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Cat. No. E502-E2-01

F3S-B Series
Safety Light Curtain

Instruction Manual

OMRON

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Introduction

Thank you for purchasing the F3S-B series Safety Light Curtain.
Always heed the following points when using the F3S-B:

- Make sure that personnel operating the F3S-B are knowledgeable about the machine on which it is installed
- Read this manual completely and be sure you understand the information provided before attempting to operate the F3S-B
- Keep the manual in a secure and convenient location and refer to it as necessary.

Regulations and Standards

(1) The F3S-B has not received the type approval provided by Article 44-2 of the Industrial Safety and Health Law of Japan. Therefore, it cannot be used in Japan as a safety device for pressing or shearing machines provided by article 42 of that law.

(2) The F3S-B is electro-sensitive protective equipment (ESPE) in accordance with European Union (EU) Machinery Directive Annex IV, B. Safety Components, Item 1.
The F3S-B complies with the following regulations and standards.

- EU regulations and technical standards:
  - Machinery Directive: No. 98/37/EC
  - EMC Directive: No. 89/336/EEC
  - EN 61496-1 (06/98) (Type 2 ESPE), IEC 61496-2 (1997) (Type 2 AOPD)

- IEC standards
  - IEC 61496-1 (1997) (Type 2 ESPE), IEC 61496-2 (1997) (Type 2 AOPD)

(3) The F3S-B received the following approvals from the EU accredited bodies.

- Certificate of a Notified Body for EC Type-Examination referred to in the EU Machinery Directive Annex IV, from TÜV Hannover/Sachsen-Anhalt e.V.
- Certificate of a Competent Body referred to in the EU EMC Directive, from Technischer Überwachungs-Verein Nord

(4) The F3S–B received the following approvals from the third–party testing laboratory UL.

- UL Listed (UL508, IEC61496-1 and –2)
- UL Listed to Canadian safety standards (CSA C22.2 No. 14 and No.0.8, IEC61496-1 and –2)
- Programmable system certificate (UL1998, IEC61496–1)

(5) The following standards are referenced when designing the F3S–B. To comply with these standards, be sure to design and use in accordance with all regulations and standards related to them. Contact an expert agency such as TÜV and UL if any of the above points are unclear.

- EN415–4
- OSHA 29 CFR 1910. 212
- ANSI/RIA 15.06 (Risk reduction category : R2B)

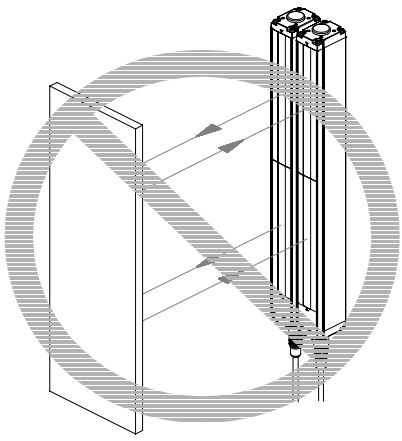
Precaution on Safety

- **General conventions for safe use**
  The following conventions are used for precautionary items in this manual in order to ensure safe and proper use of the F3S-B. Items listed here are critical for safety and must be heeded at all times.

	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

	Indicates prohibited actions.

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⚠
The F3S-B is a TYPE 2 Electro-sensitive protective equipment, intended to be used as or with the safety related part of control system to category 2,1, or B as defined in the European standard EN954-1. Do not use the F3S-B in category 3 or 4 systems.
Do not use the F3S-B on machines that cannot be stopped by electrical control in case of an emergency.
Install protective structures around the machine so that you must pass through the detection zone to reach a hazardous part of the machine (see “2-1 Installation Conditions”). Install the F3S-B so that some part of the operator’s body remains in the detection zone at all times when the operator works in a hazardous area (see “2-1 Installation Conditions”). Failure to do so may result in serious injury.
A qualified person, as determined by local regulations, must confirm that installation, inspection and maintenance are implemented correctly.
Always maintain the safety distance between the F3S-B and a hazardous part of a machines (see “2-1 Installation Conditions”).
Do not install the F3S-B in a location affected by wall reflections (see “2-1 Installation Conditions”).
Do not short the output lines to the +24 V line. Doing so will cause the output to be always ON, creating a hazardous situation.
Do not connect the F3S-B to a power supply with voltage higher than 24 VDC + 20 %. Do not connect the F3S-B to an AC power supply.
Be sure to conduct inspections regularly (see “6 Maintenance”).
The F3S-B cannot be used in applications where hazardous projectiles may exit the protected zone.
Do not disassemble, repair or modify the F3S-B.
Do not use the F3S-B in flammable or explosive environments.
DC power supply units must satisfy all of the conditions below so that the F3S-B can comply with the applicable standards IEC 61496-1 and UL 508. • The power supply voltage must be within rating (24 VDC ± 20 %). • The power supply is connected only to the F3S-B and to the devices related to the electro-sensitive protective function of the F3S-B, such as a safety controller and muting sensors, and it has enough rated current for all the devices. The power supply is not connected to other devices or machines. • The power supply uses double or reinforced insulation between the primary and secondary circuits • The power supply has automatic reset characteristics (voltage drop) to protect overcurrent. • The power supply maintains an output holding time of at least 20 ms. • FG (frame ground terminal) must be connected to PE (protective earth) when using a commercially available switching regulator. • The power supply must have output characteristics required for the power source for Class 2 Circuit or Limited Voltage/Current Circuit as defined in UL508 (see “2-3-1 Remark”). • The power supply must conform to regulatory requirements and standards, regarding EMC and electrical equipment safety, of the country where the F3S-B is installed and where machinery will be operated, for example: The EMC Directive (industrial environment) and the Low Voltage Directive in EU.
Do not use the F3S-B in a retroreflective configuration. Otherwise detection may fail. 

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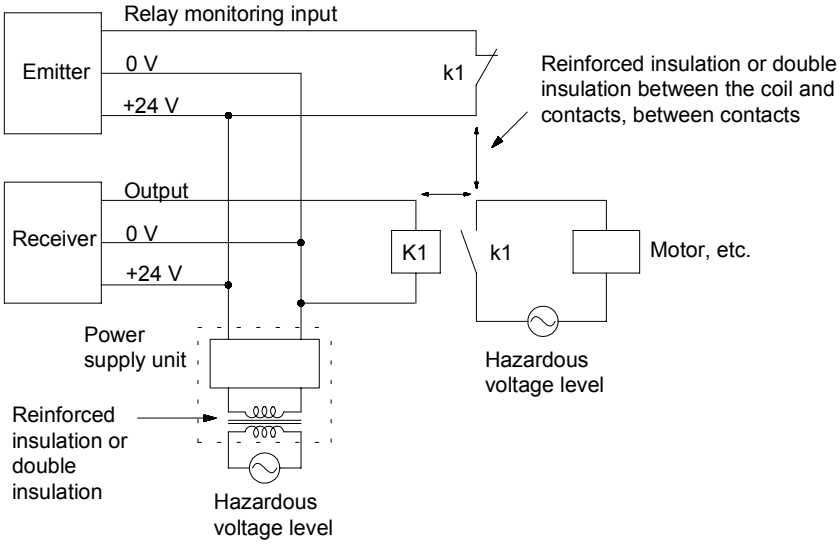
Notice

For your safety, always pay attention to the following:

- Installation Environment
  - Do not install the F3S-B in the following environments:
    - Areas exposed to intense interference light such as direct sunlight.
    - Areas with high-humidity where condensation is likely to occur.
    - Areas exposed to corrosive gases.
    - Areas exposed to vibration or shock levels higher than specification provisions.
    - Areas where the light curtain may come in direct contact with water.
  - Do not use radio equipment, such as cellular phones, walkie-talkies, or transceivers with high power, near the F3S-B.

- Wiring and Mounting
  - Be sure to route the F3S-B cable separate from high-potential power lines or through an exclusive conduit.
  - Be sure to turn OFF the power prior to wiring. Otherwise, the diagnostic function may prevent the sensor from operating.
  - When using cables with a connector other than the F39-JB series cable, make sure the connector is rated IP54 or higher.
  - The F3S-B will start operating in two seconds after the power is turned ON. Make sure that no operation faults will occur in the control system during this time.
  - The emitter and receiver are to be mounted in parallel and facing one another.

- Loads must satisfy all the conditions below.
  - Is not short-circuited.
  - Is not used with current higher than the rating.
  - Is reinforced insulated or double insulated as shown in the following figure to prevent the output from being subjected to a hazardous voltage when the load is a relay. The insulation shown in the figure below should insulate against hazardous voltage levels (230 VAC, etc.), not simply against 24 VDC.



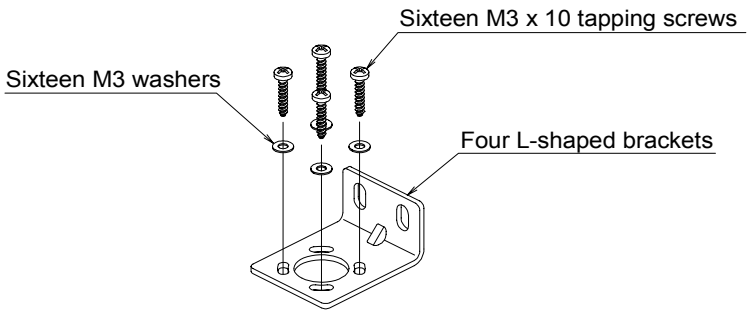
- Two control outputs must be used.
- The procedures of installation and inspection in this manual should be read carefully.
- Do not use any solvents such as paint thinners, benzene or acetone to clean the F3S-B because they will dissolve resin and paint.
- Do not use screw-locking adhesives (screw lock) to secure the cap unit or connector cap screws because the adhesive may cause the resin to deteriorate and crack.
- The F3S-B can not detect transparent or semi-transparent materials.
- After unpacking the emitter and receiver, install them facing each other.
- Be sure to dispose of the F3S-B as industrial waste.

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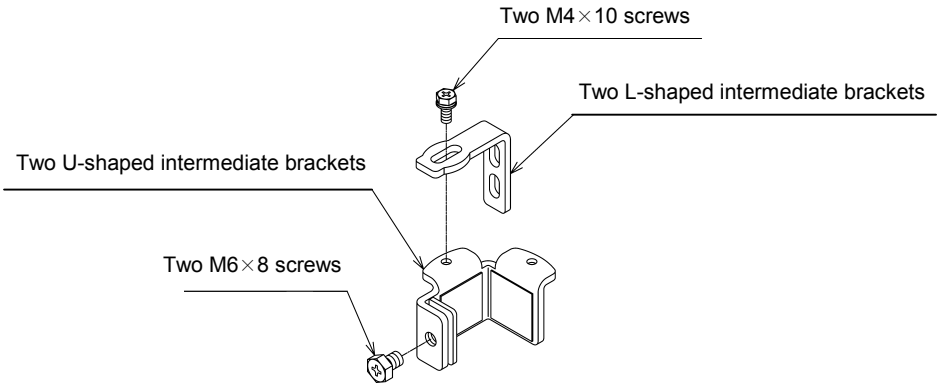
PRIOR TO USE

Make sure the following items were supplied with each F3S-B, contact your nearest OMRON representative or distributor if any item is missing.

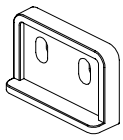
- F3S-B unit (emitter qty. 1, receiver qty. 1)
- Mounting brackets (top and bottom) qty. 4



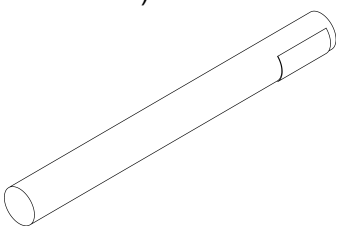
- Mounting brackets (intermediate) qty. 2
  (Supplied with types which have a protective height of 1050 mm or longer)



- Mounting plates qty. 4
  (Supplied with types which have a protective height of 1050 mm or longer)



- Test Rod Ø 30 mm qty. 1
  (Supplied with F3S-B□□2P and BM□□2P□□)



- Instruction manual (this manual) qty. 1
  (Supplied with F3S-B□□□P and BM□□□P□□)

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DESCRIPTION Section 1

1-1 Basics

Use the F3S-B only in category 2, 1, or B applications as defined in pr EN 1050 or EN 954-1. Do not use the F3S-B in category 3 or 4 systems.

The F3S-B Safety Light Curtain is a multi-axis transmissive-type light array which uses microprocessor technology.

It is used to stop a machine before the hazard is reached when any part of the detection zone is interrupted.

It consists of an IR (infrared) Emitter and a Receiver. Optional devices are available for the system with further safety requirements.

1-2 Features

- Self-test
- Optical resolution of 30, 55 or 80 mm in diameter
- Detection distance from 0.3 to 5.0 m
- Max. protective height of 1,650 mm
- TÜV approvals and CE marking
- UL listed to U.S. and Canadian safety standard
- IP 65 enclosure rating
- Start/restart interlock function selectable
- Blanking, Start Interlock, Relay monitoring functions optionally available
- Series connection types available

1-3 Standard Functions

1-3-1 Start/restart interlock

This function keeps the F3S-B in the OFF-state after power ON and every interruption of the detection zone. To reset this condition, 17 VDC to Vs (nominal 24 VDC) must be applied to the Interlock selection input of the emitter for 15 to 2500 ms. Otherwise the OFF-state continues even if nothing interrupts the detection zone.

This function can be selected/deselected as follows;
Active mode: By not connecting the Interlock selection input line or by connecting it to 0V line before turning the power ON.
Inactive mode (Automatic start): By connecting the Interlock selection input line to the Instability output line before turning the power ON (see “2-3-2 Wiring diagram”).

