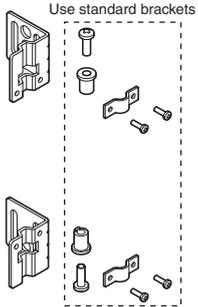
F39-LJ1 Detailed Dimensions of Bracket



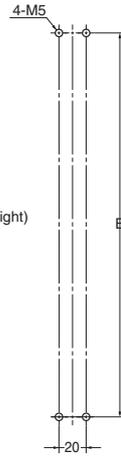
Using Side Flat Mounting Bracket (F39-LJ2)

F39-LJ2

Material: Stainless steel



Mounting screw holes



Dimensions A to C

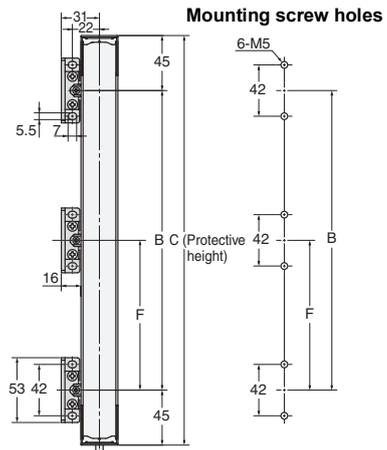
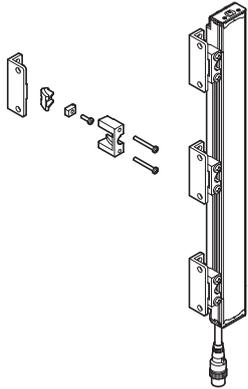
| | |
|---|--|
| A | C + 74 |
| B | C + 39.5 |
| C | 4-digit number of the model name (protective height) |

Using Free Location Mounting Bracket (F39-LJ3)

Backside mounting

F39-LJ3

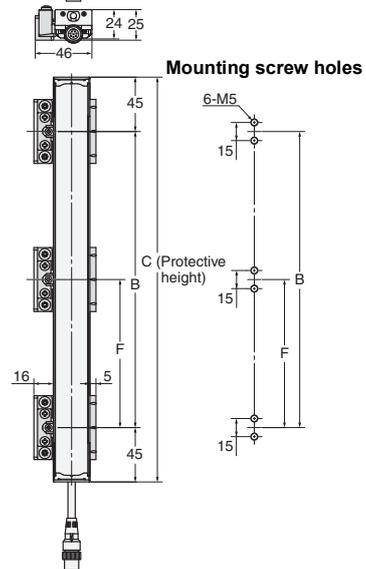
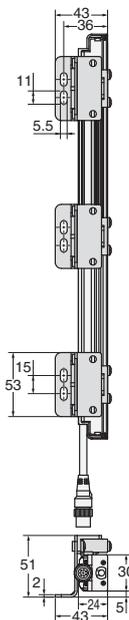
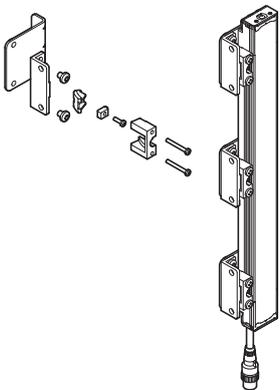
Material: Zinc die-cast
Horizontal angle: $\pm 10^\circ$



Side mounting

F39-LJ3

Material: Zinc die-cast/
stainless
Horizontal angle: $\pm 10^\circ$



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. |

Dimensions F

| Protective height | Number of intermediate brackets | F * |
|-------------------|---------------------------------|-----|
| 245 to 440 | 2 | --- |
| 443 to 785 | 3 | B/2 |
| 794 to 1,140 | 4 | B/3 |
| 1,145 to 1,490 | 5 | B/4 |
| 1,495 to 1,840 | 6 | B/5 |
| 1,845 to 2,180 | 7 | B/6 |
| 2,195 to 2,500 | 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.

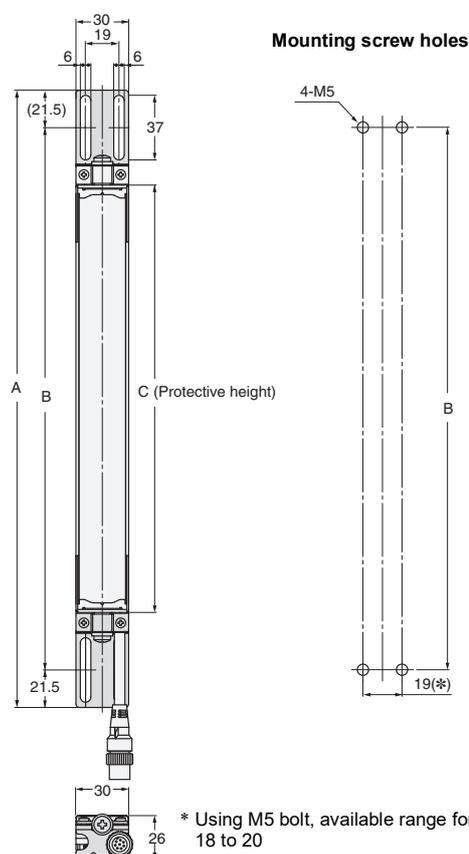
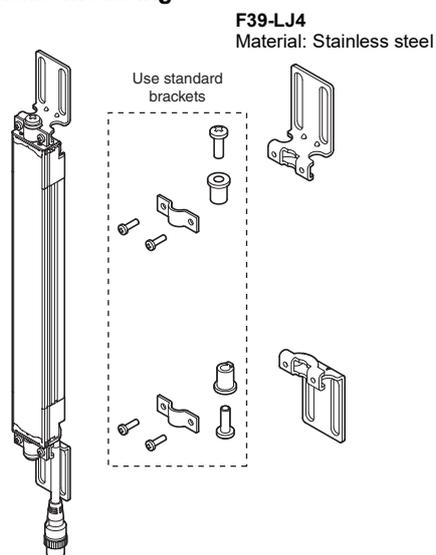
The standard included intermediate brackets are the same as the F39-LJ3 free-location mounting brackets. Purchase brackets as necessary if there are fewer intermediate brackets than required. When intermediate brackets are included, they can be used as free-location mounting brackets.

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 bracket sets to be purchased (pcs) |
|-------------------|--|--|--|
| 245 to 440 | 0 | 4 | 2 sets (4) |
| 443 to 596 | 0 | 6 | 3 sets (6) |
| 600 to 785 | 2 | 6 | 2 sets (4) |
| 794 to 1,130 | 2 | 8 | 3 sets (6) |
| 1,136 to 1,140 | 4 | 8 | 2 sets (4) |
| 1,145 to 1,490 | 4 | 10 | 3 sets (6) |
| 1,495 to 1,658 | 4 | 12 | 4 sets (8) |
| 1,660 to 1,840 | 6 | 12 | 3 sets (6) |
| 1,845 to 2,180 | 6 | 14 | 4 sets (8) |
| 2,195 to 2,500 | 8 | 16 | 4 sets (8) |

Using Top/Bottom Bracket B (F39-LJ4)

Backside mounting



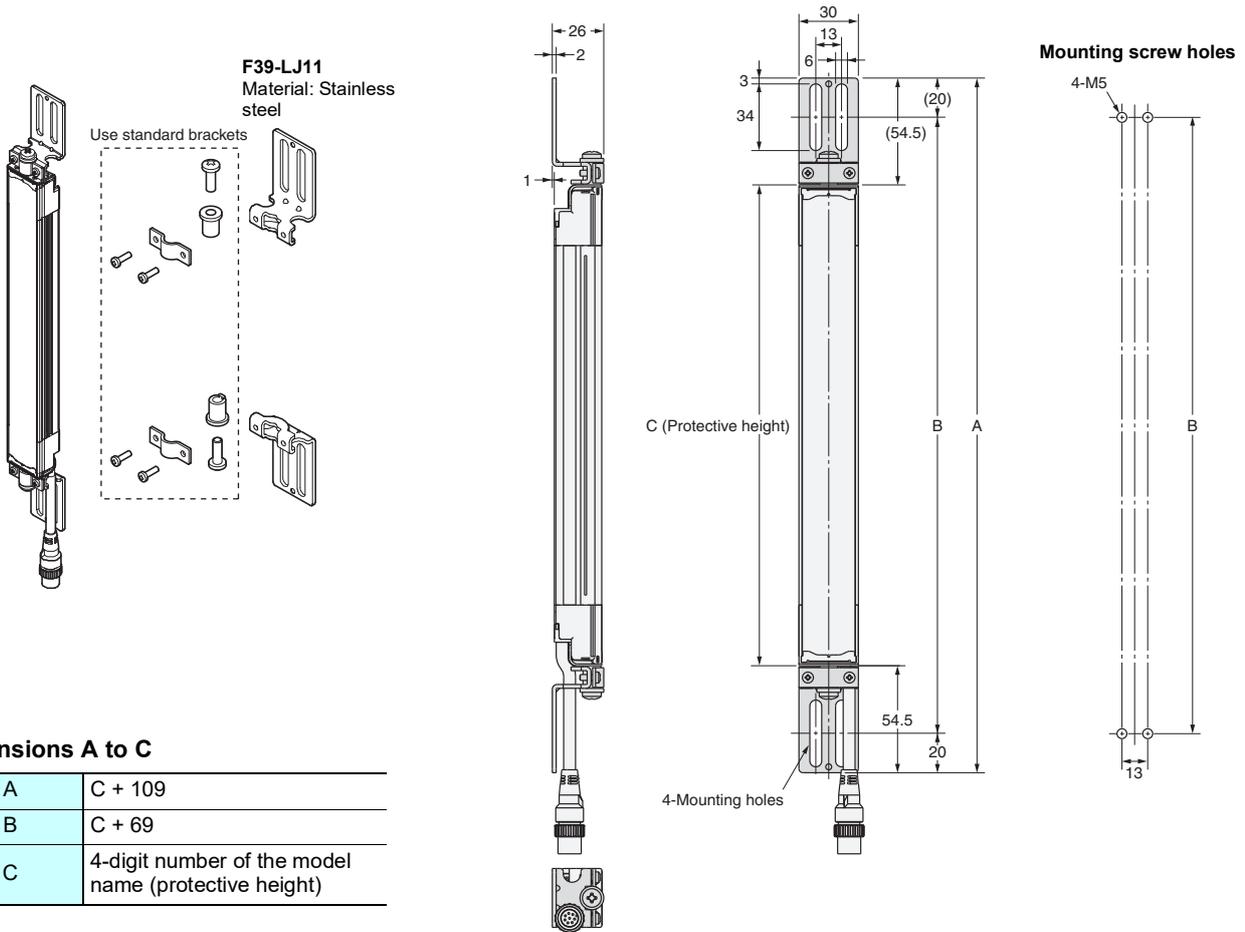
Dimensions A to C

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

Note: Refer to the User's Manual for the dimensions for side mounting.

