

Safety Light Curtain

Category 2 Safety Design
Suitable for Detecting Human Presence
in Hazardous Areas

- Type 2 Safety Light Curtain operates independently or as part of existing safety systems. Meets category 2, 1 or B. (As defined by European standard EN954-1)
- Compliance with IEC 61496-2 (1997) (Type 2 AOPD), EN 61496-1 (06/98) (Type 2 ESPE) standards and EMC Directive: No. 98/336/EEC, No. 98/37/EC
- Pursuing safety with high level of safety design and FMEA
- Series of two in a configuration is possible
- Units available with a beam pitch of 25 mm (hand protection) in protective heights from 300 mm to 1650 mm



Ordering Information

■ SAFETY LIGHT CURTAIN

Description					Part number		
Protective height	Weight (without accessories)	Beam pitch	Optical resolution	No. of beams	Stand-Alone	Master Unit	Slave Unit
300 mm	0.9 kg	25 mm	30 mm	12	F3S-B122P	F3S-BM122P□□	F3S-BS122
450 mm	1.2 kg			18	F3S-B182P	F3S-BM182P□□	F3S-BS182
600 mm	1.5 kg			24	F3S-B242P	F3S-BM242P□□	F3S-BS242
750 mm	1.8 kg			30	F3S-B302P	F3S-BM302P□□	F3S-BS302
900 mm	2.1 kg			36	F3S-B362P	F3S-BM362P□□	—
1,050 mm	2.5 kg			42	F3S-B422P	F3S-BM422P□□	—
1,200 mm	2.8 kg			48	F3S-B482P	F3S-BM482P□□	—
1,350 mm	3.1 kg			54	F3S-B542P	F3S-BM542P□□	—
1,500 mm	3.4 kg			60	F3S-B602P	F3S-BM602P□□	—
1,650 mm	3.7 kg			66	F3S-B662P	F3S-BM662P□□	—
300 mm	0.9 kg	50 mm	55 mm	6	F3S-B065P	F3S-BM065P□□	F3S-BS065
450 mm	1.2 kg			9	F3S-B095P	F3S-BM095P□□	F3S-BS095
600 mm	1.5 kg			12	F3S-B125P	F3S-BM125P□□	F3S-BS125
750 mm	1.8 kg			15	F3S-B155P	F3S-BM155P□□	F3S-BS155
900 mm	2.1 kg			18	F3S-B185P	F3S-BM185P□□	—
1,050 mm	2.5 kg			21	F3S-B215P	F3S-BM215P□□	—
1,200 mm	2.8 kg			24	F3S-B245P	F3S-BM245P□□	—
1,350 mm	3.1 kg			27	F3S-B275P	F3S-BM275P□□	—
1,500 mm	3.4 kg			30	F3S-B305P	F3S-BM305P□□	—
1,650 mm	3.7 kg			33	F3S-B335P	F3S-BM335P□□	—

(This table continues on the following page.)

Note: □□ indicates No. of beams of the connected Slave Unit.
For 25 mm beam-pitch type: 12, 18, 24, or 30.
For 50 mm beam-pitch type: 06, 09, 12, or 15.

Ordering Information — continued

Description					Part number		
Protective height	Weight (without accessories)	Optical resolution	Beam pitch	No. of beams	Stand-Alone	Master Unit	Slave Unit
300 mm	0.9 kg	80	75 mm	4	F3S-B047P	F3S-BM047P□□	F3S-BS047
450 mm	1.2 kg			6	F3S-B067P	F3S-BM067P□□	F3S-BS067
600 mm	1.5 kg			8	F3S-B087P	F3S-BM087P□□	F3S-BS087
750 mm	1.8 kg			10	F3S-B107P	F3S-BM107P□□	F3S-BS107
900 mm	2.1 kg			12	F3S-B127P	F3S-BM127P□□	—
1,050 mm	2.5 kg			14	F3S-B147P	F3S-BM147P□□	—
1,200 mm	2.8 kg			16	F3S-B167P	F3S-BM167P□□	—
1,350 mm	3.1 kg			18	F3S-B187P	F3S-BM187P□□	—
1,500 mm	3.4 kg			20	F3S-B207P	F3S-BM207P□□	—
1,650 mm	3.7 kg			22	F3S-B227P	F3S-BM227P□□	—

Note: □□ indicates No. of beams of the connected Slave Unit. For 75 mm beam-pitch type: 04, 06, 08 or 10.