Note: The switch to reset the start/restart interlock condition has to be installed out of the hazardous area. When the start/restart interlock is reset, the hazardous area must be visibly free.

1-3-2 Testing

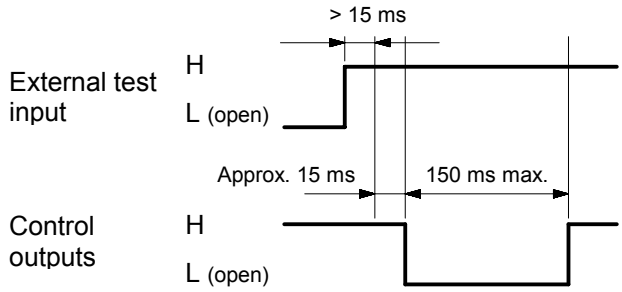
Self-test after Power-ON
After the power is turned ON, the F3S-B performs a complete self-test within 2 seconds. If no failure is found, the F3S-B goes into normal operation.

Self-test during Normal Operation
The F3S-B periodically checks all safety related functions at least every 2 seconds. All components and memories are tested in this periodic check.

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External Test

If your application requires periodic testing more often than every 2 seconds an external control system is able to initiate an external test with the External test function. If a signal of 17 VDC to Vs is applied to the External test input at least 15 ms, a self-test starts and the outputs turn to the OFF-state in 15 ms. If no failure is detected, the outputs return to the ON-state after a maximum of 150 ms.



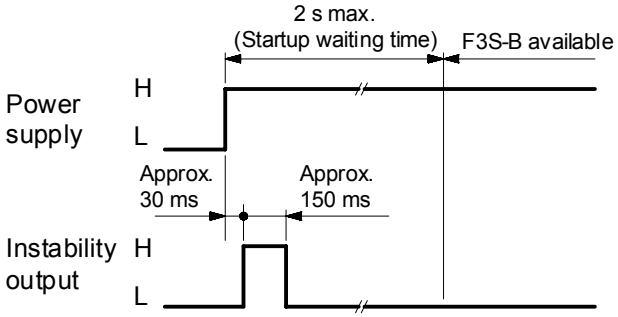
Failure detection and restoration

When a failure is detected through the tests above, the F3S-B keeps the outputs in the OFF-state and the indicators show the type of failure, refer to section “8 Troubleshooting”. After the failure is eliminated, in most cases the F3S-B operation will be restored automatically.

1-3-3 Instability Output

When the received light is insufficient, the instability output and the instability indicator turn ON. In normal operation, both are OFF. See also “1-8 Indicators”.
This output makes it possible for customers to monitor deterioration of optical performance due to aging or other factor, such as reduction of LED power, misalignment between the emitter and receiver, or dust on the lens.
Also, when a failure is detected, or the F3S-B is connected with the F39-E1 interface unit, the instability output turns ON as well.

Note: After the power is turned ON, the instability output goes to the ON-state for approximately 150 ms as shown in the timing chart for Interlock mode selection.



1-4 Optional Functions

These functions can be activated by the optional function software, F39-U1E (see the F39-U1E manual for detailed information).

Note: The F39-U1E Optional Function Software is used with the F39-E1 Interface Unit, a PC (running Microsoft® Windows®95, Windows®98 or Windows NT®), the F39-JB1C Interface Cable, and a RS-232C cable.

1-4-1 Start Interlock

When the Start interlock function is used, the F3S-B does not go to the ON-state automatically after power ON. Interrupting one or more axes resets the start interlock condition, so the F3S-B can start normal operation.

1-4-2 Relay Monitoring

MPCEs (Machine Primary Control Elements) are usually relays or contactors used to control hazardous movement directly. The state of the MPCEs can be checked with the Relay monitoring function.
A voltage of 17 VDC to Vs has to be applied to the Relay monitoring input through the NC contacts of the MPCEs when the F3S-B control outputs are in the OFF-state (see “2-3-2 Wiring diagram”). To ensure this logic relation, the MPCEs must be safety approved types, with forcibly guided contacts.

1-4-3 Blanking

With this function, one or more axes can be disabled. To select the blanking axes, a manual setting function or teaching function is available. This function is useful when part of the F3S-B detection zone is interrupted.

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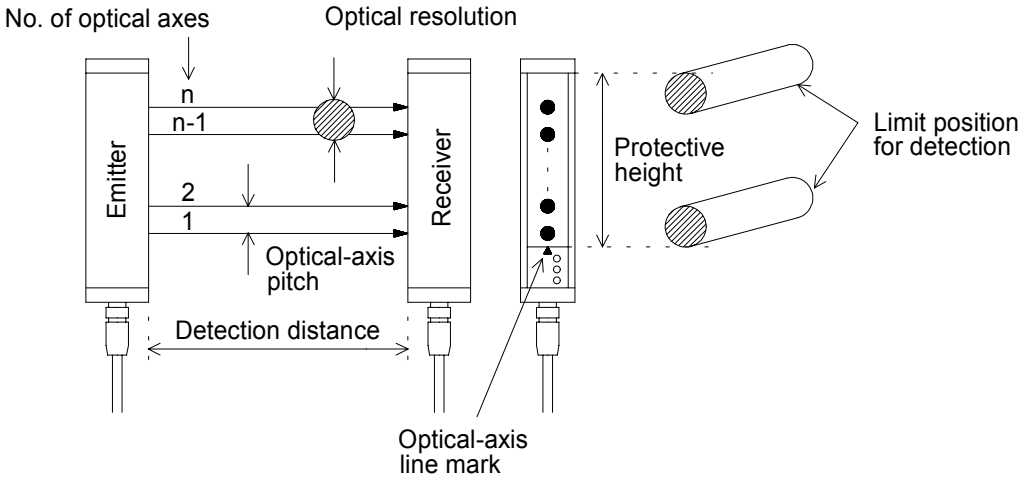
1-5 Detection zone

Protective height

The F3S-B can detect in the area indicated by “Protective height” in the figure below. The protective height is from “the Optical-axis line mark above the indicator area” to “the end of the yellow metal case”.

Optical-axis line mark

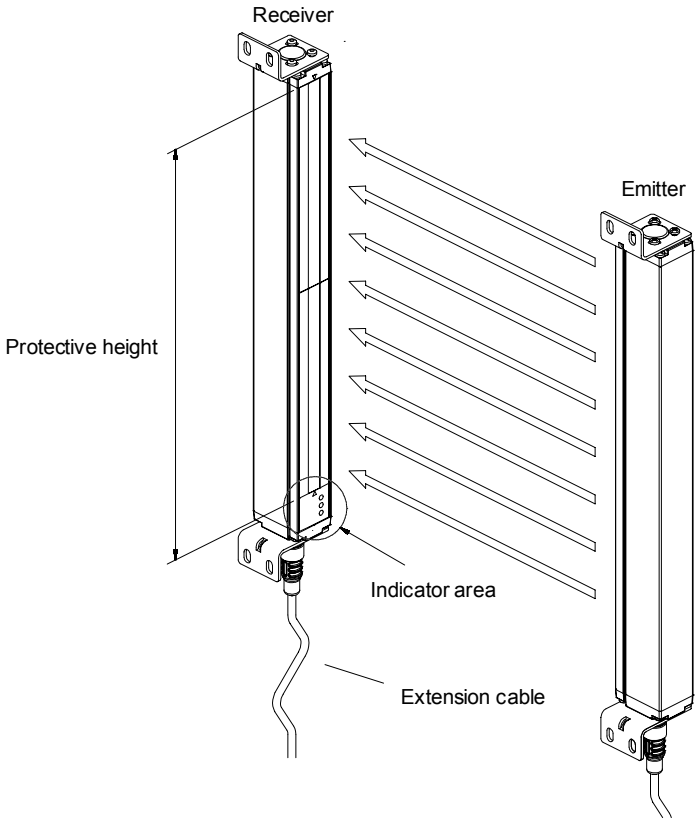
The center line for optical axes is indicated by the triangle mark. This position is a reference line for measuring safety distance.



1-6 Configuration variation

1-6-1 Stand-alone type

This is the most common configuration, and it is used to protect a hazardous part of a machine when approached from one direction only.



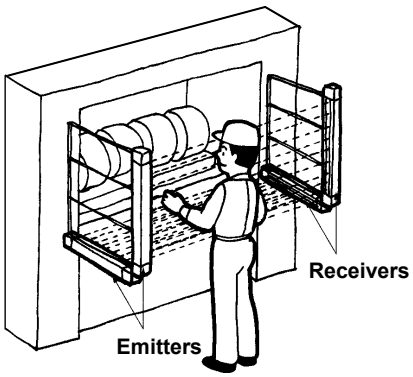
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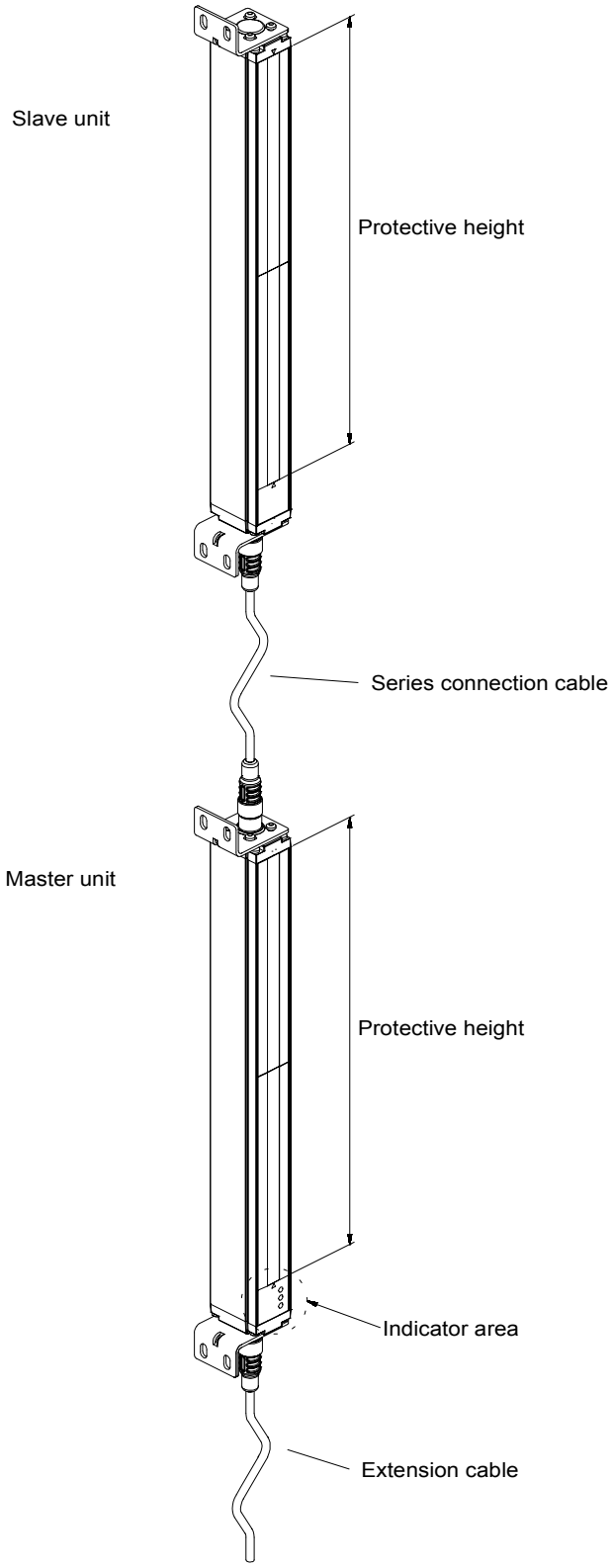
1-6-2 Series connection types

When your application requires an additional protective zone, for example, to prevent someone from staying behind a primary detection zone, the F3S-B may be connected in series. The system consists of a master unit, a slave unit, and a series connection cable, type F39-JB1B (refer to “2-3-2 Wiring diagram” and “7 Accessories (Optional)”). The series connection allows up to 96 axes and 2.4 m of protective height in total.

Series connection types have the same characteristics as a stand-alone types. When the detection zone of the master unit or that of the slave unit is interrupted, the outputs of the master unit go to the OFF-state.
However, please note that a slave unit does not have indicators.

Note: Both the master unit and the slave unit need to be ordered separately.