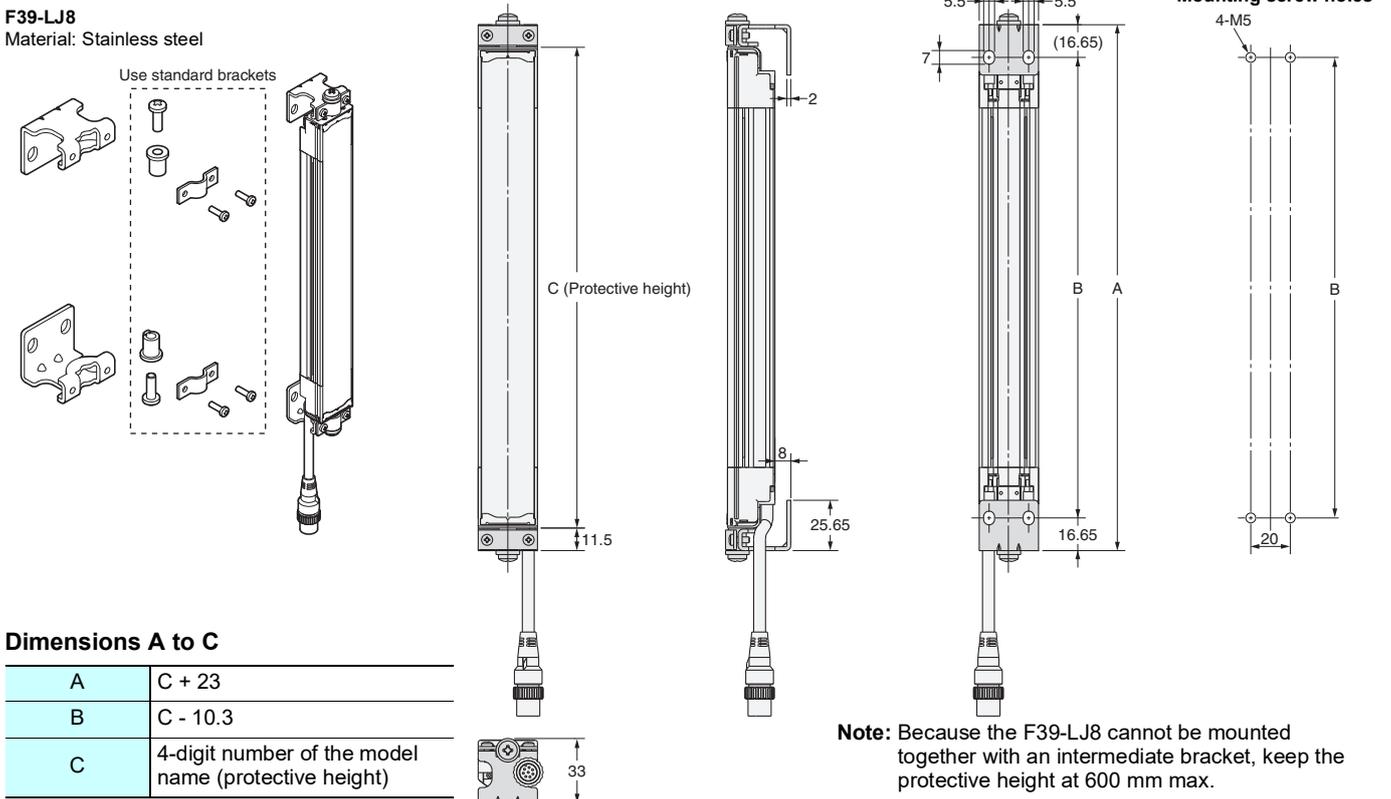
* Using M5 bolt, available range for mounting is 18 to 20

Using Top/Bottom Bracket C (F39-LJ11)



Using Space-saving Mounting Bracket (F39-LJ8)

Backside mounting



Guide to Replacing F3SJ-A with F3SJ-E/B (Including models whose production will be discontinued)

F3SJ-A to F3SJ-E/B replacement correspondence table (F3SJ-A mounting holes can be used without modification)

To check available brackets for replacement, refer to the table below.

To check dimensions when mounting brackets, refer to page 93.

The values in the table correspond to in the model name, meaning the protective height (mm) of a sensor.

| F3SJ-A | | | Replacement F3SJ-E/B | Available bracket for replacement | |
|--|-----------------------|----------------------|----------------------|-----------------------------------|----------------------------------|
| □□□□P(N)20 | □□□□P(N)25 | □□□□P(N)30 | □□□□P(N)25 | Top/bottom bracket (F39-LJB1) | Compatible bracket (F39-LJB4) |
| 0245 0260 0275 0290 | 0260 0280 | 0245 0270 0295 | 0225 | | • |
| | 0300 | | | • | • |
| 0305 0320 0335 0350 0365 | 0320 0340 0360 | 0320 0345 0370 | 0305 | | • |
| 0380 | 0380 | | | • | • |
| 0395 0410 0425 0440 0455 | 0400 0420 0440 | 0395 0420 0445 | 0385 | | • |
| | 0460 | | | • | • |
| 0470 0485 0500 0515 0530 | 0480 0500 0520 | 0470 0495 0520 | 0465 | | • |
| | 0540 | | | • | • |
| 0545 0560 0575 0590 0605 | 0560 0580 0600 | 0545 0570 0595 | 0545 | | • |
| 0620 | 0620 | 0620 | | • | • |
| 0635 0650 0665 0680 0695 | 0640 0660 0680 | 0645 0670 0695 | 0625 | | • |
| | 0700 | | | • | • |
| 0710 0725 0740 0755 0770 | 0720 0740 0760 | 0720 0745 0770 | 0705 | | • |
| | 0780 | | | • | • |
| 0785 0800 0815 0830 0845 | 0800 0820 0840 | 0795 0820 0845 | 0785 | | • |
| 0860 | 0860 | | | • | • |
| 0875 0890 0905 0920 0935 | 0880 0900 0920 | 0870 0895 0920 | 0865 | | • |
| | 0940 | | | • | • |
| 0950 0965 0980 0995 01010 | 0960 0980 01000 | 0945 0970 0995 | 0945 | | • |
| | 1020 | 1020 | | • | • |
| 1025 1040 1055 1070 1085 1100 | 1040 1060 1080 | 1045 1070 1095 | 1025 | | • |
| | 1100 | | | • | • |
| 1115 1130 1145 1160 1175 | 1120 1140 1160 | 1120 1145 1170 | 1105 | | • |

F3SJ-A

| F3SJ-A | | | Replacement F3SJ-B | Available bracket for replacement | |
|------------|------------|------------|--------------------|-----------------------------------|-------------------------------|
| □□□□P(N)20 | □□□□P(N)25 | □□□□P(N)30 | □□□□P(N)25 | Top/bottom bracket (F39-LJB1) | Compatible bracket (F39-LJB4) |
| | 1180 | | 1185 | • | • |
| 1190 | 1200 | 1195 | | | |
| 1205 | 1220 | 1220 | | | |
| 1220 | 1240 | 1245 | | | • |
| 1235 | | | | | |
| 1250 | | | | | |
| | 1260 | | 1265 | • | • |
| 1265 | 1280 | 1270 | | | |
| 1280 | 1300 | 1295 | | | |
| 1295 | 1320 | 1320 | | | • |
| 1310 | | | | | |
| 1325 | | | | | |
| 1340 | 1340 | | 1345 | • | • |
| 1355 | 1360 | 1345 | | | |
| 1370 | 1380 | 1370 | | | |
| 1385 | 1400 | 1395 | | | • |
| 1400 | | | | | |
| 1415 | | | | | |
| | 1420 | 1420 | 1425 | • | • |
| 1430 | 1440 | 1445 | | | |
| 1445 | 1460 | 1470 | | | |
| 1460 | 1480 | 1495 | | | • |
| 1475 | | | | | |
| 1490 | | | | | |
| | 1500 | | 1505 | • | • |
| 1505 | 1520 | 1520 | | | |
| 1520 | 1540 | 1545 | | | |
| 1535 | 1560 | 1570 | | | • |
| 1550 | | | | | |
| 1565 | | | | | |
| 1580 | 1580 | | 1585 | • | • |
| 1595 | 1600 | 1595 | | | |
| 1610 | 1620 | 1620 | | | |
| 1625 | 1640 | 1645 | | | • |
| 1640 | | | | | |
| 1655 | | | | | |
| | 1660 | | 1665 | • | • |
| 1670 | 1680 | 1670 | | | |
| 1685 | 1700 | 1695 | | | |
| 1700 | 1720 | 1720 | | | • |
| 1715 | | | | | |
| 1730 | | | | | |
| | 1740 | | 1745 | • | • |
| 1745 | 1760 | 1745 | | | |
| 1760 | 1780 | 1770 | | | |
| 1775 | 1800 | 1795 | | | • |
| 1790 | | | | | |
| 1805 | | | | | |
| 1820 | 1820 | 1820 | 1825 | • | • |
| 1835 | 1840 | 1845 | | | |
| 1850 | 1860 | 1870 | | | |
| 1865 | 1880 | 1895 | | | • |
| 1880 | | | | | |
| 1895 | | | | | |
| | 1900 | | 1905 | • | • |
| 1910 | 1920 | 1920 | | | |
| 1925 | 1940 | 1945 | | | |
| 1940 | 1960 | 1970 | | | • |
| 1955 | | | | | |
| 1970 | | | | | |
| | 1980 | | 1985 | • | • |
| 1985 | 2000 | 1995 | | | |
| 2000 | 2020 | 2020 | | | |
| 2015 | 2040 | 2045 | | | • |
| 2030 | | | | | |
| 2045 | | | | | |
| 2060 | 2060 | | 2065 | • | • |
| 2075 | 2080 | 2070 | | | |
| 2090 | 2100 | 2095 | | | |
| 2105 | 2120 | 2120 | | | • |
| 2120 | | | | | |
| 2135 | | | | | |

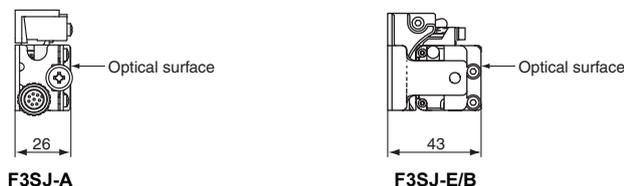
Note: 1. Protective height and detection capability vary according to replacement. Check the safe design of your device before use.
 2. The maximum protective height of F3SJ-E is 1,105 mm. Only the F3SJ-B can be replaced for the protective height of 1,185 or more.