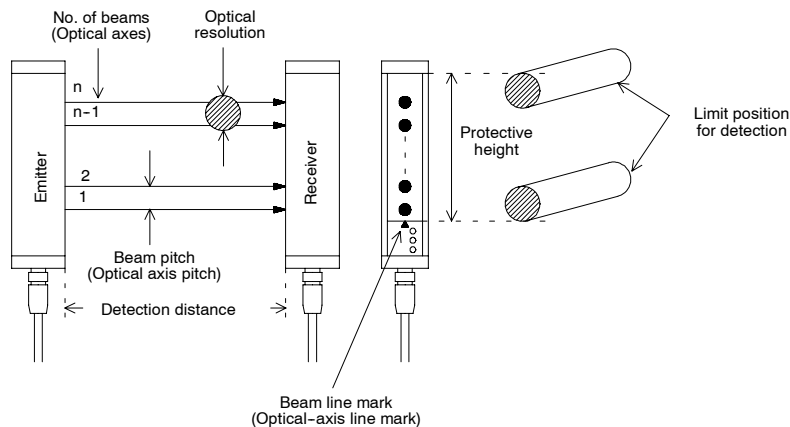
■ EXTENSION CABLE (SET OF 2) ORDER SEPARATELY

Description	Part number
3 meters	F39-JB1A
7 meters	F39-JB2A
10 meters	F39-JB3A

■ ACCESSORIES

Description	Part number
Optional Function Kit	F39-EU1E

Nomenclature



■ PROTECTIVE HEIGHT

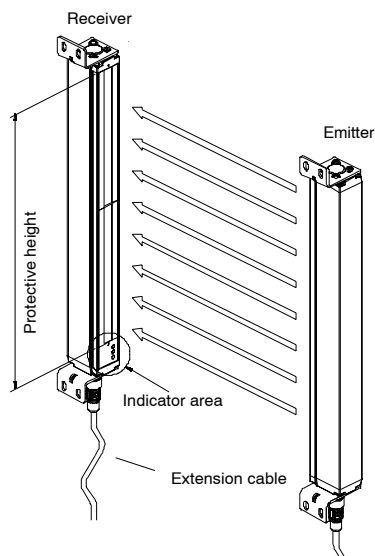
The F3S-B can detect in the area indicated by protective height in the figure below. The protective height is from the *Beam-Line Mark* (or may be called *Optical-Axis-Line Mark*) above the indicator area to the end of the yellow metal case.

■ BEAM-LINE MARK (OPTICAL-AXIS LINE MARK)

The *Center Line for the Beam* (i.e., the *Center Line for the Optical Axis*) is indicated by the triangle mark. This position is a reference line for measuring safety distance.

■ 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.



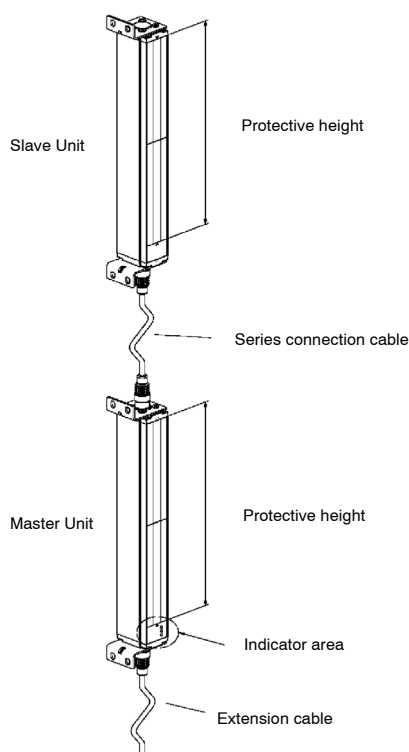
■ SERIES CONNECTION TYPES

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.

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 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.

Note: Slave Unit does not have indicators.
Master Unit and Slave Unit need to be ordered separately.



Specifications

■ RATING AND PERFORMANCE

Type	F3S-B□□□P (See Note 1.) Stand-Alone			F3S-BM□□□P□□ (See Note 1.) Master Unit for series connection			F3S-B□□□ (See Note 1.) Master Unit for series connection		
No. of optical axes (Beams)	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 to 10
Optical-axis pitch (Beam 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

(This table continues on the next page.)

Note: ¹ For detailed type names and optical specifications, see *Ordering Information*.

Specifications Table - continued from previous page

Type	F3S-B□□□P (See Note 1) Stand-Alone	F3S-B□□□P□□ (See Note 1) Master Unit for series connection	F3S-B□□□ (See Note 1) Master Unit for series connection
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 table <i>Response Time</i> OFF to ON (See note 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, 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), activated during an insufficient light detection, failure detection and connection with F39-E1, 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 <i>Interlock selection input</i> 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 <i>Interlock selection input</i> 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 <i>External test input</i> 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: Selectable between 20 and 300 ms (See Note 2) 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		
Indicator	See <i>Indicators</i>		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		
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 (See Note 3); mounting brackets - top and bottom, mounting brackets - intermediate (See Note 4); mounting plates (See Note 4); instruction manuals (See Note 5).		
Applicable standards	IEC(EN)61496-1 Type 2 ESPE (Electro-Sensitive Protective Equipment) IEC 61496-2 Type 2 AOPD (Active Opto-Electronic Protective Devices)		

Note: 1 For detailed type names and optical specifications, see *Ordering Information*.