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1-7 Ratings and Performance

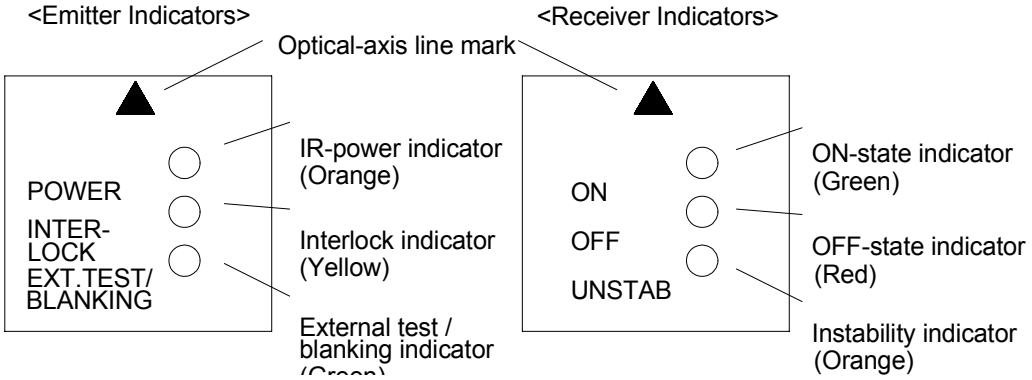
Type / Item	F3S-B□□□P (*1) Stand-alone			F3S-BM□□□P□□ (*1) Master unit for series connection			F3S-BS□□□ (*1) Slave unit for series connection		
No. of optical axes	12 to 66	6 to 33	4 to 22	12 to 66	6 to 33	4 to 22	12 to 30	6 to 15	4 to10
Optical-axis pitch	25 mm	50 mm	75 mm	25 mm	50 mm	75 mm	25 mm	50 mm	75 mm
Optical resolution (Detection capability)	Non-transparent: □□ in diameter								
	30 mm	55 mm	80 mm	30 mm	55 mm	80 mm	30 mm	55 mm	80 mm
Protective height	300 / 450 / 600 / 750 / 900 / 1,050 / 1,200 / 1,350 / 1,500 / 1,650 mm						300 / 450 / 600 / 750 mm		
Detection distance	0.3 to 5.0 m								
Response time	ON to OFF : See “1-10 Table of Response Time” OFF to ON (*2): Default 100 ms (selectable with F39-U1E, 80 to 400 ms)								
Startup waiting time	2 s max.								
Supply voltage: Vs	24 VDC ± 20% (including 5 Vp-p ripple)								
Current consumption	400 mA max. (under no-load conditions)								
Light source	Infrared LED (880 nm wavelength). Lifetime: 50,000 hrs. at 25 °C.								
Effective aperture angle	Within ± 5° for the emitter and receiver at a detection distance of at least 3 m according to IEC 61496-2								
Operating mode	Light ON								
Control output	Two PNP transistor outputs, operational current (load current) 200 mA max., residual voltage 2 V max. (except for voltage drop due to cable extension)								
Instability output	PNP transistor output (not safety-related control output), load current 100 mA max., residual voltage 2 V max. (except for voltage drop due to cable extension)								
Protection circuit	Output short-circuit protection, power supply reverse connection protection								
Start/restart interlock function	Mode selection before power ON by connecting “Interlock selection input” line to: Active : No connection or 0 to 2.5 VDC, 3 mA max. Inactive : Instability output line Reset of start/restart interlock by connecting “Interlock selection input” line to: Interlock reset : 17 VDC to Vs, 20 mA max. Duration time 15 to 2,500 ms								
External test function	Mode selection by connecting “External test input” line to: Active : 17 VDC to Vs, 10 mA max. Duration time at least 15 ms Inactive : No connection or 0 to 2.5 VDC, 2 mA max.								
Relay monitoring function (Optional)	Default inactive, selectable with F39-U1E Relay monitoring input line with NC contact connected, Available level : 17 VDC to Vs, 10 mA max. Allowed relay delay time (*2) : Selectable between 20 and 300 ms Termination when not selected : No connection or 0 to 2.5 VDC, 2 mA max.								
Start interlock function (Optional)	Default inactive, selectable with F39-U1E								
Blanking function (Optional)	Default inactive, selectable with F39-U1E								
Indicators	See “1-8 Indicators”						No indicators		
Connection method	For Extension cable : 8 pins, M12 connector For Series connection cable : 6 pins, M12 connector								
Ambient temperature	During operation : –10 to 55 °C (with no freezing) During storage : –25 to 70 °C								
Ambient humidity	During operation : 35 to 85 %RH (with no condensation) During storage : 35 to 95 %RH								
Insulation resistance	20 MΩ min. (at 500 VDC)								
Dielectric strength voltage	1,000 VAC 50/60 Hz for 1 min								

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Type / Item	F3S-B□□□P (*1) Stand-alone	F3S-BM□□□P□□ (*1) Master unit for series connection	F3S-BS□□□ (*1) Slave unit for series connection
Degree of protection	IEC60529 IP65		
Vibration resistance	Normal operation : 10 to 55 Hz, double-amplitude: 0.7mm, X, Y and Z directions 20 sweeps		
Shock resistance	Normal operation : 100 m/s^2 [10 G], X, Y and Z directions: 1000 times		
Materials	Case: Aluminum Front cover: PMMA (acrylic resin) End caps: PA6		
Size (cross section)	30 x 40 mm		
Accessories	Test rod (*3), mounting brackets (top and bottom), mounting brackets (intermediate) (*4), mounting plates (*4), Instruction manual(*5)		
Applicable standard	IEC(EN)61496-1 TYPE 2 ESPE (Electro-Sensitive Protective Equipment) IEC 61496-2 TYPE 2 AOPD (Active Opto-electronic Protective Devices)		

*1 For detailed type names and optical specifications, see “1-9 Table of Types”.
*2 Nominal value (Set time). The accuracy is – 0 / + 70% of ON to OFF response time.
*3 Only with F3S-B□□2P and BM□□2P□□.
*4 For the 1,050 mm protective height and longer types.
*5 Only with F3S-B□□□P and BM□□□P□□.

1-8 Indicators



Emitter	IR-power indicator	: Lit when emitting.
	Interlock indicator	: Lit during start/restart interlock and start interlock.
	External test/ blanking indicator	: Lit during external test. / Flashing when using blanking function.
Receiver	ON-state indicator	: Lit when receiving light.
	OFF-state indicator	: Lit with interrupted light. Flashing during connection with F39-E1 or with failure.
	Instability indicator	: Lit with an insufficient light reception or failure. Flashing during connection with F39-E1.

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1-9 Table of Types

Type Naming Rule

F3S - B [M] [36] [2] [P] [12] - [L]

blank	⇨ Stand-alone
M	⇨ Master unit for series connection
S	⇨ Slave unit for series connection
36	⇨ No. of optical axis (4-66)
2	⇨ 25mm optical pitch
5	⇨ 50mm optical pitch
7	⇨ 75mm optical pitch
blank	⇨ Slave unit
P	⇨ PNP outputs
blank	⇨ Stand-alone or slave unit
12	⇨ No. of optical axis of the connected slave unit for 25mm optical pitch type : 12, 18, 24, or 30 for 50mm optical pitch type : 06, 09, 12, or 15 for 75mm optical pitch type : 04, 06, 08, or 10
blank	⇨ Complete set of emitter and receiver
L	⇨ Emitter unit only
D	⇨ Receiver unit only

Stand-alone	Master unit	Slave unit	Optical resolution	No. of optical axes	Protective height	Weight (without accessories)
F3S-B122P	F3S-BM122P□□	F3S-BS122	30 mm	12	300 mm	0.9 kg
F3S-B182P	F3S-BM182P□□	F3S-BS182		18	450 mm	1.2 kg
F3S-B242P	F3S-BM242P□□	F3S-BS242		24	600 mm	1.5 kg
F3S-B302P	F3S-BM302P□□	F3S-BS302		30	750 mm	1.8 kg
F3S-B362P	F3S-BM362P□□			36	900 mm	2.1 kg
F3S-B422P	F3S-BM422P□□			42	1,050 mm	2.5 kg
F3S-B482P	F3S-BM482P□□			48	1,200 mm	2.8 kg
F3S-B542P	F3S-BM542P□□			54	1,350 mm	3.1 kg
F3S-B602P	F3S-BM602P□□			60	1,500 mm	3.4 kg
F3S-B662P	F3S-BM662P□□			66	1,650 mm	3.7 kg
F3S-B065P	F3S-BM065P□□	F3S-BS065	55 mm	6	300 mm	0.9 kg
F3S-B095P	F3S-BM095P□□	F3S-BS095		9	450 mm	1.2 kg
F3S-B125P	F3S-BM125P□□	F3S-BS125		12	600 mm	1.5 kg
F3S-B155P	F3S-BM155P□□	F3S-BS155		15	750 mm	1.8 kg
F3S-B185P	F3S-BM185P□□			18	900 mm	2.1 kg
F3S-B215P	F3S-BM215P□□			21	1,050 mm	2.5 kg
F3S-B245P	F3S-BM245P□□			24	1,200 mm	2.8 kg
F3S-B275P	F3S-BM275P□□			27	1,350 mm	3.1 kg
F3S-B305P	F3S-BM305P□□			30	1,500 mm	3.4 kg
F3S-B335P	F3S-BM335P□□			33	1,650 mm	3.7 kg
F3S-B047P	F3S-BM047P□□	F3S-BS047	80 mm	4	300 mm	0.9 kg
F3S-B067P	F3S-BM067P□□	F3S-BS067		6	450 mm	1.2 kg
F3S-B087P	F3S-BM087P□□	F3S-BS087		8	600 mm	1.5 kg
F3S-B107P	F3S-BM107P□□	F3S-BS107		10	750 mm	1.8 kg
F3S-B127P	F3S-BM127P□□			12	900 mm	2.1 kg
F3S-B147P	F3S-BM147P□□			14	1,050 mm	2.5 kg
F3S-B167P	F3S-BM167P□□			16	1,200 mm	2.8 kg
F3S-B187P	F3S-BM187P□□			18	1,350 mm	3.1 kg
F3S-B207P	F3S-BM207P□□			20	1,500 mm	3.4 kg
F3S-B227P	F3S-BM227P□□			22	1,650 mm	3.7 kg

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1-10 Table of Response Time

1-10-1 Stand-alone type

	Response time [ms]
F3S-B122P	20
F3S-B182P	20
F3S-B242P	20
F3S-B302P	23
F3S-B362P	27
F3S-B422P	30
F3S-B482P	34
F3S-B542P	37
F3S-B602P	41
F3S-B662P	45

	Response time [ms]
F3S-B065P	20
F3S-B095P	20
F3S-B125P	20
F3S-B155P	20
F3S-B185P	20
F3S-B215P	21
F3S-B245P	22
F3S-B275P	24
F3S-B305P	26
F3S-B335P	28

	Response time [ms]
F3S-B047P	20
F3S-B067P	20
F3S-B087P	20
F3S-B107P	20
F3S-B127P	20
F3S-B147P	20
F3S-B167P	20
F3S-B187P	20
F3S-B207P	20
F3S-B227P	21

1-10-2 Series connection types

The following chart shows the response time of combinations of a master unit and a slave unit connected in series. For example, the response time of the combination of F3S-BM122P30 and F3S-BS302 is 30 ms.

	Response time [ms]			
Slave unit / **Master unit**	F3S-BS122	F3S-BS182	F3S-BS242	F3S-BS302
F3S-BM122P□□	20	23	27	30
F3S-BM182P□□	23	27	30	34
F3S-BM242P□□	27	30	34	37
F3S-BM302P□□	30	34	37	41
F3S-BM362P□□	34	37	41	45
F3S-BM422P□□	37	41	45	49
F3S-BM482P□□	41	45	49	54
F3S-BM542P□□	45	49	54	57
F3S-BM602P□□	49	54	57	61
F3S-BM662P□□	54	57	61	65
Slave unit / **Master unit**	F3S-BS065	F3S-BS095	F3S-BS125	F3S-BS155
F3S-BM065P□□	20	20	20	21
F3S-BM095P□□	20	20	21	22
F3S-BM125P□□	20	21	22	24
F3S-BM155P□□	21	22	24	26
F3S-BM185P□□	22	24	26	28
F3S-BM215P□□	24	26	28	30
F3S-BM245P□□	26	28	30	32
F3S-BM275P□□	28	30	32	34
F3S-BM305P□□	30	32	34	35
F3S-BM335P□□	32	34	35	37
Slave unit / **Master unit**	F3S-BS047	F3S-BS067	F3S-BS087	F3S-BS107
F3S-BM047P□□	20	20	20	20
F3S-BM067P□□	20	20	20	20
F3S-BM087P□□	20	20	20	20
F3S-BM107P□□	20	20	20	20
F3S-BM127P□□	20	20	20	21
F3S-BM147P□□	20	20	21	23
F3S-BM167P□□	20	21	23	24
F3S-BM187P□□	21	23	24	25
F3S-BM207P□□	23	24	25	26
F3S-BM227P□□	24	25	26	27

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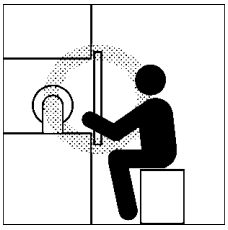
2-1 Installation Conditions

Do not use the F3S-B on machines that can not be stopped by electrical control in case of an emergency.
Do not use the F3S-B in flammable or explosive environments.

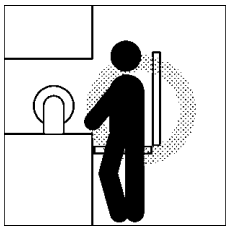
2-1-1 Detection Zone and Intrusion Path

Install protective structures around a machine so that you must pass through the detection zone to reach a hazardous part of the machine. Install the F3S-B so that some part of the operator's body remains in the detection zone at all times when the operator works in a hazardous area. Failure to do so may result in serious injury.

Correct installation

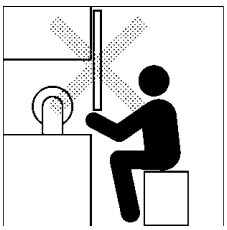


A hazardous part of a machine can be reached only by passing through the sensor detection zone.

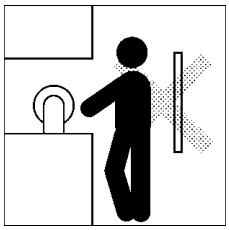


Some part of the operator's body remains in the detection zone while they are working.

Incorrect installation



A hazardous part of a machine can be reached without passing through the sensor detection zone.



A worker is between the sensor detection zone and a hazardous part of a machine.

2-1-2 Safety Distance

Always maintain the safety distance between the F3S-B and a hazardous part of a machine. Serious injury may result if the machine does not stop before someone reaches the hazardous part.

The "Safety distance" is the minimum distance that must be maintained between the F3S-B and a hazardous part of a machine in order to stop the machine before someone or something reaches it.
The calculation of safety distance varies according to with national standards and individual machine standards. It also depends on the direction of intrusion to the detection zone of the light curtain, perpendicular, parallel, or angled approach, and depends on the application, e.g. non-industrial applications where children are present.
See related standards for more details.