Change of Dimensions due to Replacement

(1) Replacement by backside mounting

| | F3SJ-A (Using standard bracket) | F3SJ-E/B (Top/bottom bracket used) | F3SJ-E/B (Compatible bracket used) |
|--|------------------------------------|---------------------------------------|---------------------------------------|
| Dimensions (mm) from mounting wall surface to optical surface (mm) | 26 | 43 | 43 |
| Total length including bracket (mm) | Protective height + 74 | Protective height + 69 | Protective height + 159 |

Dimensional drawing from mounting wall surface to optical surface



(2) Replacement by side mounting

| | F3SJ-A (Using standard bracket) | F3SJ-E/B (Top/bottom bracket used) | F3SJ-E/B (Compatible bracket used) |
|--|------------------------------------|---------------------------------------|---------------------------------------|
| Dimensions of a protrusion from mounting wall (mm) | 51 | 46 | 46 |
| Total length including bracket (mm) | Protective height +74 | Protective height +69 | Protective height +159 |

Dimensional drawing of a protrusion from mounting wall



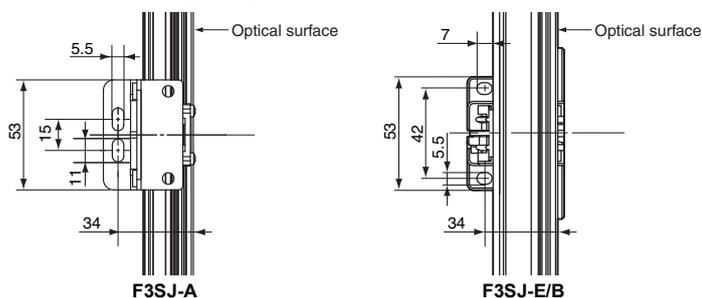
Replacement using intermediate brackets

For backside mounting, the F3SJ-A and F3SJ-E/B can be used without modification due to compatibility in mounting hole pitch. For side mounting, a new hole needs to be made due to the different mounting hole pitch.

Mounting hole pitch for side mounting using intermediate bracket

| | F3SJ-A (Free-location bracket used) | F3SJ-E/B (Intermediate bracket used) |
|--------------------------|--|---|
| Mounting hole pitch (mm) | 15 | 42 |

Dimensional drawing of mounting hole for side mounting using intermediate bracket

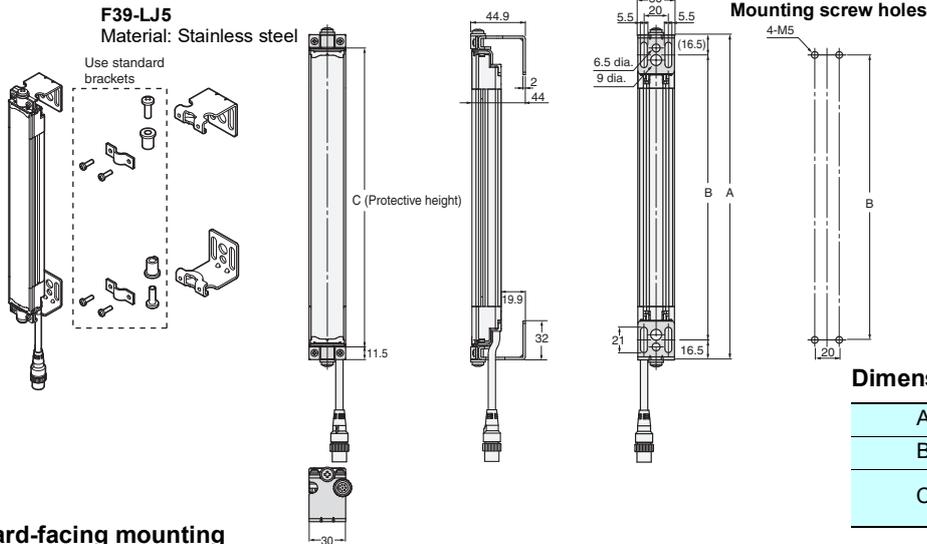


Change of Dimensions due to Replacement

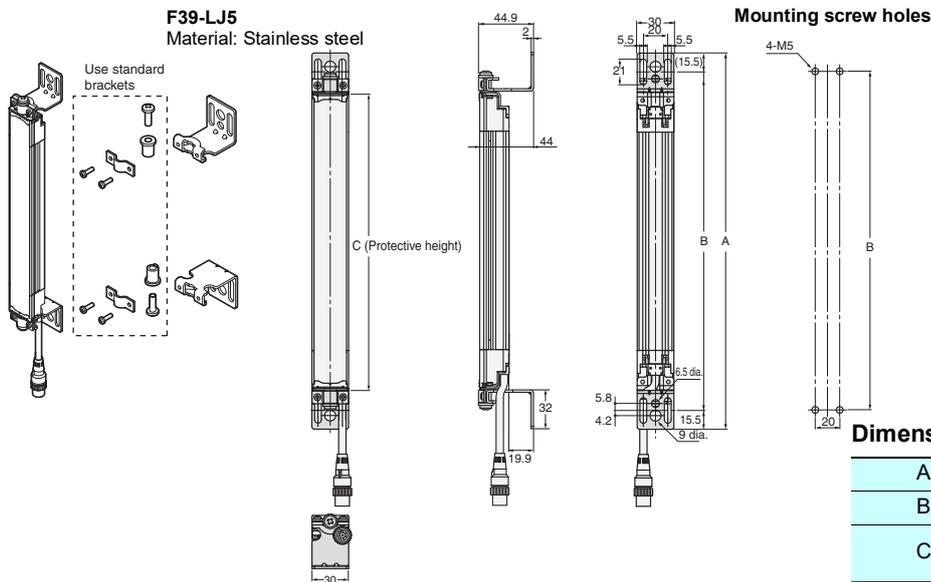
| | F3SJ-A (Free-location bracket used) | F3SJ-E/B (Intermediate bracket used) |
|--|--|---|
| Dimensions (mm) from mounting wall surface to optical surface (mm) | 26 | 43 |

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

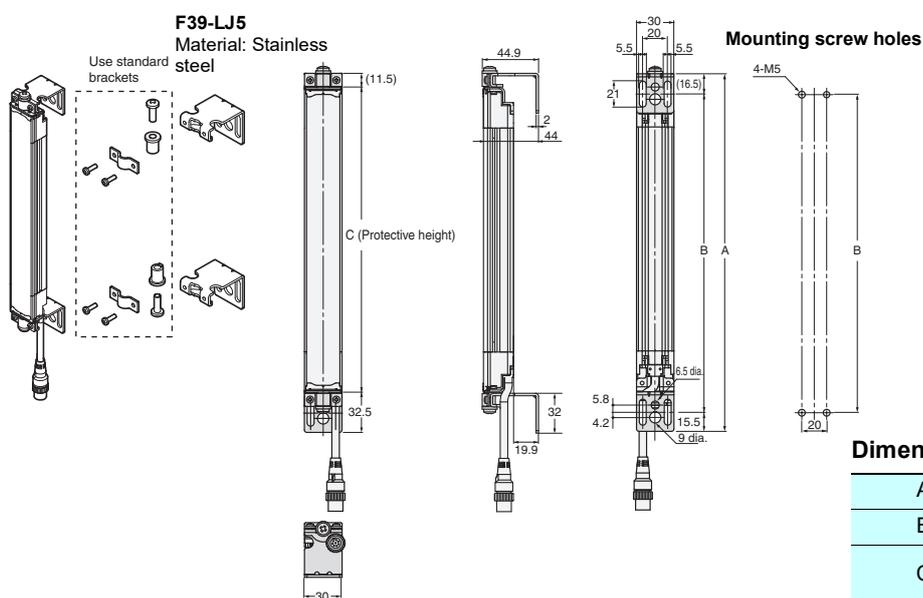
Inward-facing mounting



Outward-facing mounting



Inward + outward-facing mounting



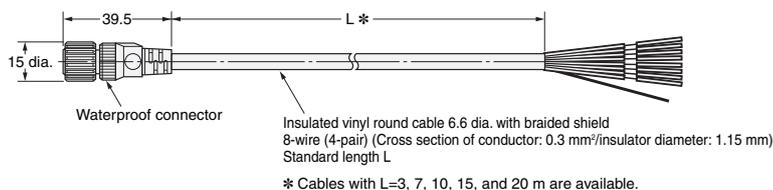
Accessories

Single-Ended Cable

- F39-JD3A (L = 3 m)
- F39-JD7A (L = 7 m)
- F39-JD10A (L = 10 m)

- F39-JD15A (L = 15 m)
- F39-JD20A (L = 20 m)

Cable color: Gray for emitter
Black for receiver

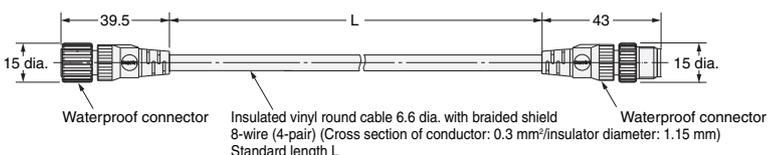


Double-Ended Cable

- F39-JDR5B (L = 0.5 m)
- F39-JD1B (L = 1 m)
- F39-JD3B (L = 3 m)
- F39-JD5B (L = 5 m)

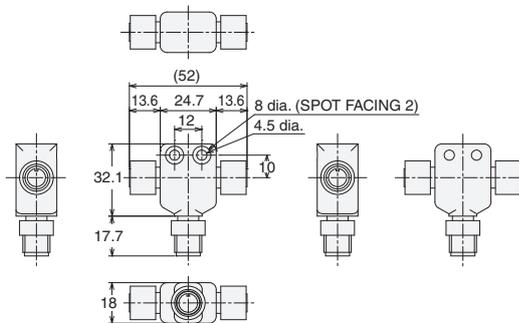
- F39-JD7B (L = 7 m)
- F39-JD10B (L = 10 m)
- F39-JD15B (L = 15 m)
- F39-JD20B (L = 20 m)