2 Nominal value (set time). The accuracy is -0. +70% of the ON to OFF response time.

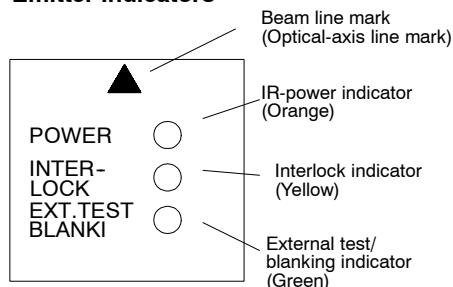
3 Only with F3S-B□□□2P and BM□□□2P□□

4 For the 1,050 mm protective height and longer types.

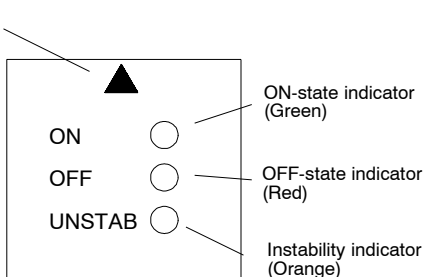
5 Only with F3S-B□□□P□ and BM□□□2P□□.

INDICATORS

Emitter Indicators



Receiver Indicators



Emitter	IR-power indicator: Lit when emitting. Interlock indicator: Lit during start/restart interlock or 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.

TABLE OF RESPONSE TIME

Stand-Alone Type

Part number	Response time	Part number	Response time	Part number	Response time
F3S-B122P	20 ms	F3S-B065P	20 ms	F3S-B047P	20 ms
F3S-B182P	20 ms	F3S-B095P	20 ms	F3S-B067P	20 ms
F3S-B242P	20 ms	F3S-B125P	20 ms	F3S-B087P	20 ms
F3S-B302P	23 ms	F3S-B155P	20 ms	F3S-B107P	20 ms
F3S-B362P	27 ms	F3S-B185P	20 ms	F3S-B127P	20 ms
F3S-B422P	30 ms	F3S-B215P	21 ms	F3S-B147P	20 ms
F3S-B482P	34 ms	F3S-B245P	22 ms	F3S-B167P	20 ms
F3S-B542P	37 ms	F3S-B275P	24 ms	F3S-B187P	20 ms
F3S-B602P	41 ms	F3S-B305P	26 ms	F3S-B207P	20 ms
F3S-B662P	45 ms	F3S-B335P	28 ms	F3S-B227P	21 ms

■ SERIES CONNECTION TYPES

The following charts show the response time of combinations of a Master Unit and a Slave Unit, and then they show combinations of a Slave Unit connected in series. For example, the response time of the combination of F3S-BM122P30 and F3S-BS302 is 30 ms.

Master unit	Response Time per Slave Unit F3S-			
	BS122	BS182	BS242	BS302
F3S-BM122P□□	20 ms	23 ms	27 ms	30 ms
F3S-BM182P□□	23 ms	27 ms	30 ms	34 ms
F3S-BM242P□□	27 ms	30 ms	34 ms	37 ms
F3S-BM302P□□	30 ms	34 ms	37 ms	41 ms
F3S-BM362P□□	34 ms	37 ms	41 ms	45 ms
F3S-BM422P□□	37 ms	41 ms	45 ms	49 ms
F3S-BM482P□□	41 ms	45 ms	49 ms	54 ms
F3S-BM542P□□	45 ms	49 ms	54 ms	57 ms
F3S-BM602P□□	49 ms	54 ms	57 ms	61 ms
F3S-BM662P□□	54 ms	57 ms	61 ms	65 ms

Master Unit	Response Time per Slave Unit F3S-			
	BS047	BS067	BS087	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

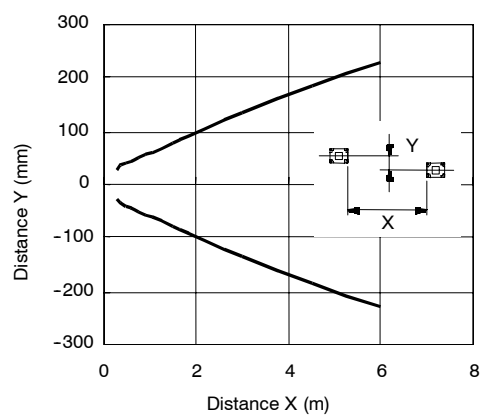
Master Unit	Response Time per Slave Unit F3S-			
	BS065	BS095	BS125	BS155
F3S-BM065P□□	20	20	20	21
F3S-BM095P□□	20	20	21	22
F3S-BM125P□□	20	21	22	24
F3S-BM155P□□	21	22	24	26
F3S-BM185P□□	22	24	26	28
F3S-BM215P□□	24	26	28	30
F3S-BM245P□□	26	28	30	32
F3S-BM275P□□	28	30	32	34
F3S-BM305P□□	30	32	34	35
F3S-BM335P□□	32	34	35	37