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■ Using EN 999 Formula (See Note 1)

Safety distance is calculated based on the following equation.

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

S : Safety distance
K : Intrusion speed into the detection zone
T : Total response time for the machine and light curtain
C : Additional distance calculated or defined based on the optical resolution of the light curtain

When safety distance is not provided by European standards for individual machine, the distance can be calculated using EN 999.

Calculation for intrusion perpendicular to the detection zone

1) 30 mm optical resolution type

Substitute K = 2,000 mm/s and C = 8 (d-14 mm) in equation (1) and calculate as shown below.

$$S = 2{,}000\ mm/s \times (Tm + Ts) + 8\ (d - 14\ mm) \qquad (2)$$

where:

S = safety distance (mm)
Tm = machine response time (s) (see Note 2)
Ts = light curtain response time (s) (see Note 3)
d = optical resolution of light curtain (mm)

e.g.:

Tm = 0.05 s, F3S-B122P (Ts = 0.02 s, d = 30 mm)
S = 2,000 mm/s x (0.05 s + 0.02 s) + 8 (30 mm-14 mm)
= 268 mm

Use S = 100 mm if the result of equation (2) is 100 mm or less.
Recalculate using the following equation with K = 1,600 mm/s if the result is over 500 mm.

$$S = 1{,}600\ mm/s \times (Tm + Ts) + 8\ (d - 14)\ mm \qquad (3)$$

Use S = 500 mm if the result from equation (3) is 500 mm or less.

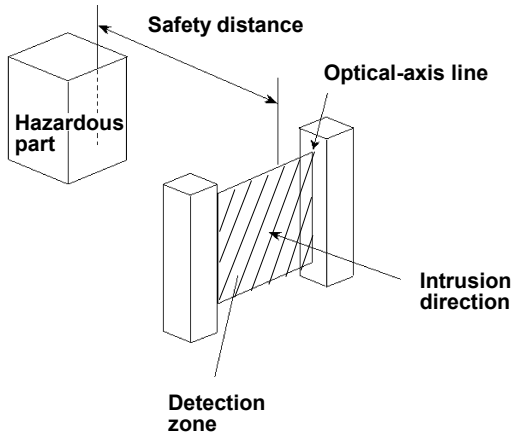
2) 55 mm and 80 mm optical resolution type

Substitute K =1,600 mm/s and C = 850 mm in equation (1) and calculate as shown below:

$$S = 1{,}600\ mm/s \times (Tm + Ts) + 850\ mm$$

Note:

1. EN 999 : European Standard. Safety of machinery – The positioning of protective equipment in respect of approach speeds of parts of the human body
2. The machine response time (Tm) refers to the maximum time from the moment the machine receives a stop signal to the moment a hazardous part of the machine stops. The machine response time should be measured and confirmed periodically.
3. The light curtain response time (Ts) refers to the time required for output changing from ON to OFF.



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■ Using ANSI/RIA R15.06 Formula (See Note 4)

Safety distance is calculated based on the following equation when a person moves perpendicular to the detection zone of a light curtain.

$$S = K \times (Ts + Tc + Tr) + Dpf \qquad (4)$$

S : Safety Distance (mm)
K : Speed constant of 1,600 mm/s (63 inches/s) minimum based on the movement being the hand/arm only and the body being stationary.
A greater value may be required in specific applications and when body motion must also be considered.
Ts : Worst stopping time of machine/equipment
Tc : Worst stopping time of the control system.
Tr : Maximum response time of the light curtain (see Note 5)
Dpf : Depth penetration factor.
Additional distance calculated or defined based on the optical resolution of the light curtain

Calculation for intrusion perpendicular to the detection zone

1) 30 mm and 55 mm optical resolution type

Substitute K = 1,600 mm/s and Dpf = 3.4 x (Os – 6.875 mm) in equation (4) and calculate as shown below.

$$S = 1{,}600\ mm/s \times (Ts + Tc + Tr) + 3.4 \times (Os - 6.875\ mm) \qquad (5)$$

where:

S = safety distance (mm)
Os = object sensitivity (=optical resolution) of light curtain (mm) (see Note 6)

e.g.:

Ts + Tc = 0.06 s, F3S-B542P (Tr = 0.037 s, Os = 30 mm)
S = 1,600 mm/s x (0.06 s + 0.037 s) + 3.4 x (30 mm – 6.875 mm)
= 234 mm

2) Flashing when receiving light in start/restart interlock.**80 mm optical resolution type**

Substitute K =1,600 mm/s and Dpf = 900 mm in equation (4) and calculate as shown below:

$$S = 1{,}600\ mm/s \times (Ts + Tc + Tr) + 900\ mm \qquad (6)$$

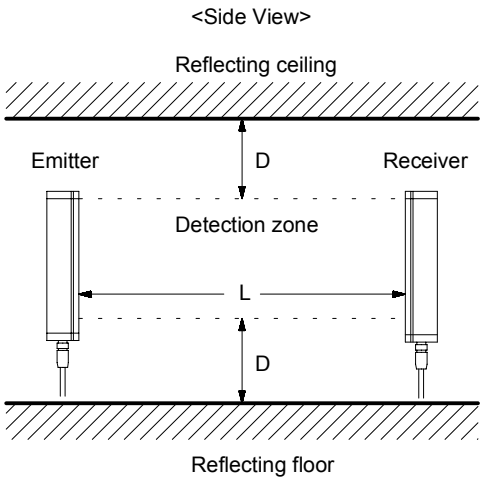
Note:

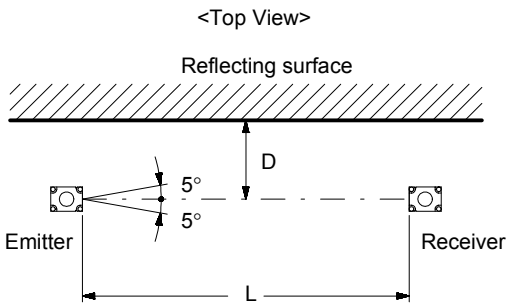
4. ANSI/RIA R15.06 1999 : American National Standard for Industrial Robots and Robot Systems Safety Requirements
5. The light curtain response time (Tr) refers to the time required for output changing from ON to OFF.
6. When the optional blanking function is used, the entire (from emitter to receiver) blanked area should be physically filled. Otherwise, d must be calculated as follows:
Os = (Size of the largest blanked area) + (Original optical resolution)

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2-1-3 Distance from Reflective Surfaces

Be sure to install the F3S-B to minimize the effects of reflection from reflective surfaces.
Failure to do so will cause detection to fail and may result in serious injury.
Install the F3S-B with minimum Distance D shown below from reflective surfaces (highly reflective surfaces) like metal walls, floors, ceilings, and work pieces.

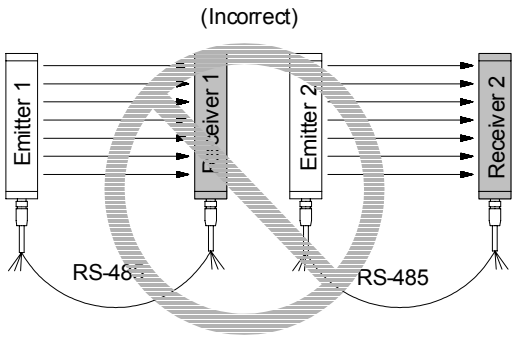


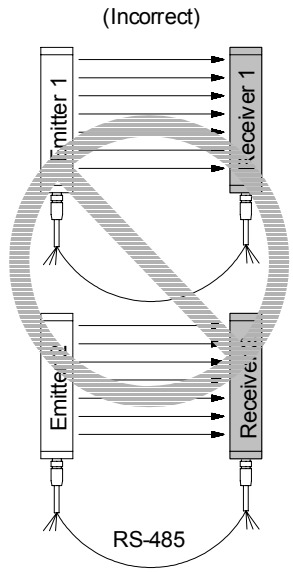


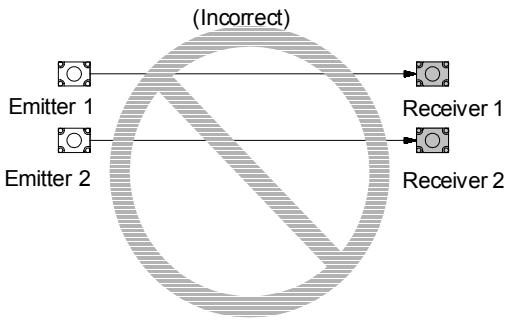
Distance between emitter and receiver (detection distance L)	Minimum installation distance D
0.3 to 3 m	0.27 m
3 to 5 m	L x tan 5° = L x 0.087 (m)

2-1-4 How to Prevent Mutual Interference

Take action to prevent mutual interference when two or more sensors are installed. The following figures show configurations in which mutual interference may occur.



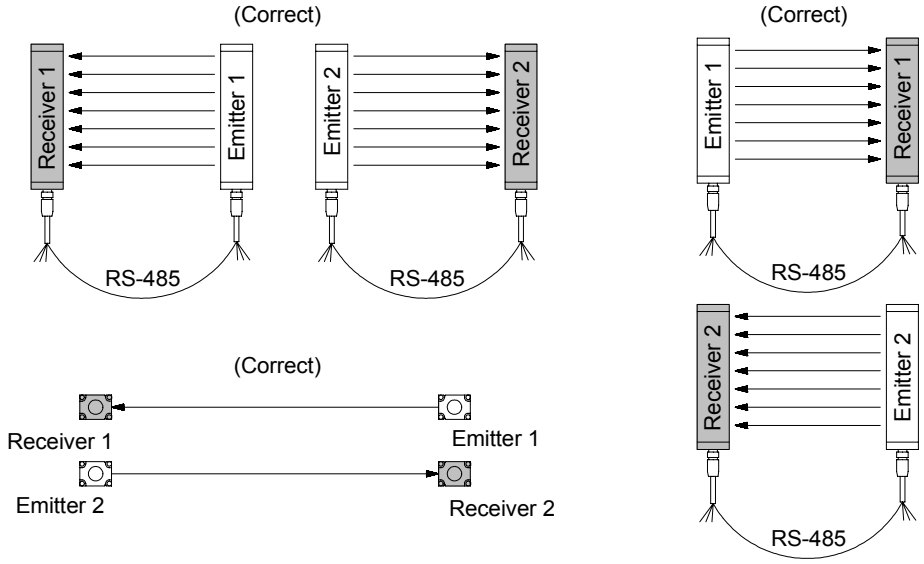




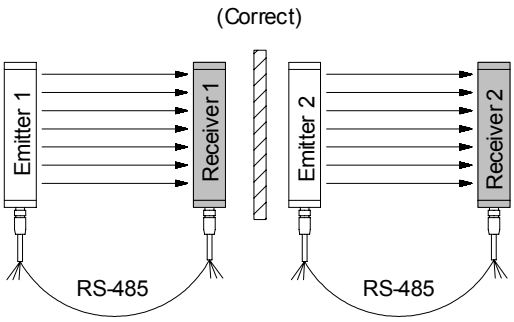
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Correct installations are shown below to prevent mutual interference.

- **Alternate emitters and receivers**

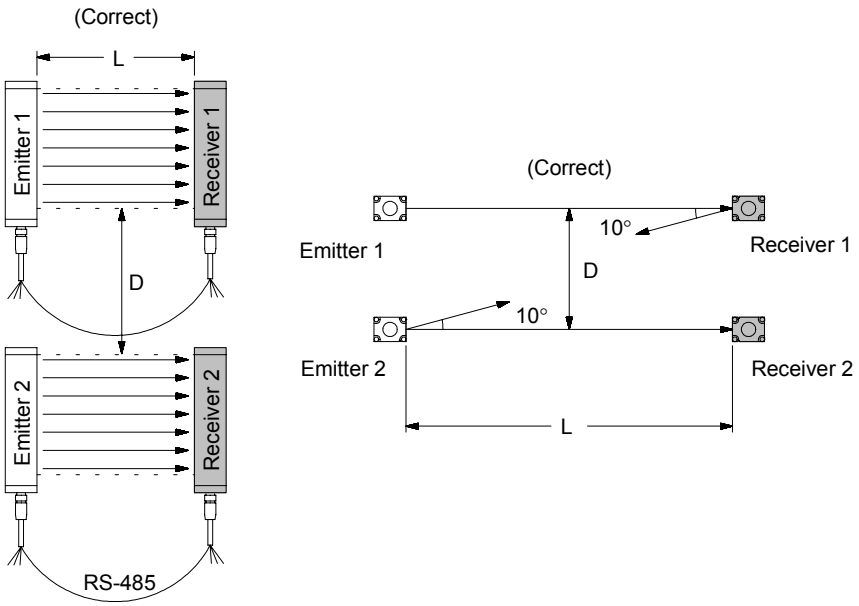


- **Install barriers**



- **Keep enough distance between each set of sensors**

Arrange the sets so that distance between their protective height marks is greater than “D” in the following table.