Cable color: Gray for emitter
Black for receiver



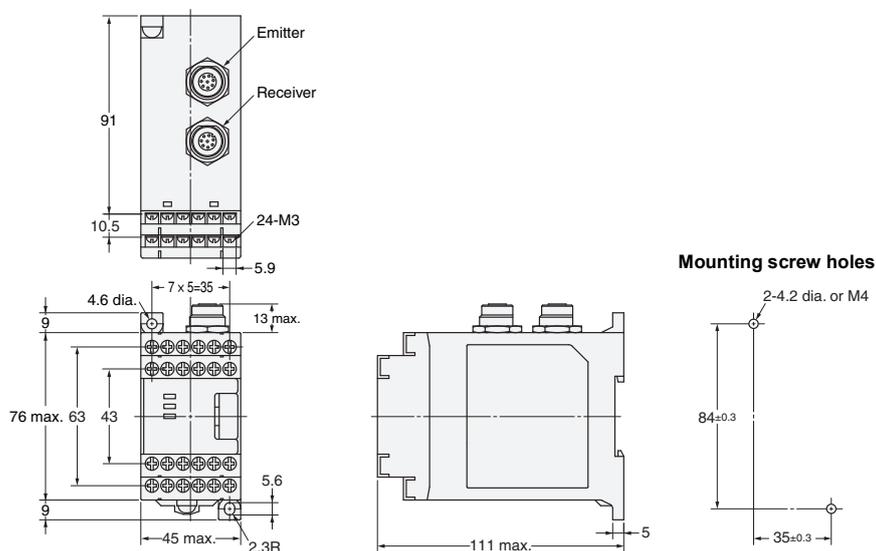
Simple Wiring Connector

F39-CN5



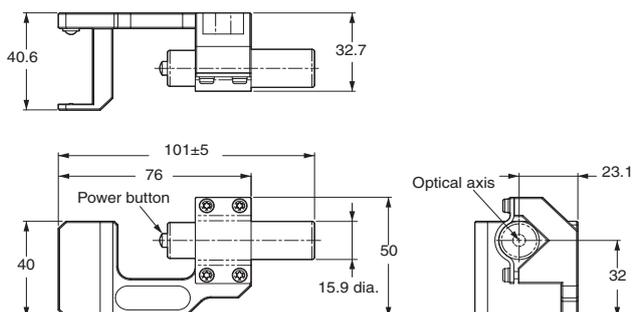
Control Unit

F3SP-B1P



Laser Pointer

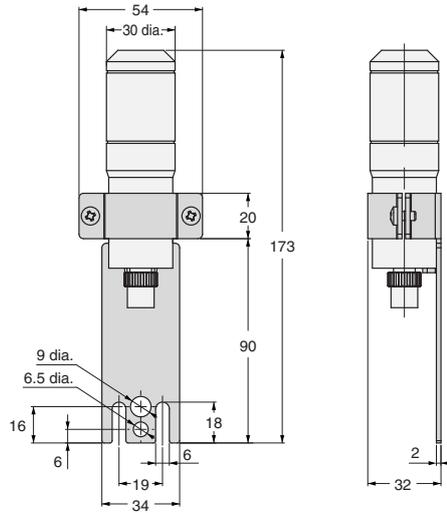
F39-PTJ



F3SJ-A

Dedicated External Indicator Set

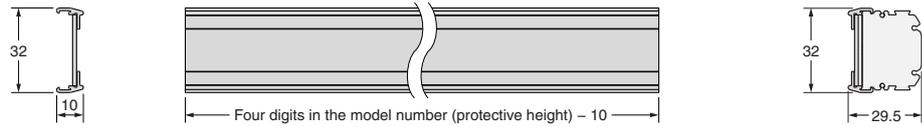
F39-A01□-PAC



Material: Stainless steel

Spatter Protection Cover

F39-HJ□□□□

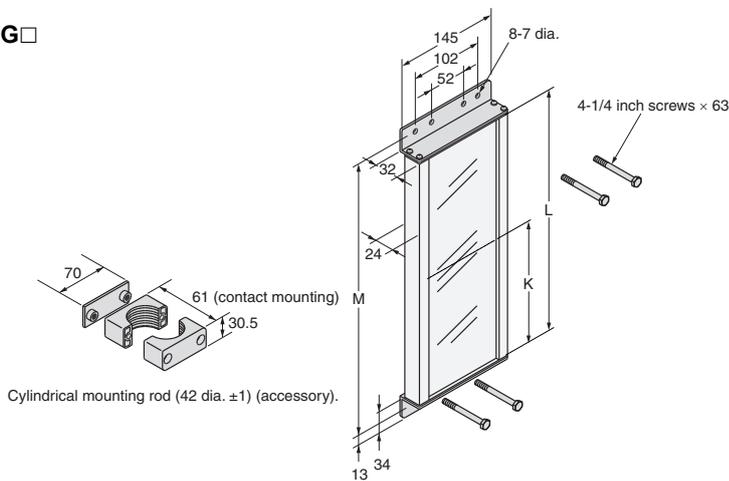


Assembled dimensions

Material: PC (transparent area)
ABS (non-transparent area)

Mirrors

F39-MLG□

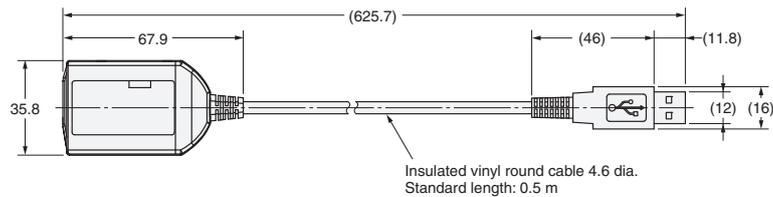


| Model | L (mm) | M (mm) | K (mm) |
|---------------|--------|--------|--------|
| F39-MLG0406 | 445 | 487 | --- |
| F39-MLG0610 | 648 | 690 | --- |
| F39-MLG0711 | 749 | 792 | --- |
| F39-MLG0914 | 953 | 995 | --- |
| F39-MLG1067 | 1,105 | 1,148 | --- |
| F39-MLG1219 | 1,257 | 1,300 | --- |
| F39-MLG1422 * | 1,499 | 1,541 | 749 |
| F39-MLG1626 * | 1,702 | 1,744 | 851 |
| F39-MLG1830 * | 1,905 | 1,948 | 952 |
| F39-MLG2134 * | 2,210 | 2,252 | 1,054 |

* Following May 2018 production, products will include a two-piece mirror. "K" indicates the distance to the mirror seam.

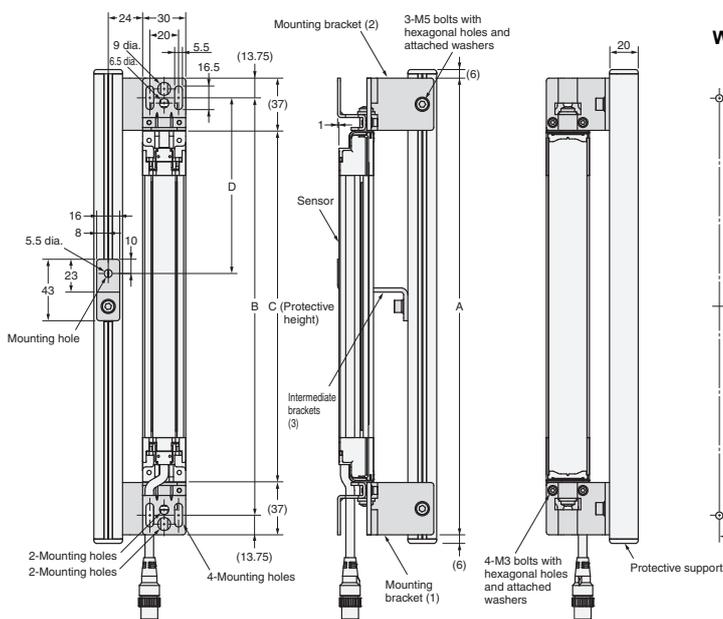
Setting Support Software for the F3SJ

F39-GWUM

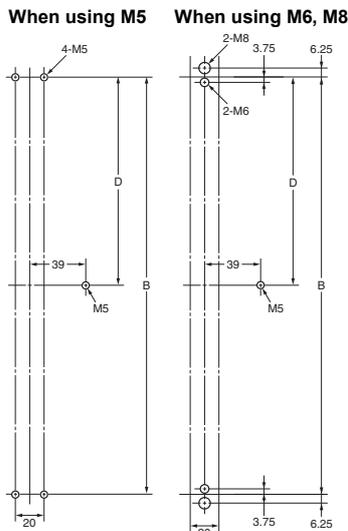


Protective Bar

F39-PJ□□□□-S
Backside mounting



Mounting screw holes

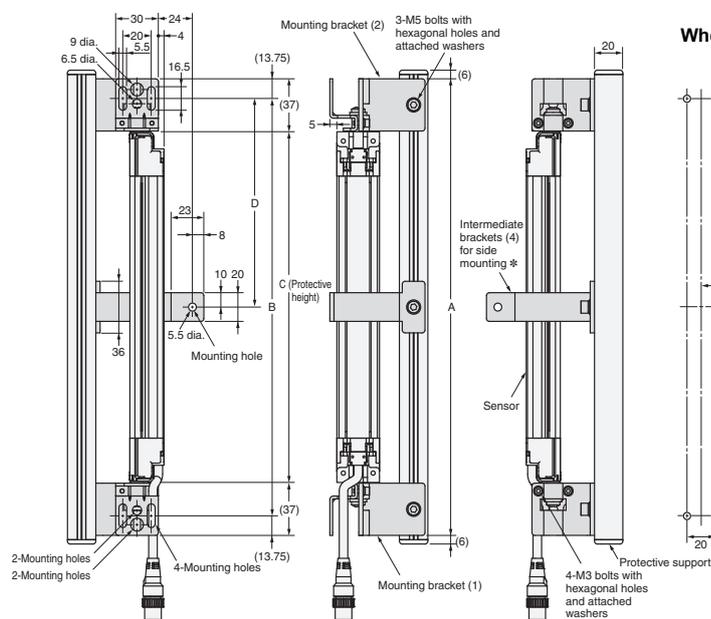


C (protective height): 4-digit number in the table
 $A = C + 74$,
 $B = C + 46.5$