Engineering Data

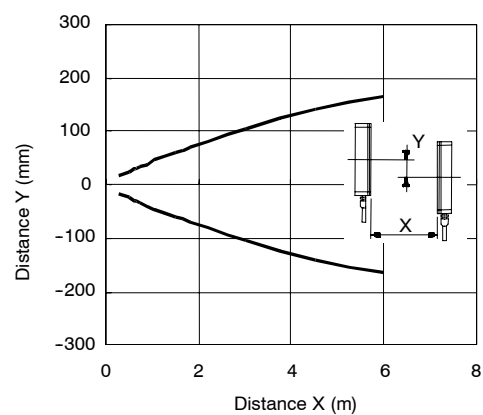
■ OPERATING RANGE

F3S-B122P

Perpendicular to Center Line of Lenses

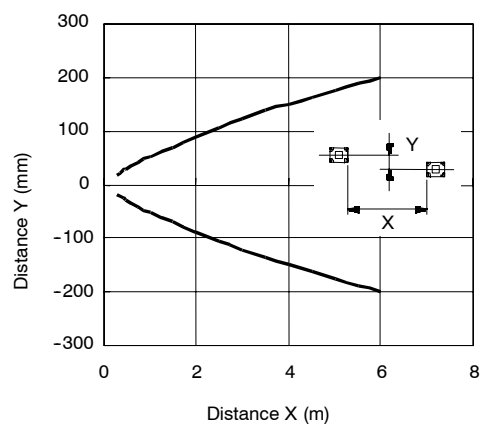


Parallel to Center Line of Lenses

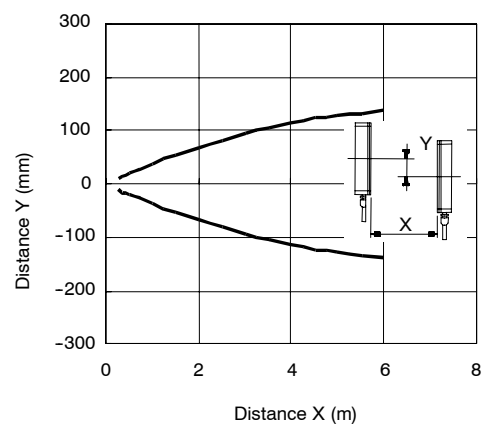


F3S-B662P

Perpendicular to Center Line of Lenses

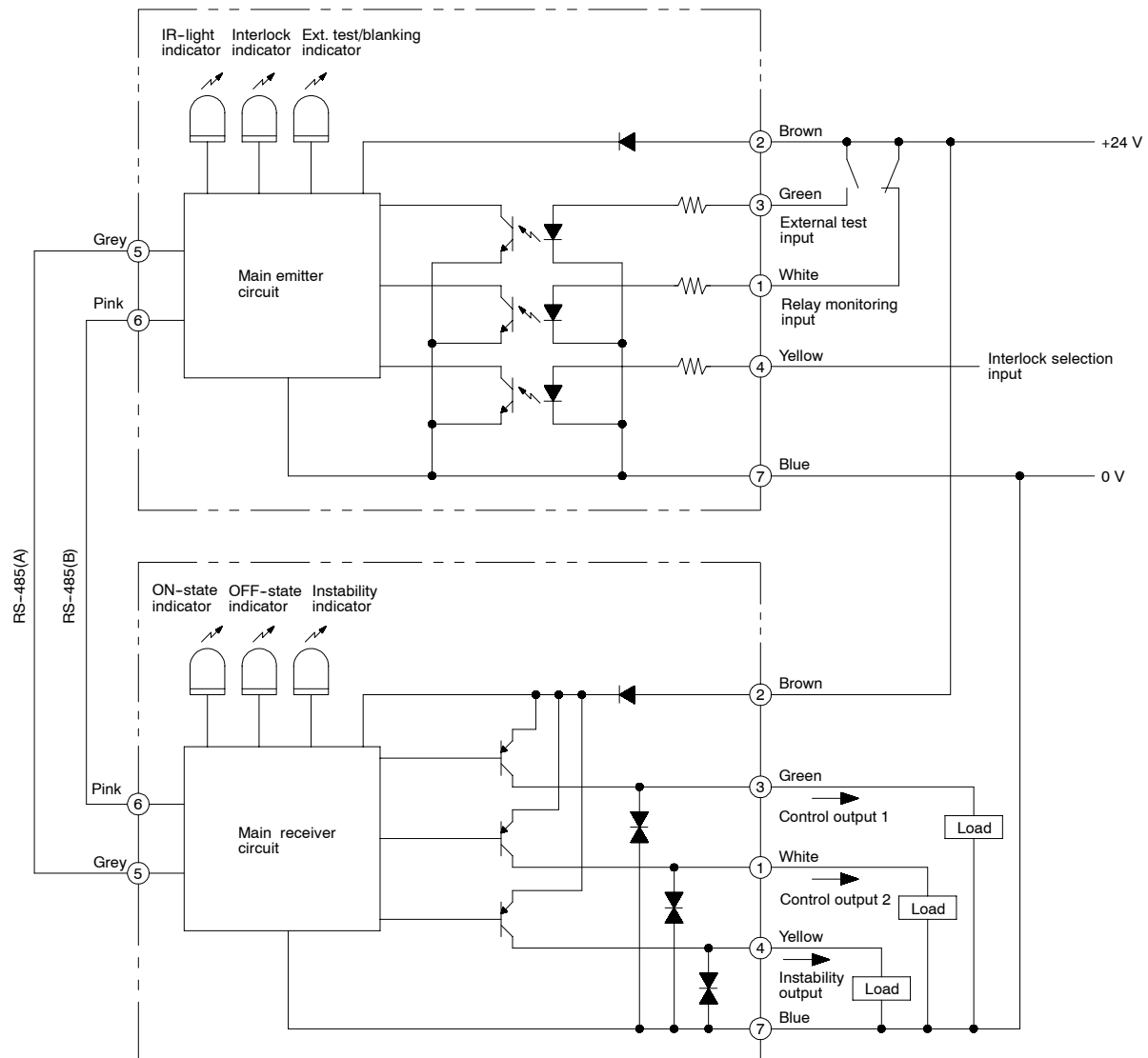


Parallel to Center Line of Lenses



Operation

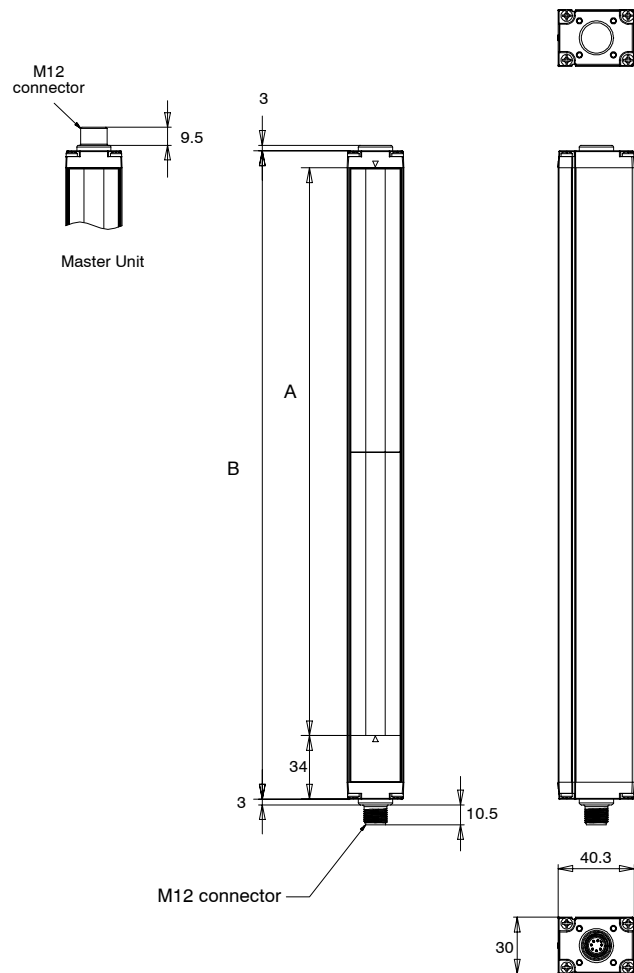
■ I/O CIRCUIT DIAGRAM



Dimensions

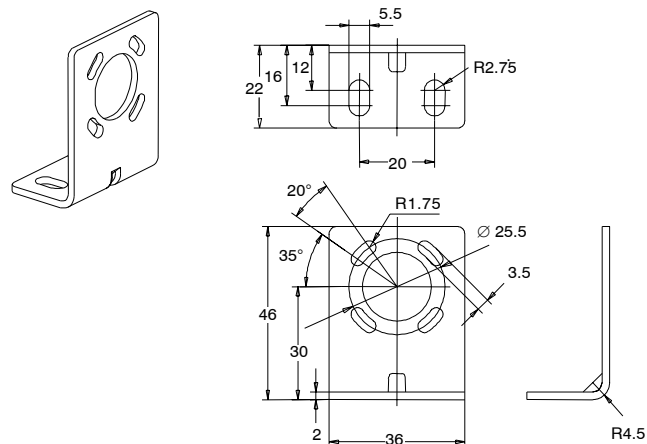
Unit: mm

■ F3S-B SAFETY LIGHT CURTAIN



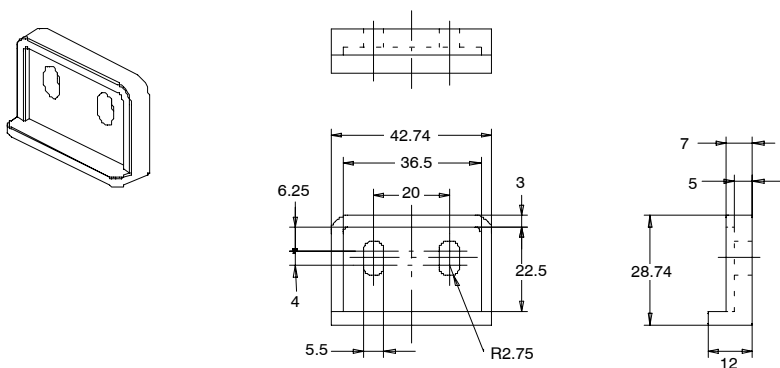
Part number	A (Protective height)	B (Full length)