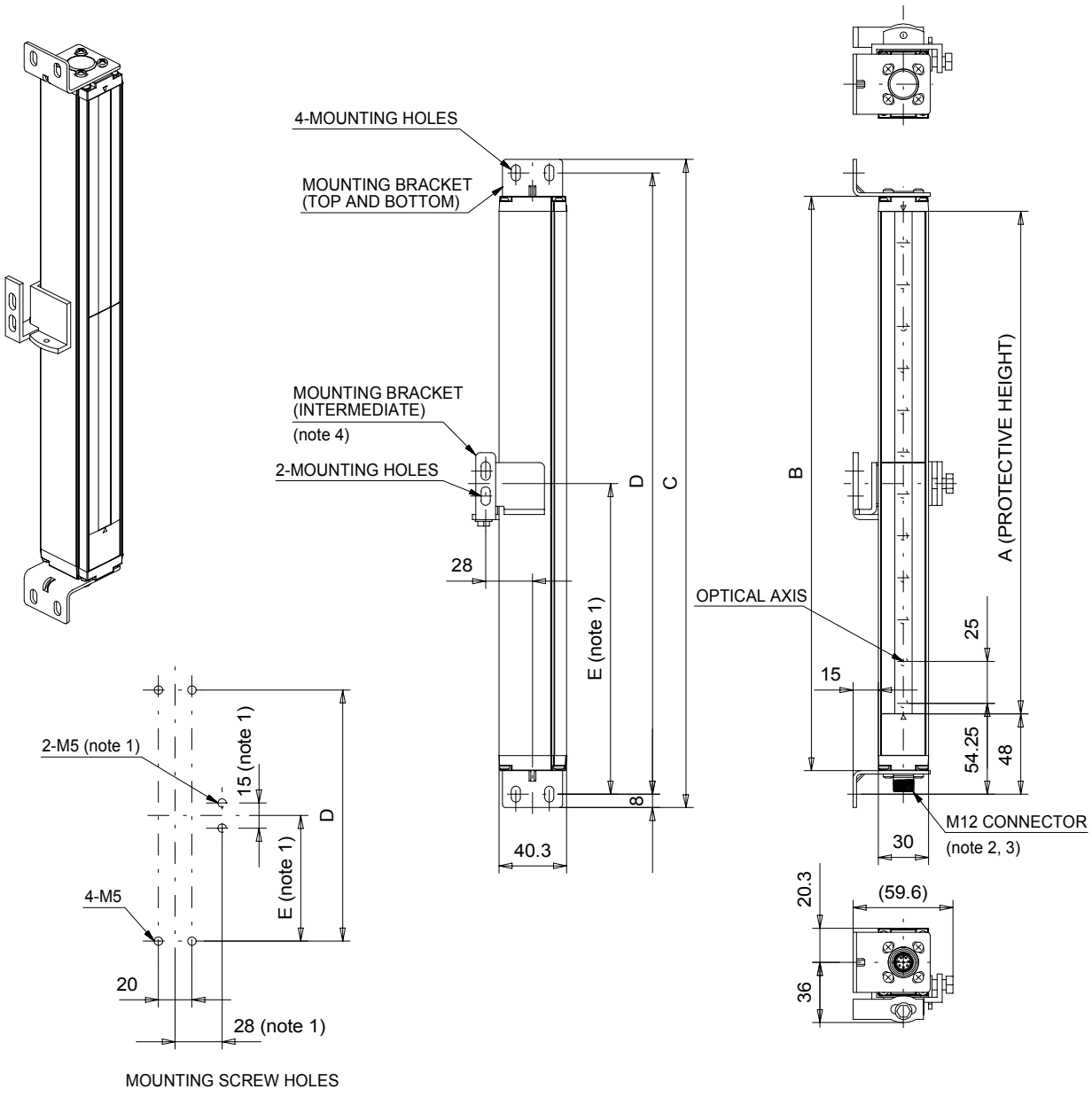
Distance between emitter and receiver (detection distance L)	Minimum installation distance D
0.3 to 3 m	0.54 m
3 to 5 m	L x tan 10° = L x 0.18 (m)

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2-2 Dimensional Drawings

2-2-1 F3S-B

- Side Mounting

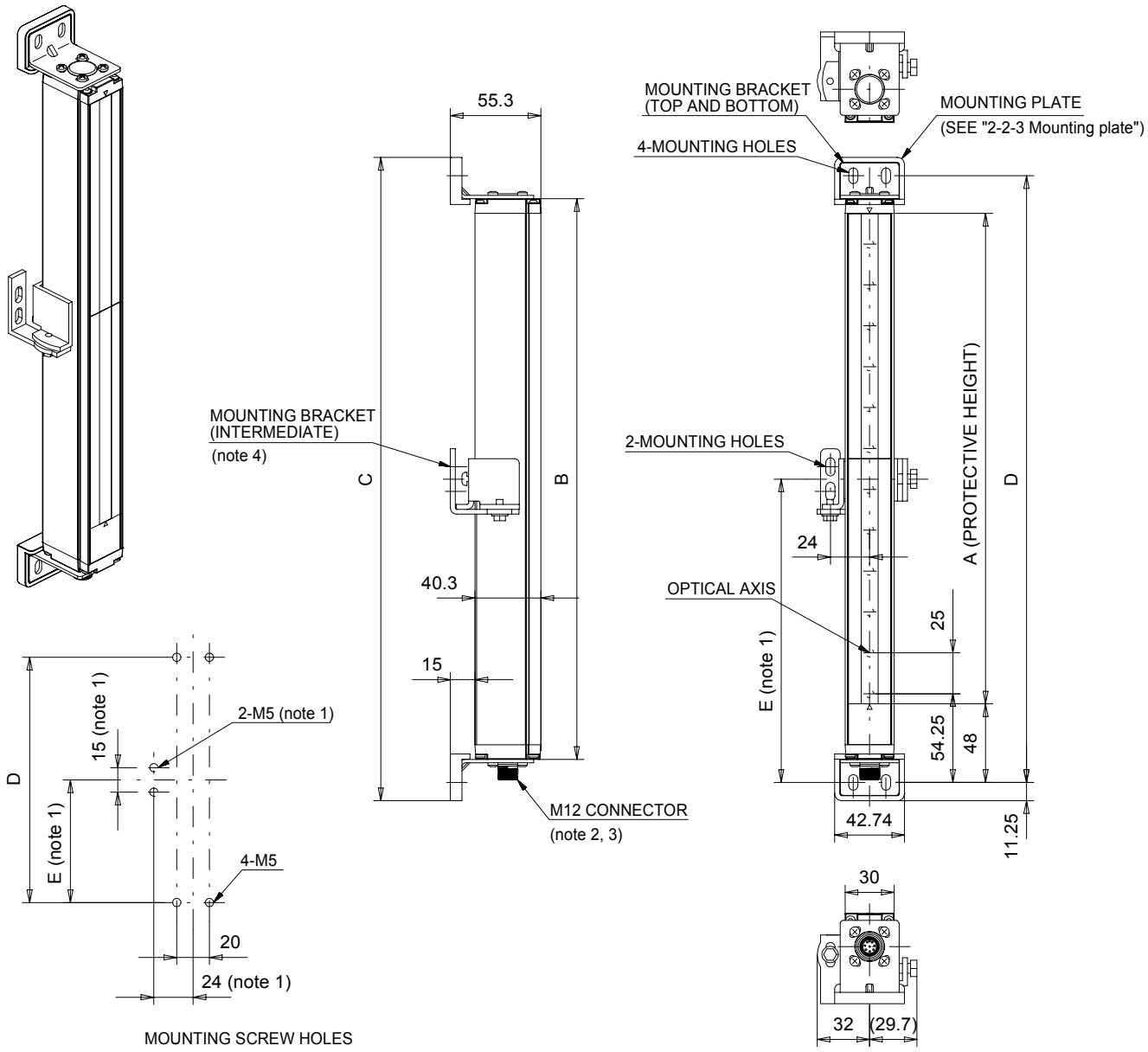


Unit: mm

Type	A Protective height	B Full length of the sensor	C Full length with brackets	D Mounting hole center width	E Intermediate mounting bracket position
F3S-B□122□, B□065□, B□047□	300	343	387	371	-----
F3S-B□182□, B□095□, B□067□	450	493	537	521	-----
F3S-B□242□, B□125□, B□087□	600	643	687	671	-----
F3S-B□302□, B□155□, B□107□	750	793	837	821	-----
F3S-B□362□, B□185□, B□127□	900	943	987	971	-----
F3S-B□422□, B□215□, B□147□	1050	1093	1137	1121	560.5
F3S-B□482□, B□245□, B□167□	1200	1243	1287	1271	635.5
F3S-B□542□, B□275□, B□187□	1350	1393	1437	1421	710.5
F3S-B□602□, B□305□, B□207□	1500	1543	1587	1571	785.5
F3S-B□662□, B□335□, B□227□	1650	1693	1737	1721	860.5

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- Rear Mounting (with Intermediate Mounting Bracket)

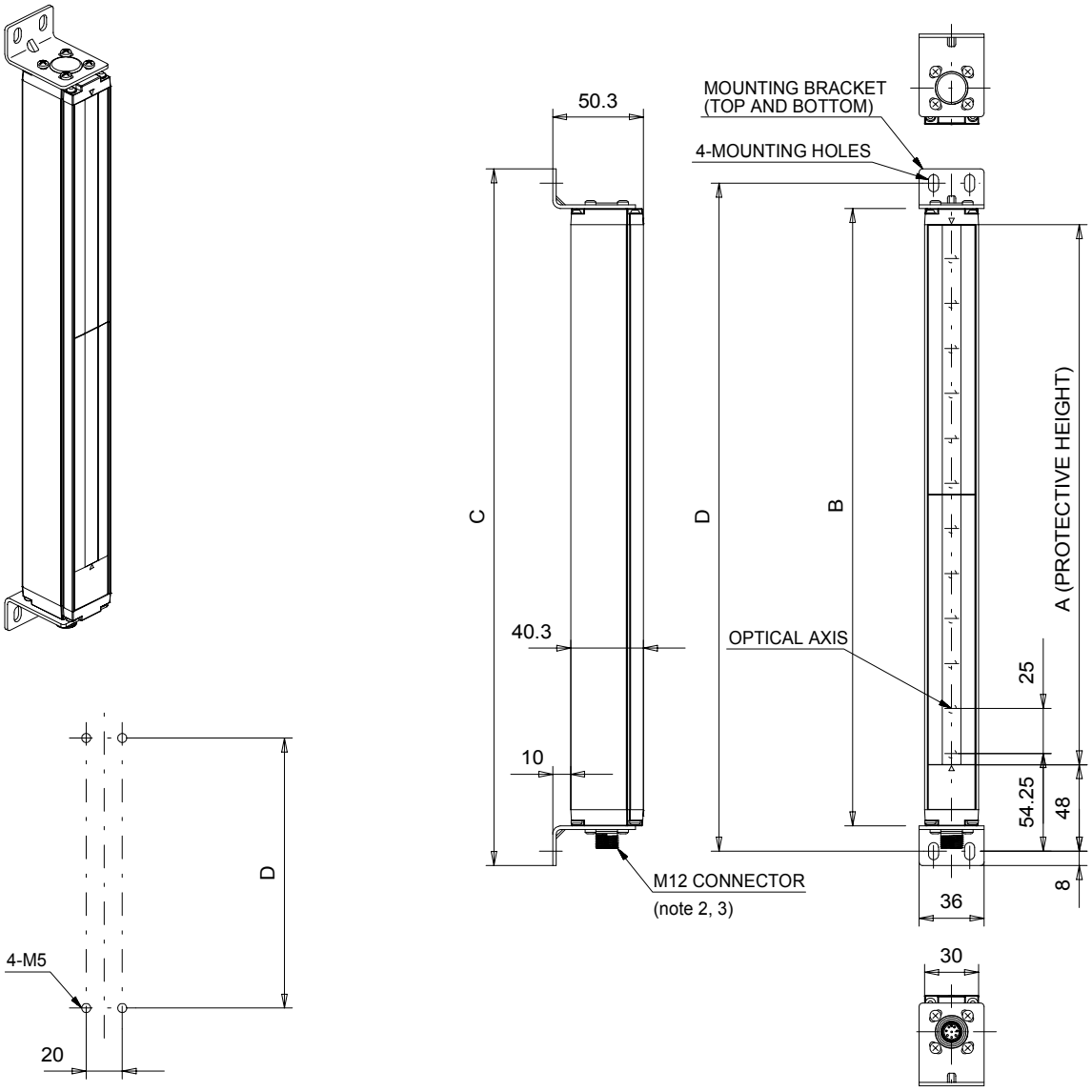


Unit: mm

Type	A Protective height	B Full length of the sensor	C Full length with brackets	D Mounting hole center width	E Intermediate mounting bracket position
F3S-B□422□, B□215□, B□147□	1050	1093	1143.5	1121	560.5
F3S-B□482□, B□245□, B□167□	1200	1243	1293.5	1271	635.5
F3S-B□542□, B□275□, B□187□	1350	1393	1443.5	1421	710.5
F3S-B□602□, B□305□, B□207□	1500	1543	1593.5	1571	785.5
F3S-B□662□, B□335□, B□227□	1650	1693	1743.5	1721	860.5

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- Rear Mounting (without Intermediate Mounting Bracket)



MOUNTING SCREW HOLES

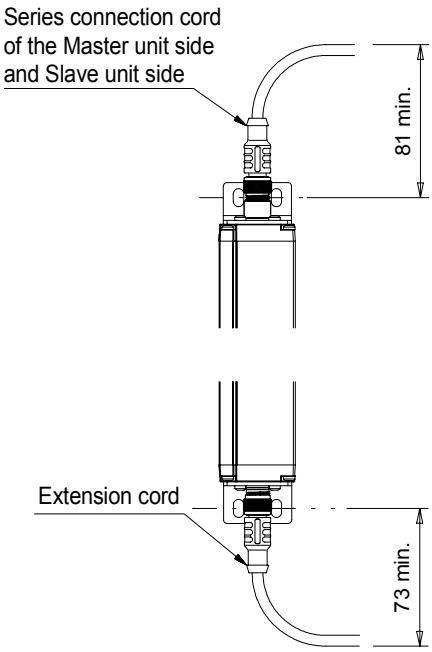
Unit: mm

Type	A Protective height	B Full length of the sensor	C Full length with brackets	D Mounting hole center width
F3S-B□122□, B□065□, B□047□	300	343	387	371
F3S-B□182□, B□095□, B□067□	450	493	537	521
F3S-B□242□, B□125□, B□087□	600	643	687	671
F3S-B□302□, B□155□, B□107□	750	793	837	821
F3S-B□362□, B□185□, B□127□	900	943	987	971