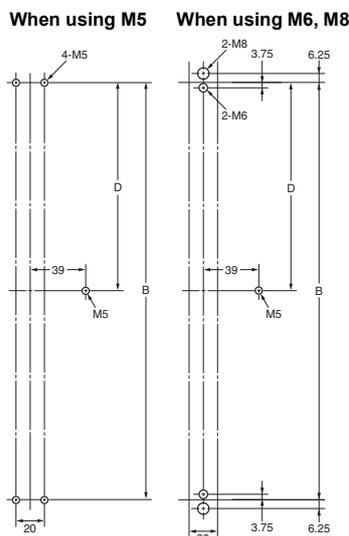
| Protective height | Number of intermediate brackets used (3) | D |
|-------------------|--|-----|
| 245 to 995 | 0 | --- |
| 1,001 to 2,000 | 1 | B/2 |
| 2,009 to 2,500 | 2 | B/3 |

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

Side mounting



Mounting screw holes

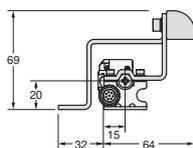


C (protective height): 4-digit number in the table
 $A = C + 74$,
 $B = C + 46.5$

| Protective height | Intermediate brackets for side mounting Number of intermediate brackets used (4) | D |
|-------------------|---|-----|
| 245 to 995 | 0 | --- |
| 1,001 to 2,000 | 1 | B/2 |
| 2,009 to 2,500 | 2 | B/3 |

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

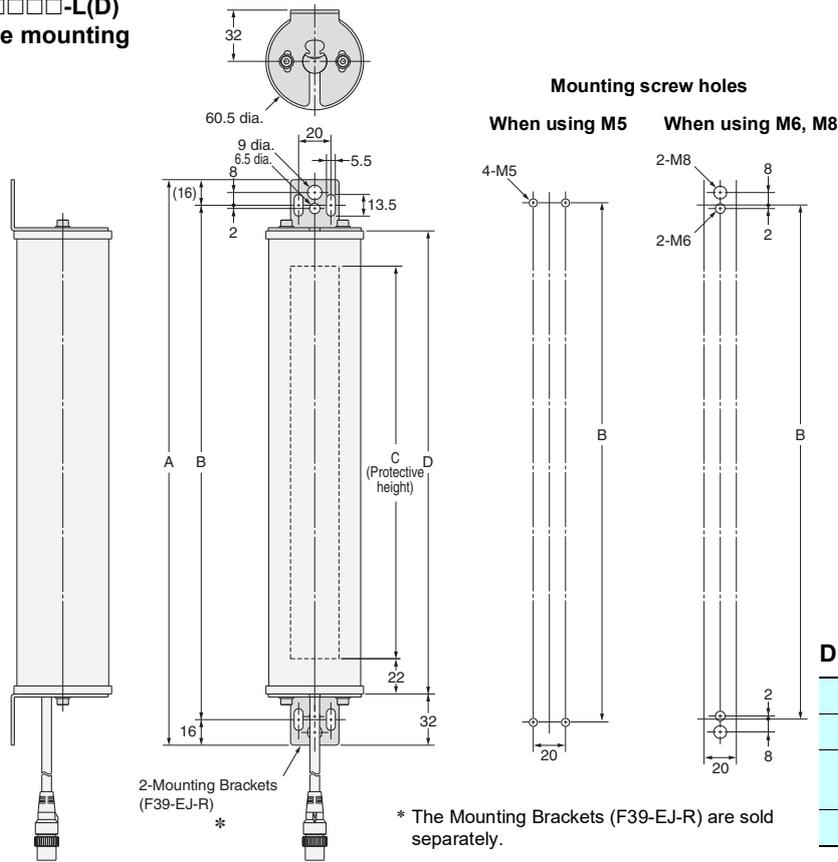
* The four intermediate brackets (F39-PJ-MS) for side mounting are not provided.



F3SJ-A

Water-resistant Case

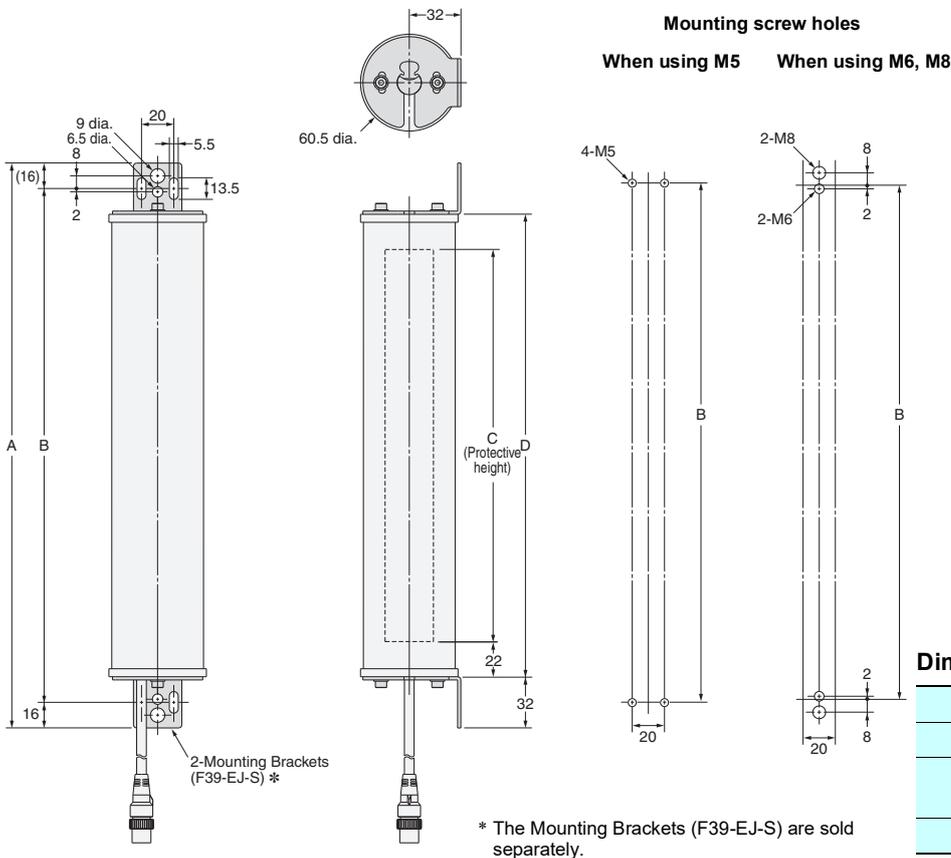
F39-EJ□□□□-L(D) Backside mounting



Dimensions A to D

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

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 |

Function List

Functions that can be used on F3SJ are shown as follows: Refer to the F3SJ User's Manual for details. For manual number, check the "Related Manuals" at the end of the catalog.

✓: Can be used.

X: Cannot be used.

Basic functions

| Function | F3SJ-E (EASY) | F3SJ-B (BASIC) | F3SJ-A (ADVANCED) |
|-------------------------------------|---------------|----------------|-------------------|
| Self-test function | ✓ | ✓ | ✓ |
| External test function | ✓ | ✓ | ✓ |
| External device monitoring function | X | ✓*1 | ✓ |
| Interlock function | X | ✓*1 | ✓ |
| Auxiliary output function | X | ✓ | ✓ |
| Muting function *2 | X | ✓ | ✓ |

*1. Cannot be used at muting.

*2. The muting time for the F3SJ-A can be set via the software tool. The muting time for the F3SJ-B cannot be changed.

Functions for individual applications

| | | | |
|------------------------------------|---|---|---|
| Override function | X | ✓ | ✓ |
| Partial muting function | X | X | ✓ |
| Position detection muting function | X | X | ✓ |
| Fixed blanking function | X | X | ✓ |
| Floating blanking function | X | X | ✓ |
| Warning zone function | X | X | ✓ |
| Use of setting tools | X | X | ✓ |

Wiring/mounting related function

| | | | |
|--|---|---|---|
| Series connection function | X | ✓ | ✓ |
| Dead space less (single connection) | ✓ | ✓ | ✓ |
| Dead space less (series connection) | X | X | ✓ |
| Response time integration (15 ms) *3 | ✓ | ✓ | X |
| Simple wiring | ✓ | X | X |
| Connector cable | X | ✓ | |
| Quick mounting | ✓ | ✓ | X |
| TOP/BOTTOM indicator for beam adjustment | ✓ | ✓ | X |
| Laser Pointer | ✓ | ✓ | ✓ |

*3. Convenient to calculate safety distance.

Indicator related functions

| | | | |
|---------------------------|---|-----|-----|
| External indicator output | X | ✓*4 | ✓*5 |
| Muting error display | X | ✓ | X |

Note: The specifications of the models with the suffixes "-01TS", "-02TS" or "-TS" are different.

Refer to the Specifications.

*4. An external Indicator can be connected to the F3SJ-B auxiliary output .

*5. An external Indicator can be connected to the F3SJ-A auxiliary output 1 and 2, external Indicator 1 and 2 .

Self-test Function

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

External Test Function

This function stops the emission using an external signal. It can be used to verify that a safety system should properly stop when F3SJ is interrupted.

External Device Monitoring Function

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

This function constantly monitors that a specified voltage is applied to the receiver's external device monitoring input line, and the system 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 the normally closed N.C. contact does not close within 0.3 s after the safety outputs turn from ON to OFF, and a specified voltage is not applied to the external device monitoring line, it is evaluated as an error and the system enters a lockout state. To utilize this function properly, use safety relays and contactors that have force guided or mechanically linked contact structure.

Interlock Function

The F3SJ turns the safety outputs OFF when its power is turned on or its beam is interrupted and holds this state until reset input is applied. This state is called "interlock".

Two methods can be used to reset the interlock state: "auto reset that automatically turns safety outputs ON when the interrupting object is removed" and "manual reset mode that keeps safety outputs OFF until a reset signal is provided, if the interrupting object is removed".

Auto Reset

When the interrupting object is removed from the detection zone, the safety outputs automatically turn 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.

Manual Reset

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

Auxiliary Output Function

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

Muting Function

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

Override Function

The override function turns the safety outputs ON when the muting start condition is not satisfied. If a workpiece stops while passing through the F3SJ, as shown below, causing a muting error, the normal state cannot be recovered unless the workpiece is removed from the muting sensors and the detection field of the F3SJ. However, the override function will mute the safety outputs of the F3SJ so that the conveyor can be restarted to move the workpiece out of the muting sensors and detection zone.