F3S-B122	300	343
F3S-B182	450	493
F3S-B242	600	643
F3S-B302	750	793
F3S-B362	900	943
F3S-B422	1050	1093
F3S-B482	1200	1243
F3S-B542	1350	1393
F3S-B602	1500	1543
F3S-B662	1650	1693

■ MOUNTING BRACKET (TOP AND BOTTOM)

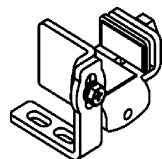


■ MOUNTING PLATE

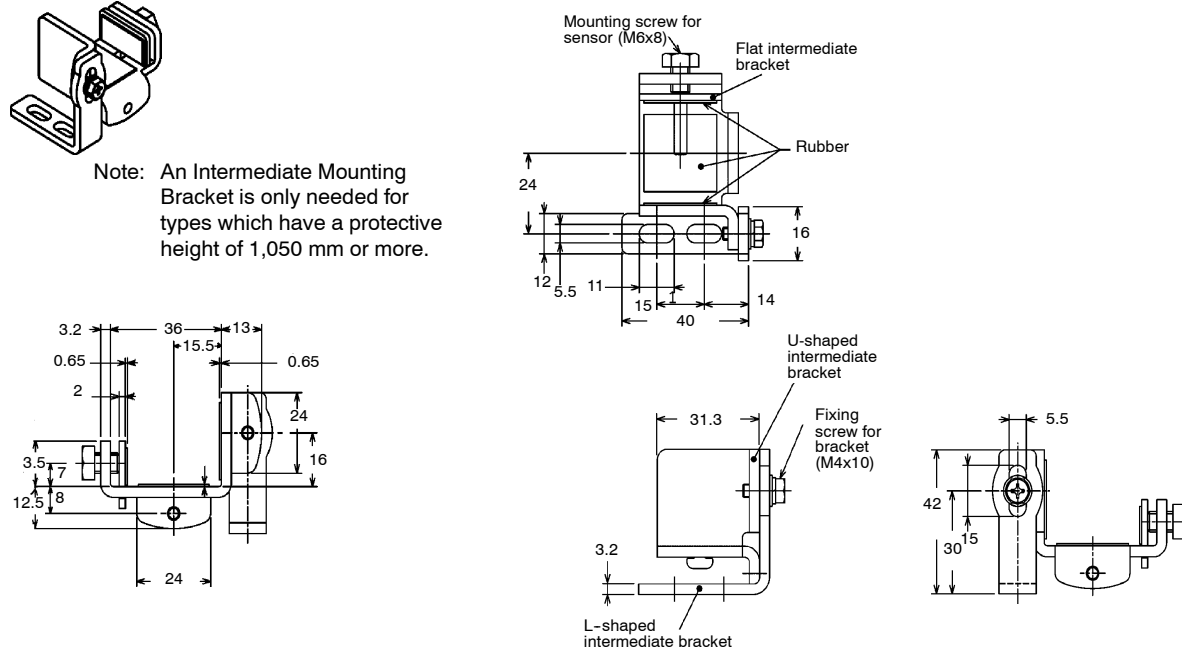
Only supplied with types which have a protective height of 1,050 mm or longer (including intermediate brackets). Only needed for rear mounting.



■ INTERMEDIATE MOUNTING BRACKET



Note: An Intermediate Mounting Bracket is only needed for types which have a protective height of 1,050 mm or more.