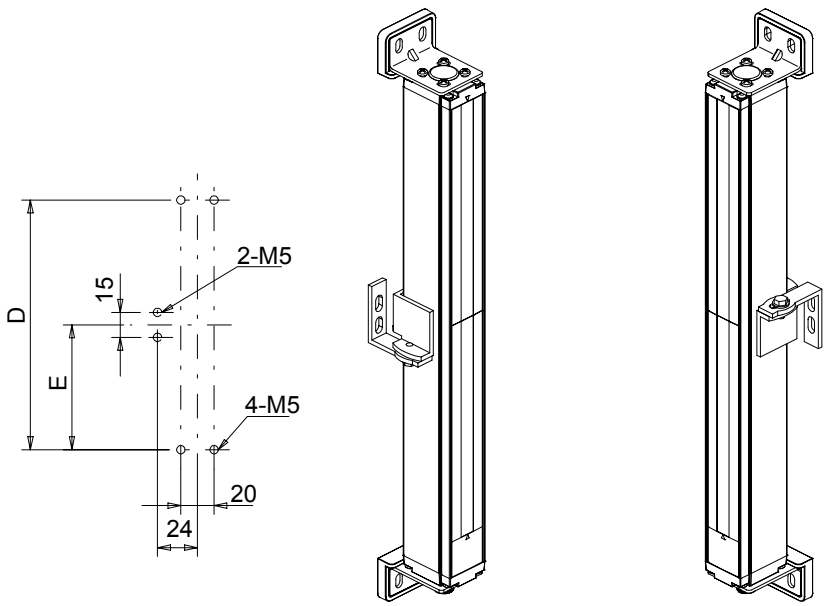
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Note:

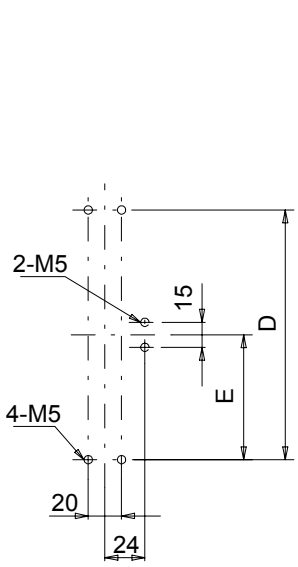
1. The intermediate bracket and mounting screw holes are only applied to types which have a protective height of 1050 mm or longer.
2. The master unit has an M12 connector on both ends of the sensor (for the extension cable and the series connection cable).
3. Keep the following distance for the extension cable and the series connection cable when the cable is bent.



4. The figures on the previous pages show the L-shaped intermediate bracket (see 2-2-4) on the left side of the F3S-B. In case the L-shaped intermediate bracket needs to be on the right side of the sensor, the intermediate mounting bracket needs to be oriented upside down as shown the figure below. The position of the mounting screw holes for the L-shaped intermediate bracket changes from left side to right side. This also applies in the case of side mounting, the figures below show the rear mounting style only.



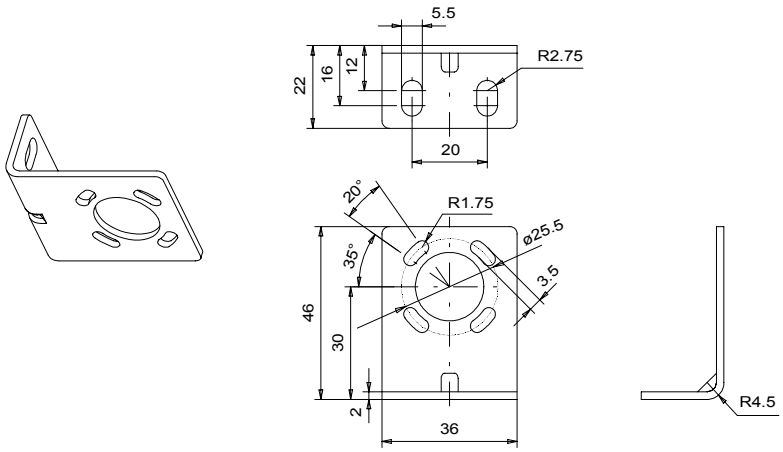
MOUNTING SCREW HOLES



MOUNTING SCREW HOLES

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2-2-2 Mounting Bracket (Top and Bottom)

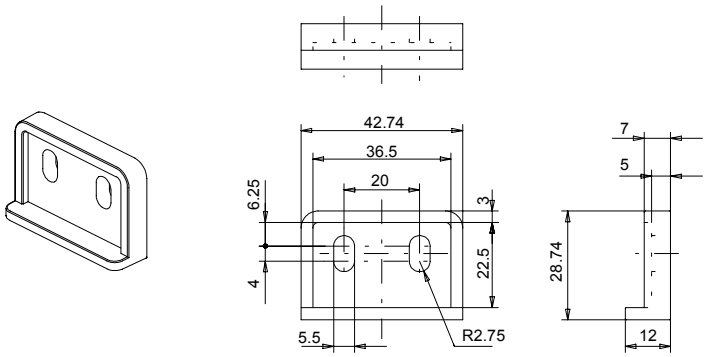


Unit: mm

2-2-3 Mounting Plate

Only supplied with types which have a protective height of 1050 mm or longer.

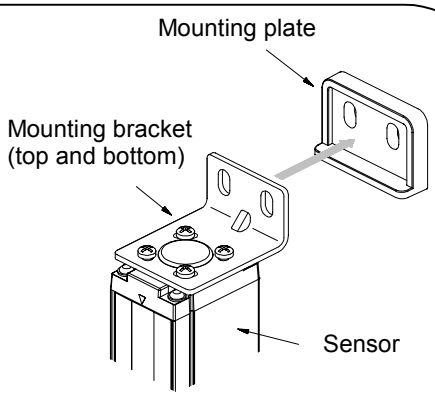
The mounting plates are only required when the F3S-B is mounted in the rear mounting configuration with the intermediate brackets.



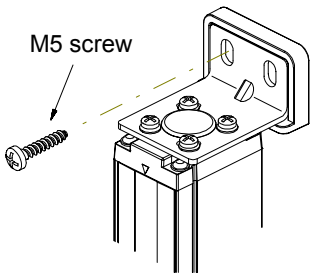
Unit: mm

How to use

1. Combine the mounting bracket (top and bottom) with the mounting plate.



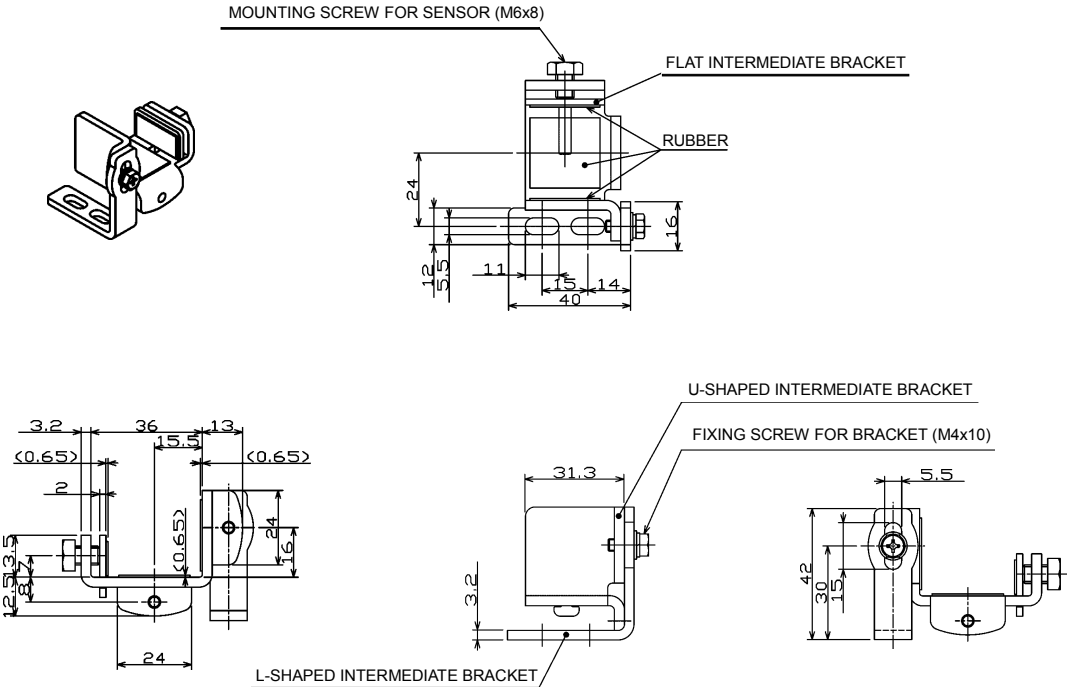
2. Then affix the assembled bracket with M5 screws.



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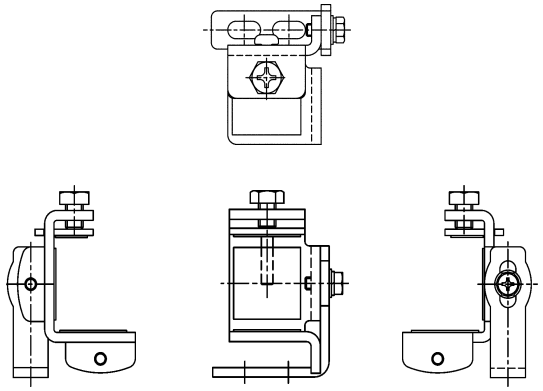
2-2-4 Mounting Bracket (Intermediate)

Only supplied with types which have a protective height of 1050 mm or longer.



Unit: mm

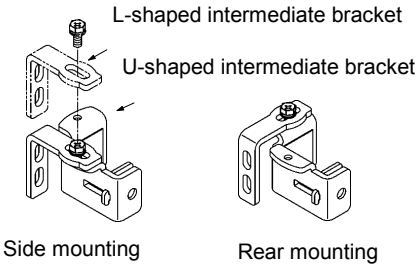
Configuration of U-shaped Intermediate Bracket Mounted at 90 Degree Angle



How to use

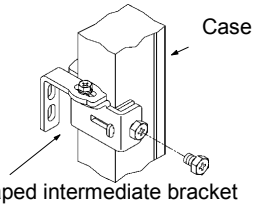
1. Assembly

Choose the mounting direction for the L- and U-shaped intermediate bracket combination based on the mounting direction (side or rear) and temporarily secure the brackets with the M4 x 10 screw.



2. Installation

Clasp the center of the case with the U-shaped bracket and temporarily secure the bracket to the F3S-B with the M6 x 8 screw. The mounting bracket (intermediate) for the emitter is oriented upside down when compared to the bracket of the receiver.



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2-3 Wiring

Do not connect the F3S-B to a power supply with a voltage higher than 24 VDC + 20%.
Do not connect the F3S-B to an AC power source.

2-3-1 Power Supply Units and Loads

DC power supply units must satisfy all of the conditions below so that the F3S-B can comply with the applicable standards IEC 61496-1, and UL 508.

- The power supply voltage should be within rating (24 VDC ± 20 %).
- The power supply is connected only to the F3S-B and to the devices related to the electro-sensitive protective function of the F3S-B, such as a safety controller and muting sensors, and it has enough rated current for all the devices. The power supply is not connected to other devices or machines.
- The power supply uses double or reinforced insulation between the primary and secondary circuits
- The power supply has automatic reset characteristics (voltage drop) to protect overcurrent.
- The power supply maintains an output holding time of at least 20 ms.
- FG (frame ground terminal) must be connected to PE (protective earth) when using a commercially available switching regulator.
- The power supply must have output characteristics required for the power source for Class 2 Circuit or Limited Voltage/Current Circuit as defined in UL508 (see “Remark”).
- The power supply must conform to regulatory requirements and standards, regarding EMC and electrical equipment safety, of the country where the F3S-B is installed and where machinery will be operated, for example: The EMC Directive (industrial environment) and the Low Voltage Directive in EU.

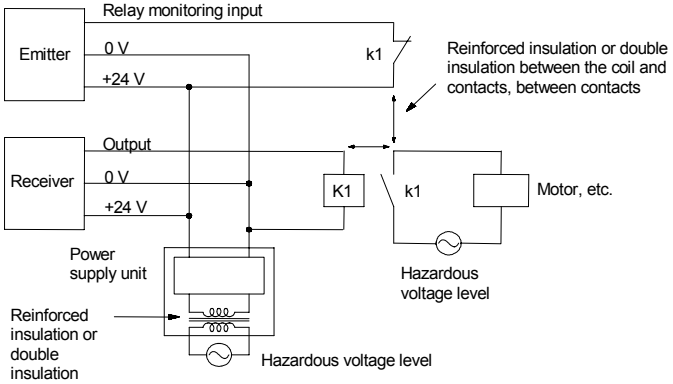
[Remark] The power supply must conform to the following requirements (1) or (2) regarding a secondary circuit, in accordance with UL 508, to avoid a fire.

(1) The power supply includes a limited voltage/current circuit supplied by an isolating source like the secondary winding of an isolating type transformer. In the limited voltage/current circuit,
- the current available is limited to a value not exceeding 8 A (including the case of short-circuit), or
- a secondary fuse or other such secondary circuit protective device used to limit the available current shall be rated at not more than a value 4.2 amperes (for the power supply voltage of 24 VDC).