Partial Muting Function

Partial muting function secures safety without enabling muting except for beams when a workpiece passes.

Position Detection Muting

A limit switch or other means is used to detect when the robot is in a safe position, and muting is then applied.

Fixed Blanking Function

Fixed blanking function disables a specific beam of the F3SJ. This function keeps safety output ON even when part of machinery equipment exists within a detection zone.

Floating Blanking Function

Floating blanking function increases the diameter of the F3SJ's detection capability and turns OFF the safety output when multiple objects are detected. 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.

Warning Zone Function

When an individual enters, a warning lamp lights or buzzer sounds without stopping the equipment by dividing the detection zone into the detection zone and a warning zone.

Setting Tool

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

- F39-MC21 Setting Console
- F39-GWUM SD Manager Setting Support Software for the F3SJ

Series Connection Function

Up to 3 sets of the F3SJ-Bs or up to 4 sets of F3SJ-As can be series-connected. Series connection allows them to be used as a safety light curtain, requiring only one set to be wired to a controller and preventing mutual interference.

Safety Precautions

Description shown below is only a guideline to choose a safety sensor. To use the product properly, you must read its instruction manual that comes with the product.

Legislation and Standards

1. Application of a sensor alone cannot receive type approval provided by Article 44-2 of the Industrial Safety and Health Act of Japan. It is necessary to apply it in a system.
Therefore, when using the F3SJ in Japan as a "safety system for pressing or shearing machines" prescribed in Article 42 of that law, the system must receive type approval.
2. The F3SJ is electro-sensitive protective equipment (ESPE) in accordance with European Union (EU) Machinery Directive Index Annex V, Item 2.
3. The F3SJ-E/B is in conformity with the following standards:
 - (1) EC legislation
Machinery Directive 2006/42/EC
EMC Directive 2014/30/EU
 - (2) European standards
EN 61496-1 (type 4 ESPE),
EN 61496-2 (type 4 AOPD),
EN 61508-1 through -3 (SIL3),
EN 61000-6-4,
EN ISO 13849-1:2015 (PLe/Safety Category 4)
 - (3) International standards
IEC 61496-1 (type 4 ESPE),
IEC 61496-2 (type 4 AOPD),
IEC 61508-1 through -3 (SIL3),
ISO 13849-1:2015 (PLe/Safety Category 4)
 - (4) JIS standards
JIS B 9704-1 (type 4 ESPE),
JIS B 9704-2 (type 4 AOPD)
 - (5) North American standards:
UL 61496-1 (type 4 ESPE),
UL 61496-2 (type 4 AOPD),
UL 508, UL 1998, CAN/CSA C22.2 No.14,
CAN/CSA C22.2 No.0.8
4. The F3SJ-A is in conformity with the following standards:
 - (1) EC legislation
Machinery Directive 2006/42/EC
EMC Directive 2014/30/EU
 - (2) European standards
EN 61496-1 (type 4 ESPE),
EN 61496-2 (type 4 AOPD),
EN 61508-1 through -3 (SIL3),
EN ISO 13849-1:2015 (PLe/Safety Category 4)
 - (3) International standards
IEC 61496-1 (type 4 ESPE),
IEC 61496-2 (type 4 AOPD),
IEC 61508-1 through -3 (SIL3),
ISO 13849-1: 2015 (PLe/Safety Category 4)
- (4) JIS standards
JIS B 9704-1 (type 4 ESPE),
JIS B 9704-2 (type 4 AOPD)
- (5) North American standards:
UL 61496-1 (type 4 ESPE),
UL 61496-2 (type 4 AOPD),
UL 508, UL 1998, CAN/CSA C22.2 No.14,
CAN/CSA C22.2 No.0.8
5. The F3SJ received the following certification from the EU-accredited body, TÜV SÜD Product Service GmbH:
 - EC type test based on machinery directive
Type 4 ESPE (EN 61496-1),
Type 4 AOPD (EN 61496-2)
6. The F3SJ is scheduled to received certificates of UL listing for US and Canadian safety standards from the Third Party Assessment Body UL.
 - Type 4 ESPE (UL 61496-1),
Type 4 AOPD (UL 61496-2)
7. The F3SJ is designed according to the standards listed below. To make sure that the final system complies with the following standards and regulations, you are asked to design and use it in accordance with all other related standards, laws, and regulations. If you have any questions, consult with specialized organizations such as the body responsible for prescribing and/or enforcing machinery safety regulations in the location where the equipment is to be used.
 - European standards: EN 415-4, EN 692, EN 693
 - US Occupational Safety and Health Standards: OSHA 29 CFR 1910.212
 - US Occupational Safety and Health Standards: OSHA 29 CFR 1910.217
 - American National Standards: ANSI B11.1 to B11.19
 - American National Standards: ANSI/RIA 15.06
 - Canadian Standards Association CSA Z142, Z432, Z434
 - SEMI Standards SEMI S2
 - Japan Ministry of Health, Labour and Welfare "Guidelines for Comprehensive Safety Standards of Machinery"
8. We have obtained S-Mark Certification from Legislation and Standards Korea Occupational Safety & Health Agency (KOSHA).
(F3SJ-E□□□□P25-S/F3SJ-B□□□□P25-S/
F3SJ-A□□□□P□□-S)

F3SJ-E/F3SJ-B/F3SJ-A

Precautions on Safety

Indication and meaning for safe use

This instruction manual describes notification and/or warning with indication and symbols as shown below for safe use of F3SJ. This notification describes very important details for safety. You must follow the description. Shown below are indication and symbols.

| | |
|--|--|
|  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 | If you fail to use a product properly, it may result in injuries or damage on property. |
|--|---|

Meanings of Alert Symbols

| | |
|---|--|
|  | Inhibited Indicates general inhibition. |
|---|--|

Alert Statements in this Manual

F3SJ-E Description applied to F3SJ-E models.

F3SJ-B Description applied to F3SJ-B models.

F3SJ-A Description applied to F3SJ-A models.

For users

| |
|--|
|  WARNING |
|--|

F3SJ-E **F3SJ-B** **F3SJ-A**

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.

F3SJ-A

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 |
|--|

F3SJ-E **F3SJ-B** **F3SJ-A**

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

F3SJ-B **F3SJ-A**

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

For installation

| |
|--|
|  WARNING |
|--|

F3SJ-E **F3SJ-B** **F3SJ-A**

Make sure to test the operation of the F3SJ after installation to verify that the F3SJ operates as intended. Make sure to stop the machine until the test is complete.

Unintended function settings may cause a person to go undetected, resulting in serious injury.

F3SJ-E **F3SJ-B** **F3SJ-A**

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

F3SJ-E **F3SJ-B** **F3SJ-A**

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

F3SJ-B **F3SJ-A**

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.

F3SJ-E **F3SJ-B** **F3SJ-A**

The F3SJ cannot protect a person from a projectile exiting the hazardous zone. Install protective cover(s) or fence(s).

F3SJ-A

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.

F3SJ-A

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.

F3SJ-A

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.

F3SJ-B **F3SJ-A**

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.

F3SJ-B F3SJ-A

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.

F3SJ-B F3SJ-A

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.

F3SJ-A

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.

F3SJ-B F3SJ-A

Use two independent input devices for the muting inputs.

F3SJ-B F3SJ-A

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.

F3SJ-B F3SJ-A

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.

F3SJ-E F3SJ-B F3SJ-A

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

F3SJ-E F3SJ-B F3SJ-A

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.

F3SJ-E F3SJ-B F3SJ-A

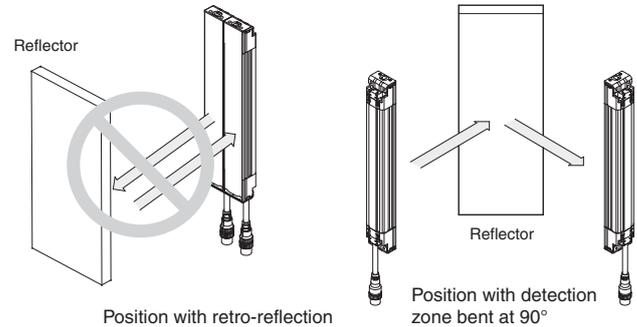
Make sure that the F3SJ is securely mounted and its cables and connectors are properly secured.

F3SJ-E F3SJ-B F3SJ-A

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

F3SJ-E F3SJ-B F3SJ-A

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



F3SJ-E F3SJ-B F3SJ-A

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

For wiring

WARNING

F3SJ-E F3SJ-B F3SJ-A

[For PNP output]

Connect the load between the output and 0V line.

[For NPN output]

Connect the load between the output and +24V line. If +24 V and 0 V are connected, it is dangerous because operation mode is inverted to "ON when interrupted".

F3SJ-E F3SJ-B F3SJ-A

[For PNP output]

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

F3SJ-E F3SJ-B F3SJ-A

Configure the system by using the optimal number of safety outputs that satisfy the requirements of the necessary safety category.

F3SJ-E F3SJ-B F3SJ-A

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.

F3SJ-E F3SJ-B F3SJ-A

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 UL 508
- 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 to the EMC Low Voltage Directive)

F3SJ-E F3SJ-B F3SJ-A

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.

F3SJ-E F3SJ-B F3SJ-A

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

F3SJ-E F3SJ-B F3SJ-A

Make sure to perform wiring while the power supply is OFF.

Others F3SJ-E F3SJ-B F3SJ-A

WARNING

To use the F3SJ in PSDI mode (Reinitiation of cyclic operation by the protective equipment), you must configure an appropriate circuit between the F3SJ and the machine. For details about PSDI, refer to OSHA1910.217, IEC 61496-1, and other relevant standards and regulations.

Do not try to disassemble, repair, or modify this product. Doing so may cause the safety functions to stop working properly.

Do not use the F3SJ in environments where flammable or explosive gases are present. Doing so may result in explosion.

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

Do not use radio equipment such as cellular phones, walkie-talkies, or transceivers near the F3SJ.

Note: For customers using the F3SJ-B□□□□P25-01TS:
The functions available are external test, lockout reset, auxiliary output and series connection.

Installation Conditions

Detection Zone and Approach F3SJ-E F3SJ-B F3SJ-A

WARNING

Install a protective structure so that the hazardous part of a machine can only be reached by passing through the sensor's detection zone. Install the sensors so that part of the person is always present in the detection zone when working in a machine's hazardous zones.