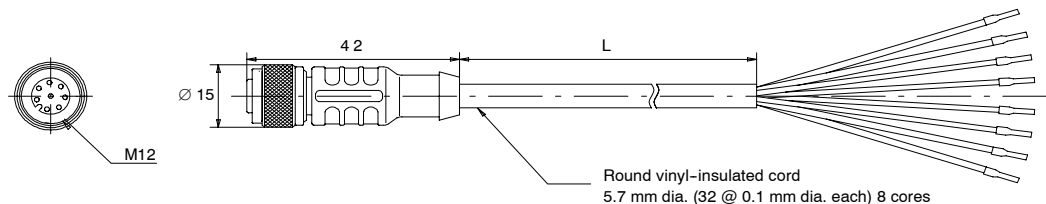


Options (Order Separately)

Unit: mm

■ EXTENSION CABLE (SET OF 2: EMITTER = GRAY, RECEIVER = BLACK)

F39-JB1A (L = 3 m)
F39-JB2A (L = 7 m)
F39-JB3A (L = 10m)



■ F39-EU1E OPTIONAL FUNCTION KIT

This set includes the following items:

- F39-U1E Optional Function Software
- F39-E1 Interface Unit
- F39-JB1C Interface Cable

The F39-U1E Optional Function Software is the WINDOWS® based software for use with the F39-E1 Interface Unit to program the F3S-B Safety Light Curtain. The software is provided on one 3.5 inch floppy disk. The software has the features listed below.