(2) The power supply includes a Class 2 circuit supplied by an isolating source that complies with the requirement in the Standard for Class 2 Power Units, UL 1310, or the requirements in the Standard for Class 2 and Class 3 Transformers, UL 1585.

Recommended power supply: S82K (15 W, 30 W, 50 W, 90 W type) made by OMRON, UL Listed (UL508, Class2 Output) and CE Marked (EMC and Low Voltage Directives)

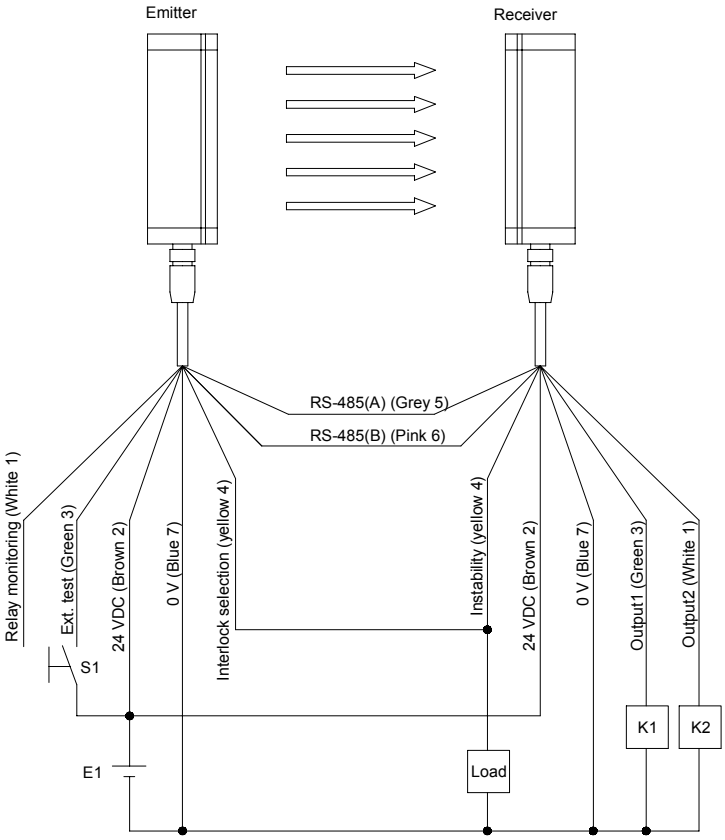
Power supply and loads must be reinforced insulated or double insulated as shown in the following figure to protect against electrical shock. The insulation shown in the figure should insulate against hazardous voltage levels (230 VAC, etc.), not simply against 24 VDC.



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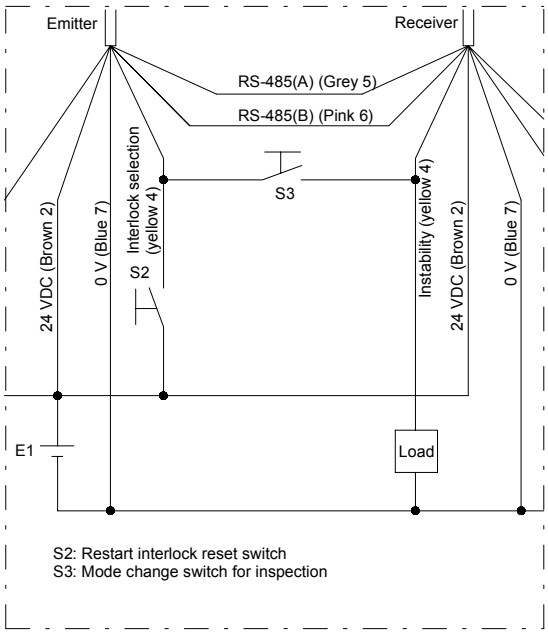
2-3-2 Wiring Diagram

Disconnect all sources of power before wiring the F3S-B to a machine.



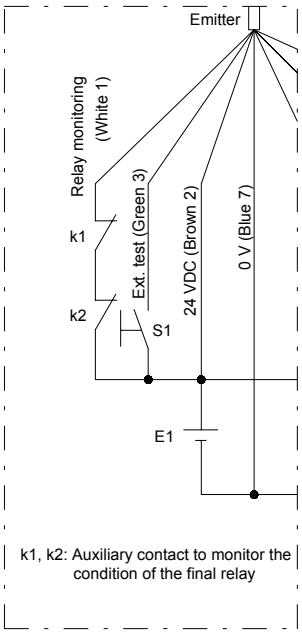
E1: 24 VDC Power supply
S1: External test switch
K1, K2: Relay or PLC input to control the dangerous movement of a machine
Load: Inductive load with surge suppressor (Note) or resistive load to indicate unstable condition

When using Start/restart interlock Function



S2: Restart interlock reset switch
S3: Mode change switch for inspection

When using optional Relay Monitoring Function



k1, k2: Auxiliary contact to monitor the condition of the final relay

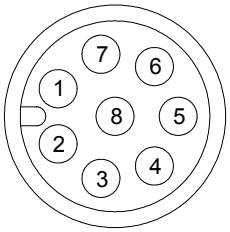
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2-3-3 Wiring Procedure

1. Connect the emitter extension cable (F39-JB□A-L optional, **gray color outer jacket**) to the emitter. (The emitter uses gray color plastic caps.)
2. Connect the receiver extension cable (F39-JB□A-D optional, **black color outer jacket**) to the receiver. (The receiver unit uses black color plastic caps.)
3. Connect the 0 V line of the power supply directly to protective earth (PE).

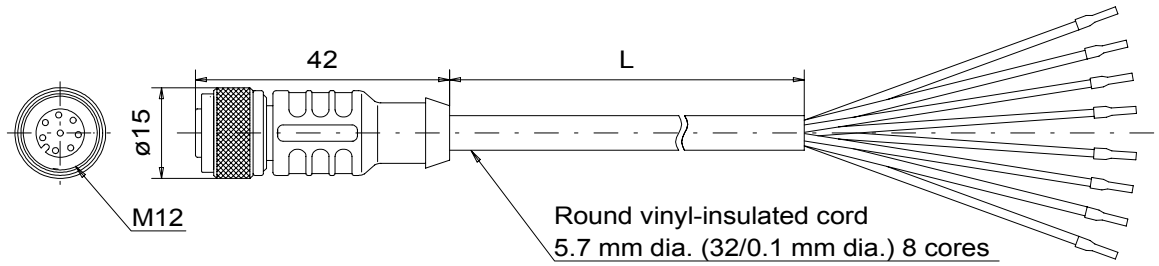
Note: Be sure to wire correctly. Failure to do so may damage the F3S-B.

- **Connector (Main Unit End)**

Front View	Pin No.	Signal Name		Wire Color of Extension Cable
		Receiver	Emitter	
	1	Control output 2	Relay monitoring input	White
	2	24 VDC	24 VDC	Brown
	3	Control output 1	External test input	Green
	4	Instability output	Interlock selection input	Yellow
	5	RS-485 (A)	RS-485 (A)	Grey
	6	RS-485 (B)	RS-485 (B)	Pink
	7	0 V	0 V	Blue
	8	N.C. / reserved	N.C. / reserved	Red

N.C. / reserved: do not connect

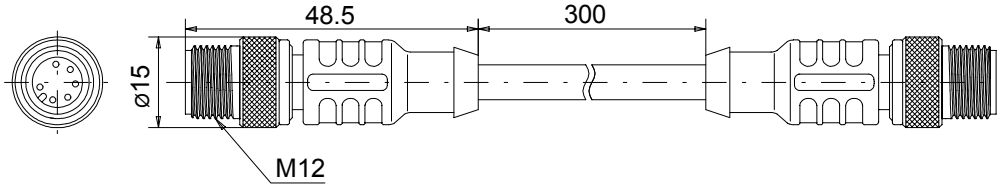
- **Extension Cable (F39-JB□A Optional)**



Unit: mm

Type (Set name)	for Emitter		for Receiver		L
F39-JB1A	F39-JB1A-L	Gray outer jacket color	F39-JB1A-D	Black outer jacket color	3000
F39-JB2A	F39-JB2A-L		F39-JB2A-D		7000
F39-JB3A	F39-JB3A-L		F39-JB3A-D		10000

- **Series Connection Cable (F39-JB1B Optional)**



Unit: mm

Type (Set name)	for Emitter		for Receiver	
F39-JB1B	F39-JB1B-L	Gray outer jacket color	F39-JB1B-D	Black outer jacket color

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ADJUSTMENT Section 3

3-1 Adjustment Procedure

1. Ensure the following points.
   - A hazardous part of a machine cannot move during the adjustment.
   - The optical surfaces of the emitter and receiver are clean.
   - There should be no light-interrupting objects in the F3S-B detection zone.
2. Adjust the torsion angle of the emitter while monitoring the indicator on the receiver and locate the point where the ON-state indicator (lit: green) is lit and the Instability indicator (UNSTAB: orange) goes OFF.
3. Adjust the torsion angle so that the light-receiving condition becomes as stable as possible. When the above adjustments have been completed, tighten all brackets and mounting screws while being careful not to change the optical axis adjustment for the F3S-B. The tightening torque for these screws is shown in the following table.

Mounting bracket types	Screw designation and length (mm)	Tightening torque
Mounting brackets (top and bottom)	M3 x 10 (tapping screw)	0.54 N·m (5.5 kg·cm)
Mounting brackets (intermediate)	M4 x 10	1.2 N·m (12.2 kg·cm)
	M6 x 8	4.3 N·m (43.9 kg·cm)

4. If a stable light receiving condition is not obtained through the angle adjustment of the emitter, perform the following adjustments.
   If the Instability indicator does not go OFF, temporarily fix the emitter at the most stable state and conduct angle adjustment for the receiver according to the procedure described in the above step 2.
5. If a stable light receiving condition is not obtained through the above angle adjustment of the receiver, check for parallelism between the emitter mounting surface and the receiver mounting surface and also check if the emitter and receiver are mounted to the same height.

3-2 Check List

Check the following items to make sure the installation is correct

1. ❑ Machine structure does not hinder stop and other safety functions.
2. ❑ Intrusion into a hazardous part of the machine is not possible without passing through the F3S-B detection zone.
3. ❑ Protective structure that allows the F3S-B to detect an operator when he/she works in the hazardous area.
4. ❑ The actual safety distance is greater than the calculated distance.
5. ❑ Reflective surfaces are not installed in prohibited areas.

Check the following items to make sure wiring is correct before turning ON power.

1. ❑ The power supply is connected only to the F3S-B and to the devices related to the electro-sensitive protective function of the F3S-B, such as a safety controller and muting sensors, and it has enough rated current for all the devices.
2. ❑ The power supply unit is a 24-VDC unit that conforms to the EMC Directive, Low-voltage Directive and output holding specifications.
3. ❑ The polarity of the power supply connection is not reversed.
4. ❑ The emitter extension cable is properly connected to the emitter and the receiver extension cable is properly connected to the receiver.
5. ❑ Double insulation or reinforced insulation is used between the output and the hazard potential (commercial power supplies, etc.), and between the Relay monitoring input and the hazard potential.
6. ❑ Outputs are not shorted to the +24V line.
7. ❑ Loads are not connected to the +24V line.
8. ❑ No lines are connected to a commercial power supply.

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9. ❑ When two or more units are used in close proximity, they are mounted properly to prevent mutual interference.

Turn ON power to the F3S-B and make sure the F3S-B is operating properly as described below with the machine stopped.

10. ❑ The F3S-B will begin operating normally within 2 seconds after power is turned ON. When the protective field is free of obstructions, IR-Power indicator (orange) of the emitter and the ON-state indicator (green) of the receiver will light.
11. ❑ A test rod can be detected at any position in the detection zone. In other words, the OFF-state indicator (red) will remain lit and the ON-state indicator (green) will be never lit as long as the test rod is present in the detection zone.

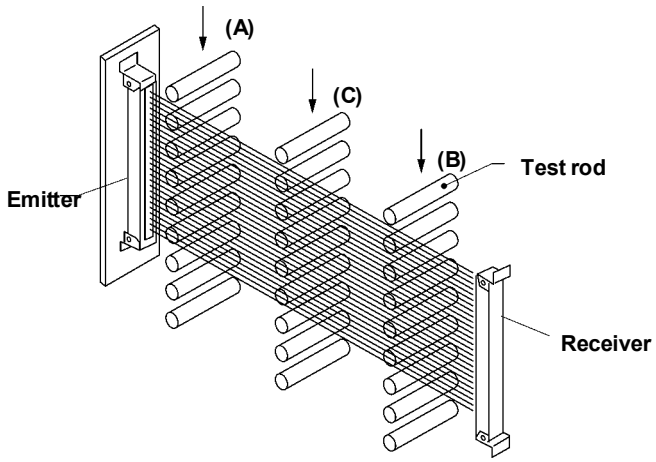
    Detection checkpoints are:

    (A) Protective height directly in front of the emitter.

    (B) Protective height directly in front of the receiver.

    (C) Protective height midway between the emitter and receiver.

    * Be sure to use the correct test rod which has the same diameter as the optical resolution of the F3S-B to be tested.
    * Make the start/restart interlock function inactive to carry out this check.