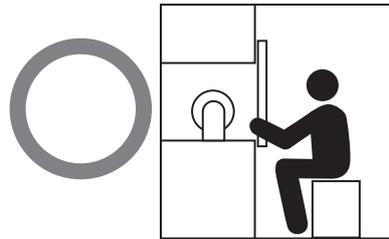
If a person is able to step into the hazardous zone of a machine and remain behind the F3SJ's detection zone, configure the system with an interlock function that prevents the machine from being restarted. Failure to do so may result in serious injury.

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

The F3SJ cannot protect a person from a projectile exiting the hazardous zone. Install protective cover(s) or fence(s).

Right positions

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



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

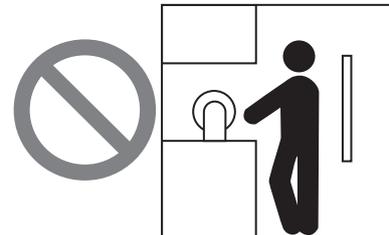


Incorrect installation

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

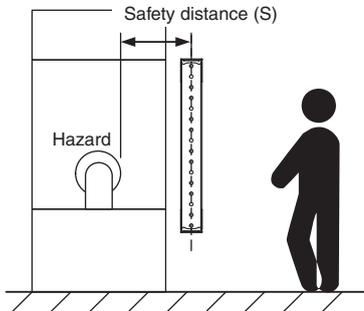


A person is between the sensor's detection zone and the hazardous zone of a machine.



Safety Safety Distance F3SJ-E F3SJ-B F3SJ-A

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



WARNING

Make sure to secure the safety distance (S) between the F3SJ and the hazardous part. 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.

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

How to calculate the safety distance specified by International Standard ISO 13855 (European Standard EN ISO 13855) (Reference)

Detection Zone Orthogonal to Direction of Approach

$S = K \times T + C$. . . Formula (1)

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

<System with a detection capability of 40 mm max.>

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

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

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

[Calculation example]

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

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

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

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

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

If the result of this Formula (3) is less than 500 mm,

$S = 500 \text{ mm}$

<System with a detection capability larger than 40 mm>

Use $K = 1,600 \text{ mm/s}$ and $C = 8 \times (d - 850 \text{ mm})$ in equation (1) for the calculation.

$S = 1,600 \text{ mm/s} \times (T_m + T_s) + 850 \times (d - 14 \text{ mm})$... Formula (4)

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

[Calculation example]

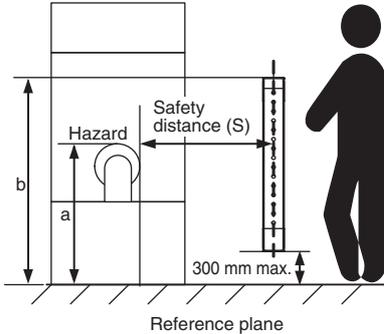
When $T_m = 0.05 \text{ s}$, $T_s = 0.01 \text{ s}$:

$S = 1,600 \text{ mm/s} \times (0.05 \text{ s} + 0.01 \text{ s}) + 850 \text{ mm}$
 $= 946 \text{ mm}$

F3SJ-E/F3SJ-B/F3SJ-A

Possible Circumventing by Reaching Over the Detection Zone

If access to the hazardous zone by reaching over the detection zone of vertically mounted F3SJ cannot be excluded, the height and the safety distance, S, of the F3SJ shall be determined. S shall be determined by comparison of the calculated values in *Detection Zone Orthogonal to Direction of Approach*. The greater value resulting from this comparison shall be applied.



$$S = (K \times T) + Cro \dots \text{Formula (5)}$$

- S: Safety distance
- K: Approach speed to the detection zone
- T: Total response time of the machine and F3SJ
- Cro: Approach distance based on the distance which personnel can move towards the hazardous zone of a machine by reaching over the detection zone. The distance is determined in the table below based on the height of the hazardous zone, a, and the height of the upper edge of the detection zone, b.

Note: Lower edge of the detection zone above 300 mm in relation to the reference plane does not offer sufficient protection against crawling below.

First, use $K = 2,000 \text{ mm/s}$ in formula (5) for the calculation. If the result of this calculation is less than 100 mm, use $S = 100 \text{ mm}$. If the result exceeds 500 mm, use $K = 1,600 \text{ mm/s}$ to recalculate it. If the result of the recalculation is less than 500 mm, use $S = 500 \text{ mm}$.

| Height of hazardous zone, a | Height of upper edge of detection zone, b | | | | | | | | | | | |
|--|---|------|------|------|------|------|------|------|------|------|------|------|
| | 900 | 1000 | 1100 | 1200 | 1300 | 1400 | 1600 | 1800 | 2000 | 2200 | 2400 | 2600 |
| Additional distance to hazardous zone, Cro | | | | | | | | | | | | |
| 2600 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2500 | 400 | 400 | 350 | 300 | 300 | 300 | 300 | 300 | 250 | 150 | 100 | 0 |
| 2400 | 550 | 550 | 550 | 500 | 450 | 450 | 400 | 400 | 300 | 250 | 100 | 0 |
| 2200 | 800 | 750 | 750 | 700 | 650 | 650 | 600 | 550 | 400 | 250 | 0 | 0 |
| 2000 | 950 | 950 | 850 | 850 | 800 | 750 | 700 | 550 | 400 | 0 | 0 | 0 |
| 1800 | 1100 | 1100 | 950 | 950 | 850 | 800 | 750 | 550 | 0 | 0 | 0 | 0 |
| 1600 | 1150 | 1150 | 1100 | 1000 | 900 | 850 | 750 | 450 | 0 | 0 | 0 | 0 |
| 1400 | 1200 | 1200 | 1100 | 1000 | 900 | 850 | 650 | 0 | 0 | 0 | 0 | 0 |
| 1200 | 1200 | 1200 | 1100 | 1000 | 850 | 800 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1000 | 1200 | 1150 | 1050 | 950 | 750 | 700 | 0 | 0 | 0 | 0 | 0 | 0 |
| 800 | 1150 | 1050 | 950 | 800 | 500 | 450 | 0 | 0 | 0 | 0 | 0 | 0 |
| 600 | 1050 | 950 | 750 | 550 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 400 | 900 | 700 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 200 | 600 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

- Note:**
1. Upper edge of the detection zone below 900 mm is not included since they do not offer sufficient protection against circumventing or stepping over.
 2. When determining the values of this table, it shall not be interpolated. If the known values a, b or Cro are between two values of this table, the greater safety distance shall be used.

[Calculation example]

- T: $T_m + T_s$ (s)
- T_m : Machine's response time (s)
- T_s : Response time of the F3SJ from ON to OFF (s)
- a: Height of machine hazardous zone (mm)
- b: Height of upper edge of detection zone (mm)

When $T_m = 0.05 \text{ s}$, $T_s = 0.01 \text{ s}$, $a = 1,400 \text{ mm}$, $b = 1,500 \text{ mm}$:
From the table above, $Cro = 850 \text{ mm}$. Since b is between 1,400 mm and 1,600 mm, $b = 1,400 \text{ mm}$ which has the greater Cro value, shall be used.

$$S = 2,000 \text{ mm/s} \times (0.05 \text{ s} + 0.01 \text{ s}) + 850 \text{ mm} = 970 \text{ mm}$$

Since 970 mm is greater than 500 mm, use $K = 1,600 \text{ mm/s}$ and recalculate it.

$$S = 1,600 \text{ mm/s} \times (0.05 \text{ s} + 0.01 \text{ s}) + 850 \text{ mm} = 946 \text{ mm}$$

Compare $S = 946 \text{ mm}$ with the calculation in *Detection Zone Orthogonal to Direction of Approach*, and choose the larger value as the safety distance.

For the system with a detection capability of 40 mm max., the safety distance S is 946 mm since this is larger than $S = 120 \text{ mm}$ calculated in the calculation example of *Detection Zone Orthogonal to Direction of Approach*.

For the system with a detection capability larger than 40 mm, the safety distance S is 946 mm since this is the same value as $S = 946 \text{ mm}$ calculated in the calculation example of *Detection Zone Orthogonal to Direction of Approach*.

Detection Zone Parallel to Direction of Approach

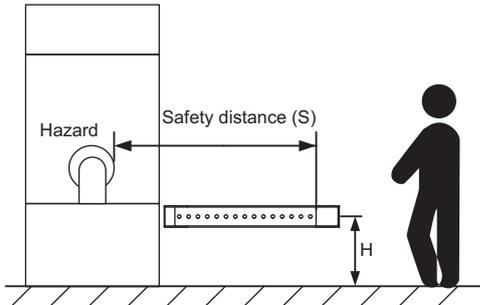
Use $K = 1,600 \text{ mm/s}$ and $C = (1200 - 0.4 \times H)$ in formula (1) for calculation. Note that C must not be less than 850 mm.

$$S = 1,600 \text{ mm/s} \times (T_m + T_s) + 1200 - 0.4 \times H$$

- S : Safety distance (mm)
- T_m = Machine's response time (s)
- T_s = Response time of F3SJ from ON to OFF (s)
- H = Installation height (mm)

Note that H must satisfy:

$$1000 \geq H \geq 15 (d - 50 \text{ mm}) \geq 0 \text{ mm}$$



Also, you must include a hazardous condition under which a person may go through under a detection zone if H exceeds 300 mm (200 mm for other purpose than industrial use) into risk assessment.

[Calculation example]

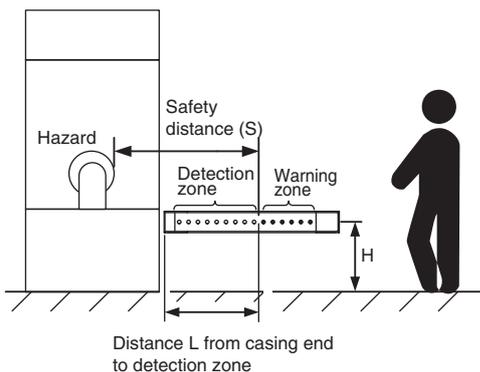
When $T_m = 0.05 \text{ s}$, $T_s = 0.01 \text{ s}$, and $d = 14 \text{ mm}$:

$$S = 1,600 \text{ mm/s} \times (0.05 \text{ s} + 0.01 \text{ s}) + 1200 - 0.4 \times 500 \text{ mm} = 1096 \text{ mm}$$

When a warning zone is configured as in the figure, you must calculate L , a distance from an end of casing to a detection zone, using a formula below:

$$L = (\text{Total number of F3SJ beams} - \text{number of warning zone beams} - 1) \times P + 10$$

- P : Beam Gap (mm)
- F3SJ-A□□□□P14/N14 . . . 9 mm
- F3SJ-A□□□□P20/N20 . . . 15 mm
- F3SJ-A□□□□P25/N25 . . . 20 mm
- F3SJ-A□□□□P30/N30 . . . 25 mm
- F3SJ-A□□□□P55/N55 . . . 50 mm



Refer to the F3SJ User's Manual for details. For manual number, check the "Related Manuals" at the end of the catalog.