Set the following functions to the F3S-B:

1. Start interlock function
 2. Relay monitoring function
 3. Blanking function
- Display each axis and each input line condition of the F3S-B
 - Change the ON delay time

Note: The F3S-B is not in normal operation during connection with the F39-E1. The control outputs are held in their OFF-state. For detailed information please refer to *Details of Optional Function Kit*, E39-EU1E in this data sheet.



WARNING

After setting the blanking function, check that the F3S-B detects a test rod at any position in the F3S-B detection zone through which a person reaches the hazardous part of the machine. If any positions are found by check above, install protective structures to there to prevent intrusion which the F3S-B can not detect. Failure to do so may result in serious injury.

Perform the installation check and the periodical inspection described in the F3S-B manual.

Disconnect the outputs of the F3S-B from the load when programming it using the F39-U1E software and with F39-E1 Interface Unit. Failure to do so may result in serious injury.

Do not connect the F39-E1 to a power supply with a voltage higher than 24 VDC +20 %. Do not connect the F39-E1 to an AC power supply.

Installation


■ WIRING

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

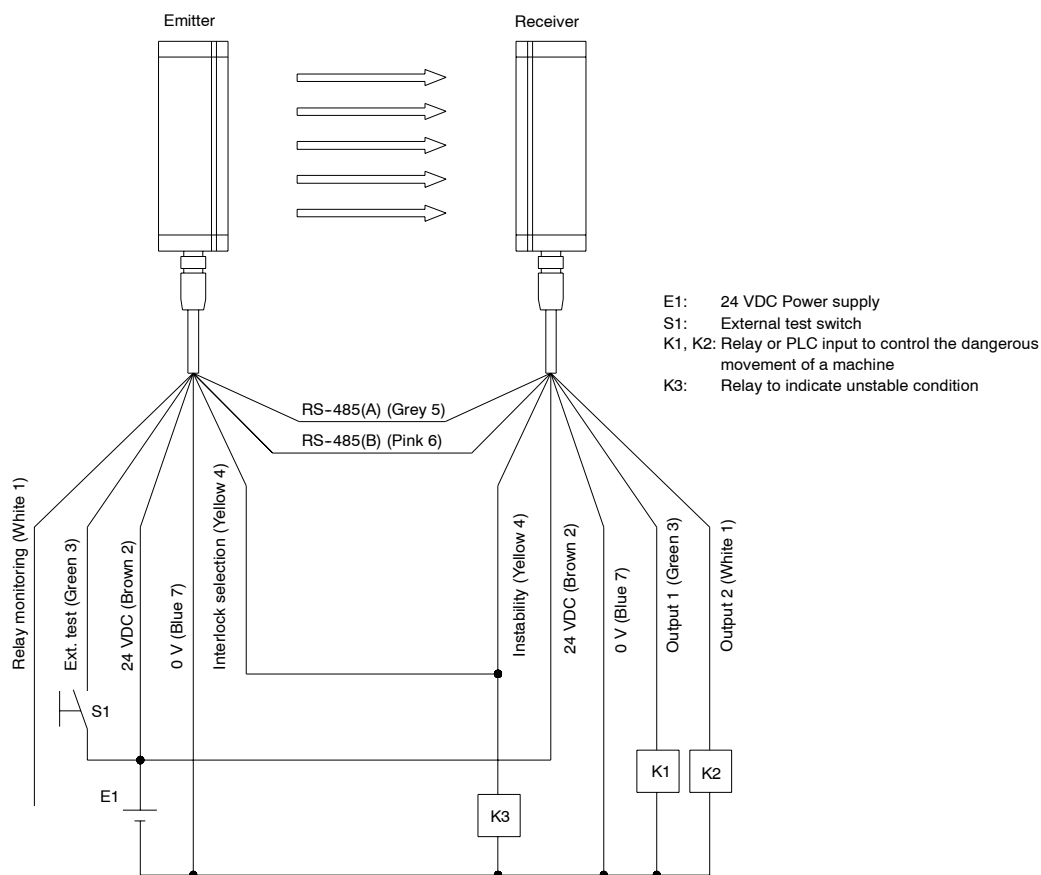
- Connect the emitter extension cable (F39-JB□A-L optional, **gray color outer jacket**) to the emitter. (The emitter uses gray color plastic caps.)
- Connect the receiver extension cable (F39-JB□A-D optional, **black color outer jacket**) to the receiver. (The receiver unit uses black color plastic caps.)
- 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.