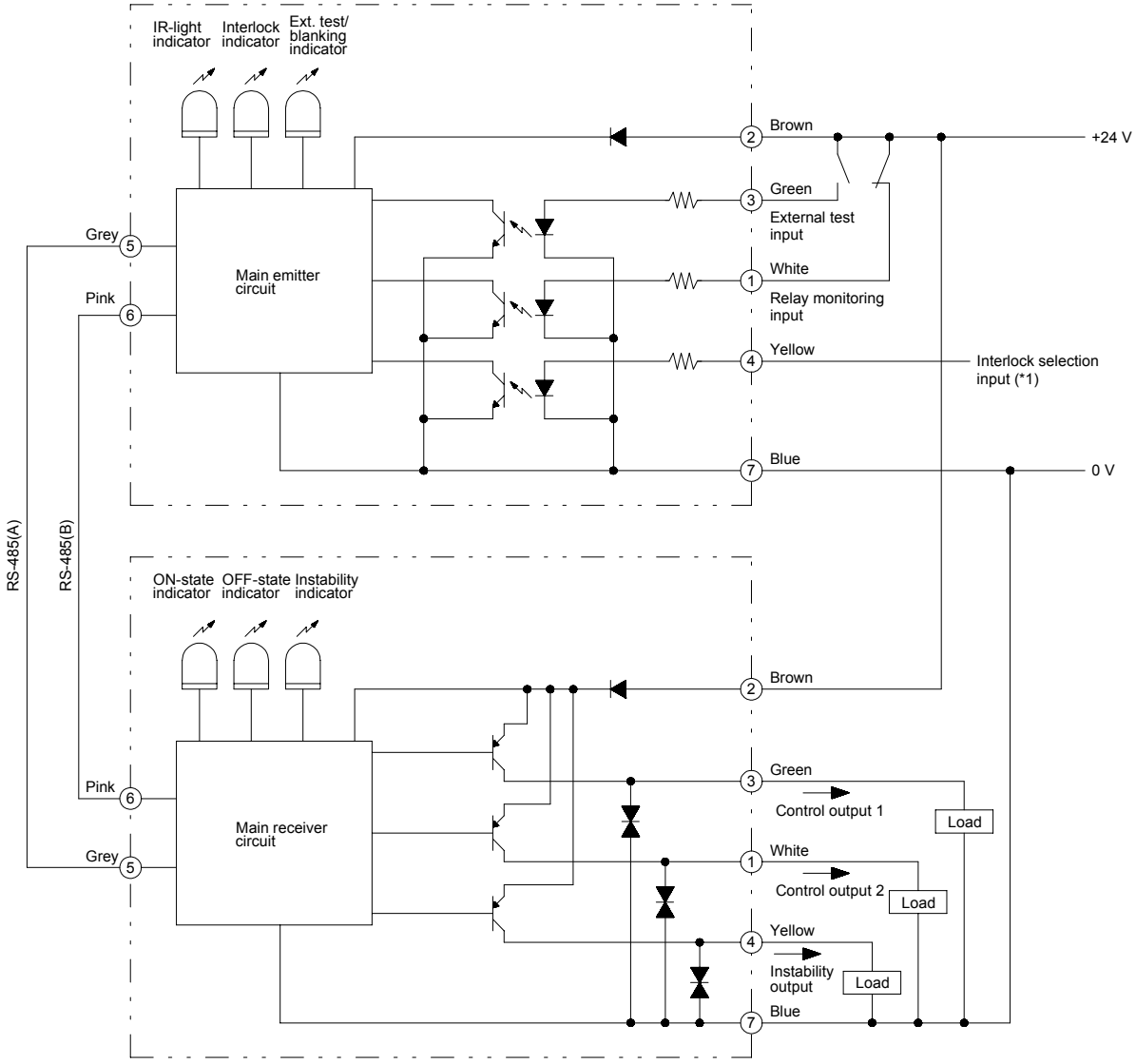
12. ❑ The external test function can be activated and outputs are momentarily turned OFF if the external test input terminal is connected to a voltage of 17 VDC to Vs.

Operate the machine and check to see if a hazardous part stops under the conditions below.

13. ❑ The hazardous part stops within the calculated time when a test rod is inserted into the detection zone directly in front of the emitter, directly in front of the receiver and midway between the emitter and receiver.
14. ❑ The hazardous part remains stopped as long as the test rod is present in the detection zone.
15. ❑ The hazardous part stops when the F3S-B power supply is turned OFF.
16. ❑ The overall measured machine response time is less than the calculated response time.

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I/O CIRCUIT Section 4



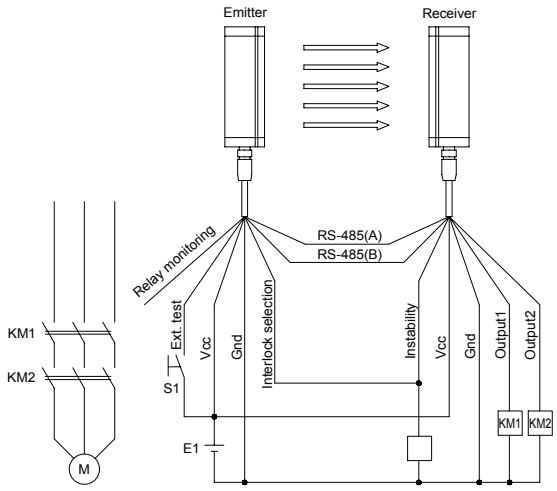
*1 See “2-3 Wiring” for wiring information

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APPLICATIONS Section 5

5-1 Application (1)

- without Start/restart interlock function
- without Relay monitoring function

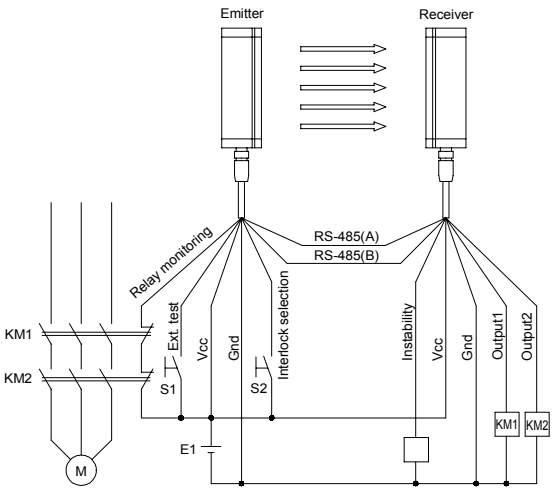


M: 3-phase motor
E1: 24 VDC Power supply
S1: External test switch
KM1, KM2: Electromagnet contactor (with Reinforced insulation)

Note: KM1 and KM2 must have reinforced insulation between the coil and contacts.

5-2 Application (2)

- with Start/restart interlock function
- with Relay monitoring function



M: 3-phase motor
E1: 24 VDC Power supply
S1: External test switch
S2: Restart interlock reset switch
KM1, KM2: Electromagnet contactor (with Reinforced insulation)

Note: KM1 and KM2 must have reinforced insulation between the coil and contacts as well as between contacts.

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MAINTENANCE Section 6

⚠
Do not use the F3S-B until the following inspections are completed. Failure to do so may result in loss of life or serious injury.
Do not disassemble, repair or modify the F3S-B.

Note:

1. For Safety, be sure to record and store inspection results.
2. Make sure you are thoroughly familiar with the F3S-B and the machine prior to conducting an inspection.
3. Make sure all personnel have adequate guidelines for performing maintenance and inspections.
4. Check all items in “3-2 Check List” again if the protective structures preventing access to the hazard are changed.

6-1 Daily Inspections

Be sure to inspect the following items at the start of work or after a shift change.

1. ❑ No intrusion paths into a hazardous part of a machine except through the F3S-B detection zone.
2. ❑ Some part of the operator’s body remains in the F3S-B detection zone at all times while the operator works in the hazardous area.
3. ❑ The actual safety distance is greater than the calculated distance.
4. ❑ No dirt or scratches on the optical surface.

Operate the machine and check to see if the hazardous part stops under the conditions below.

5. ❑ The hazardous part moves when there is nothing in the detection zone (normal operation).
6. ❑ The hazardous part stops within the calculated time when the test rod is inserted into the detection zone directly in front of the emitter, directly in front of the receiver and midway between the emitter and receiver.
7. ❑ The hazardous part remains stopped as long as the test rod is present in the detection zone.
8. ❑ The hazardous part stops when the F3S-B power supply is turned OFF.

6-2 Inspection Every Six Month

Inspect the following items every six months or when a machine setting is changed.

1. ❑ Machine structure does not hinder stop and safety functions.
2. ❑ There is no machine modification or connection change that will adversely affect the control system.
3. ❑ The F3S-B outputs are correctly wired to the machine.
4. ❑ The actual overall response time of the machine is less than the calculated response time.
5. ❑ The control relay and connector are in good condition.
6. ❑ The brackets are securely tightened.

6-3 Cleaning

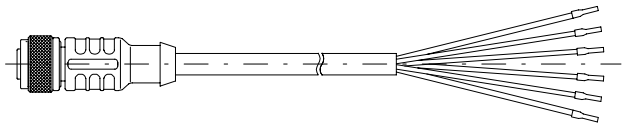
If the surface of the F3S-B is extremely dirty, F3S-B will stop activating outputs. In this case, use a clean soft cloth and clean the surface without pressure. Do not use any solvents such as paint thinners, benzene or acetone to clean the F3S-B because they will damage the translucent surface.

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ACCESSORIES (OPTIONAL) Section 7

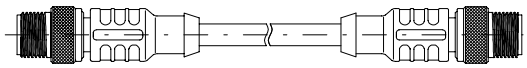
- **F39-JB□A Extension Cable** : 2 pcs./set

Type	Length	Specification
F39-JB1A	3 m	M 12 connector (8 pins)
F39-JB2A	7 m	
F39-JB3A	10 m	



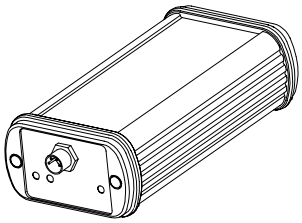
- **F39-JB1B Series Connection Cable** : 2 pcs./set

Type	Length	Specification
F39-JB1B	300 mm	M12 connector (6 pins)



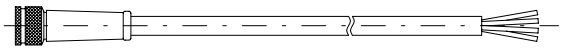
- **F39-EU1E Optional Function Kit**
  The following three accessories, the F39-E1 Interface Unit, the F39-U1E Optional Function Software, and the F39-JB1C Interface Cable are packed in one package.

- **F39-E1 Interface Unit**



- **F39-U1E Optional Function Software**
  Contained on one 3.5 Inch floppy disk and runs with Windows®95, Windows®98 or Windows NT®
  Hardware requirements: PC/Laptop Pentium® 133 (32 MB for Windows®95, 64 MB for Windows NT®)

- **F39-JB1C Interface Cable**
  5 m cable length, M8 connector (4 pins)



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TROUBLESHOOTING Section 8

The F3S-B runs internal self-tests after the power is turned ON and while the F3S-B is in normal operation. The external test is also available. If a failure is detected, a corresponding flicker pattern is indicated by the red LED (OFF-state indicator) of the receiver. Each failure indication sequence, other than continuous flashing, will repeat after a two-second interval. This repetition will continue until a remedy is effected.

Indication	Cause	Remedy
Flashing continuously	**Relay monitoring failure during ON-state** (In the case that the Relay monitoring function is activated, the wrong status of the relay NC contact is detected when the control outputs are in the ON-state.)	– Check connection of the relay monitoring input. – Check the voltage of the relay monitoring input. (When control outputs are ON-state, the relay monitoring input must show 0 V) * Regarding only this failure, the interruption and restoration of power is necessary to restore F3S-B.
Flashing once	**Internal parameter failure of a receiver**	– Change the setting parameters by the optional software F39-U1E, or reset the setting parameters to factory setting status also by F39-U1E. – Replace the receiver.
Flashing twice	**Communication failure between an emitter and receiver, or internal failure of an emitter**	– Check connection of the emitter and the receiver. – Check series connection of the emitters. – Check if the emitter and the receiver have the same type name. – Check if the type name of the slave unit emitter is same as the indicated one on the label of the master unit emitter – Replace the emitter.
Flashing three times	**Internal memory failure of a receiver**	– Replace the receiver.
Flashing four times	**Relay monitoring failure during OFF-state** (In case that Relay monitoring function is activated, wrong status of the relay NC contact is detected when the control outputs are OFF-state.)	– Check connection of relay monitoring input. – Check the voltage of the relay monitoring input. (When control outputs are OFF, the relay monitoring input must be at a level of 17 VDC to Vs.)
Flashing five times	**Control output failure** (High level voltage is detected although a control output is in OFF-state.)	– Check connection of control outputs for a short circuit with Vs (cables, connected devices) – Replace the receiver.
Flashing six times	**Internal hardware failure of a receiver**	– Replace the receiver.
Flashing seven times	**Series connection system failure of receivers**	– Check series connection between the receivers. – Check if the type name of the slave unit receiver is same as the indicated one on the label of the master unit receiver – Replace the master unit receiver and /or the slave unit receiver.

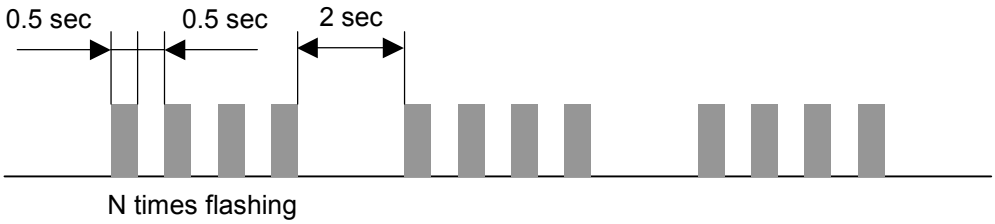


Fig. Timing Chart for flashing pattern of red LED (OFF-state indicator)

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Cat. No. E502-E2-01
Part No. 7490-00098 Rev. A2

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