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

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

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

- S : Safety distance
- K : Approach speed to the detection zone

(the value recommended by OSHA standard is 1,600 mm/s)

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

- T_s = Machine's stop time (s)
- T_s = Response time of the F3SJ from ON to OFF (s)
- T_c = Machine control circuit's maximum response time required to activate its brake (s)
- T_{bm} = Additional time (s)

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

- D_{pf} = Additional distance

According to ANSI's formula, D_{pf} is calculated as shown below:
 $D_{pf} = 3.4 \times (d - 7.0)$: Where d is the detection capability of the F3SJ (unit: mm)

[Calculation example]

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

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

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

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

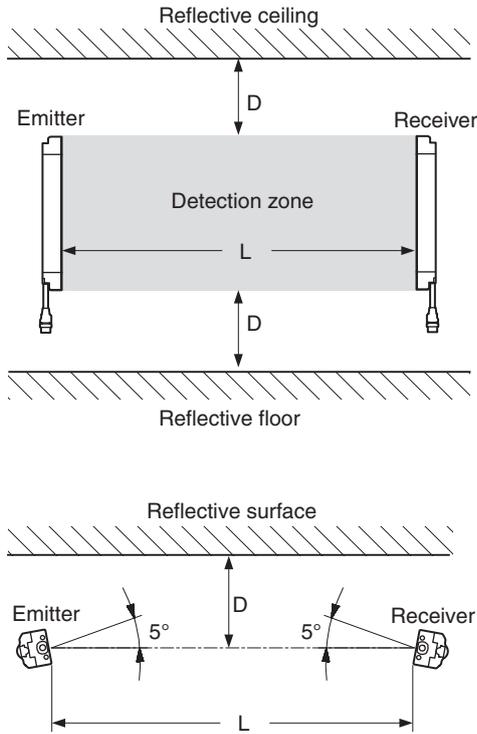
F3SJ-E/F3SJ-B/F3SJ-A

Distance from Reflective Surface F3SJ-E F3SJ-B F3SJ-A

WARNING

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

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



| Distance between emitter and receiver (operating range L) | Allowable installation distance D |
|---|--|
| For 0.2 to 3 m | 0.13 m |
| For 3 m or more | $L/2 \times \tan 5^\circ = L \times 0.044$ (m) |

Mutual Interference Prevention F3SJ-E F3SJ-B F3SJ-A

WARNING

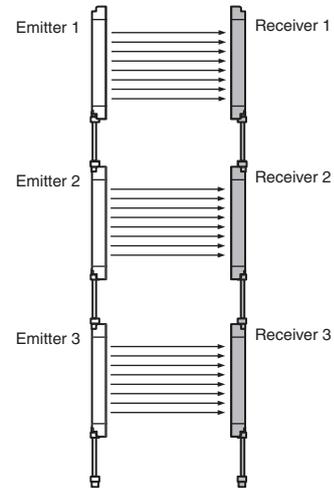
Do not use the sensor system with mirrors in a regressive reflective configuration. Doing so may hinder detection. It is possible to use mirrors to "bend" the detection zone to a 90-degree angle.

When using 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 F3SJ-B F3SJ-A

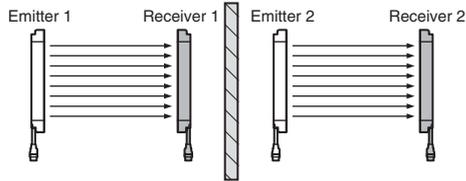
Series connection can prevent mutual interference when multiple sensors are used. Up to 3 sets with 192 beam for F3SJ-B series, or up to 4 sets with 400 beams for F3SJ-A series can be series-connected. Emission of series-connected F3SJ is time-divided, ensuring safety without occurring mutual interference.



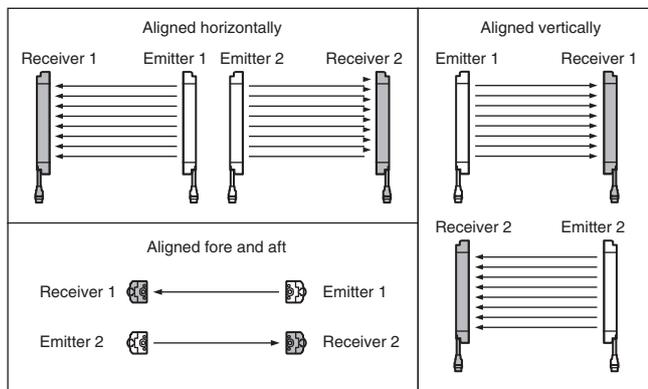
No series connections **F3SJ-B** **F3SJ-A**

Mutual interference is prevented in up to three sets, using interference light detection and cycle shift algorithm.
 If 4 or more sets of F3SJs are installed and are not connected to each other, arrange them so that mutual interference does not occur.
 If two sets are installed near each other, reflection from the surface of the F3SJ may cause mutual interference. When mutual interference occurs, the safety outputs are turned OFF momentarily or the F3SJ enters lockout state. Combining countermeasures 1 to 3 shown below is effective.

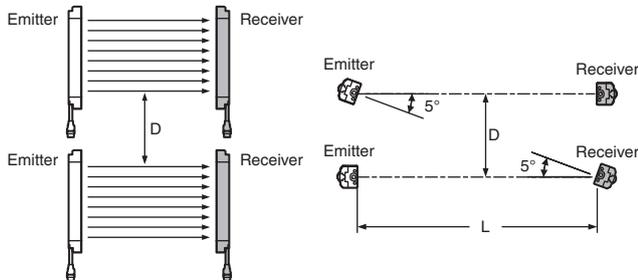
1. Install a physical barrier



2. Alternate the direction of emission (alternation)

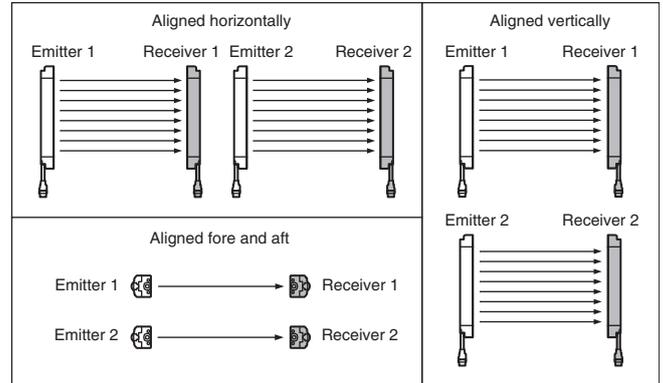


3. Keep sufficient distance between the F3SJs so that mutual interference does not occur



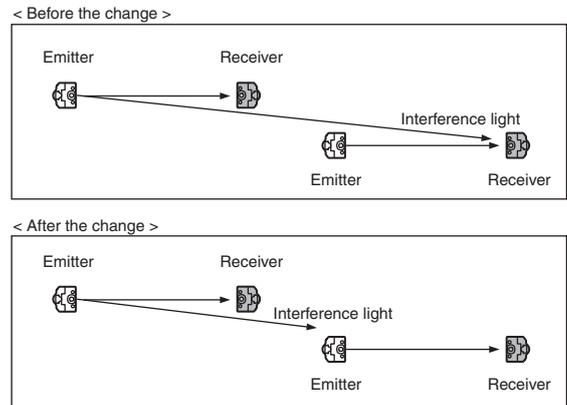
| Distance between emitter and receiver (operating range L) | Allowable installation distance D |
|---|--|
| For 0.2 to 3 m | 0.26 m |
| For 3 m or more | $L \times \tan 5^\circ = L \times 0.088 \text{ (m)}$ |

Installation shown below may cause mutual interference. When mutual interference occurs, the safety outputs are turned OFF momentarily or the F3SJ enters lockout state.



F3SJ-A

If two sets are installed near each other, reflection from the surface of the F3SJ may cause mutual interference. Use of F3SJ-A can improve the condition by shortening operating range with the setting tool.



F3SJ-E/F3SJ-B/F3SJ-A

Related Manuals

| Man. No. | Model | Manual name |
|----------|------------------------|---|
| SCHG-718 | F3SJ-A□□□□P□□ | F3SJ-A□□□□P□□ (Ver.2) Safety Light Curtain User's Manual |
| SCHG-720 | F3SJ-A□□□□P□□-TS | F3SJ-A□□□□P□□-TS Safety Light Curtain User's Manual |
| SCHG-722 | F3SJ-A□□□□P□□-01TS | F3SJ-A□□□□P□□-01TS Safety Light Curtain User's Manual |
| SCHG-719 | F3SJ-A□□□□N□□ | F3SJ-A□□□□N□□(Ver.2) Safety Light Curtain User's Manual |
| SCHG-726 | F3SJ-A□□□□N□□-01T | F3SJ-A□□□□N□□-01T(Ver.2) Safety Light Curtain User's Manual |
| SCHG-716 | F3SJ-AM□P□□□ | F3SJ-AM□P□□□(Ver.2) Multi-beam Safety Sensor User's Manual |
| SCHG-734 | F3SJ-B□□□□P25-01TS | F3SJ-B□□□□P25-01TS Safety Light Curtain User's Manual |
| SCHG-733 | F3SJ-E□□□□N25/B□□□□N25 | F3SJ-E□□□□N25/B□□□□N25 Safety Light Curtain User's Manual |
| SCHG-732 | F3SJ-E□□□□P25/B□□□□P25 | F3SJ-E□□□□P25/B□□□□P25 Safety Light Curtain User's Manual |
| SCHG-712 | F39-MC21 | F39-MC21 F39-MC21 Setting Console Instruction Sheet |
| SCHG-736 | F3SJ-B□□□□P25-02TS | F3SJ-B□□□□P25-02TS Safety Light Curtain User's Manual |

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