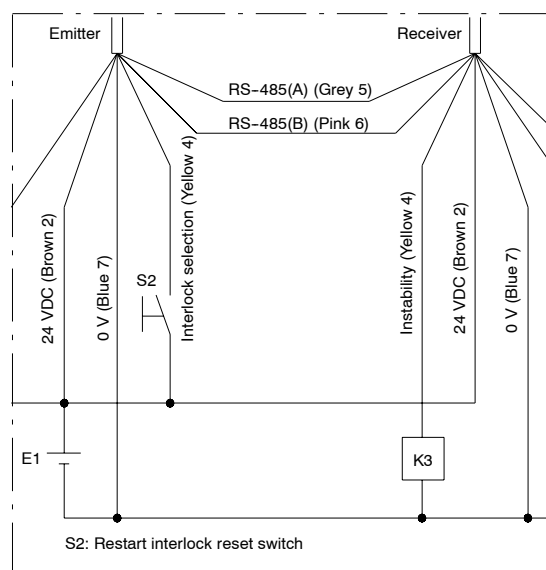
■ CONNECTOR (MAIN UNIT END)

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

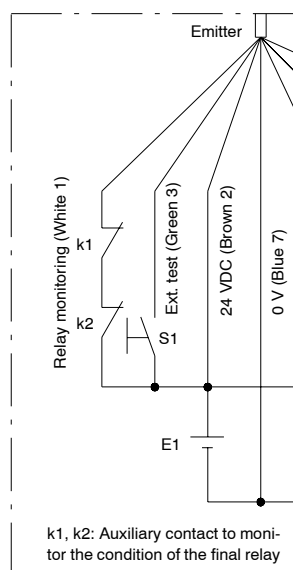
Note: N.C. / reserved: do not connect



When Using START/RESTART FUNCTION



When Using Optional RELAY MONITORING FUNCTION



■ DETAILS OF F39-EU1E OPTIONAL FUNCTION KIT

Preparation

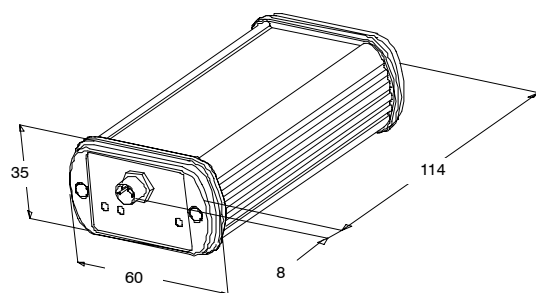


Caution

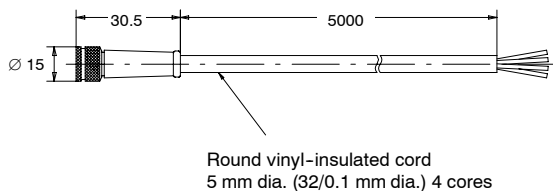
Perform the installation check and the periodical inspection described in the F3S-B manual.
Do not disassemble, repair or modify the F39-E1.
Do not use the F39-E1 in flammable or explosive environments.

To use the F39-U1E software, the following items are necessary.

- Personal Computer (not included)
 - Windows® 95, Windows® 98, or Windows NT®
 - 133MHz Pentium® processor or better
 - 32MB RAM or higher for Windows® 95 and Windows® 98
 - 64MB RAM or higher for Windows NT®
 - A 115kBd RS-232 serial interface port or better
- F39-E1 Interface Unit

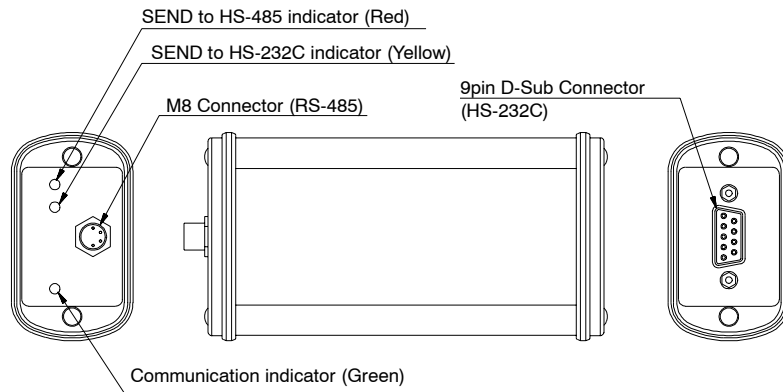


- F39-JB1C Interface Cable 5 m cable length, M8 connector (4 pins)



- RS-232C Cable (not included)

■ COMPONENT NAMES AND FUNCTIONS OF THE F39-E1 INTERFACE UNIT



SEND to RS-485 Indicator (Red) Lit when the F39-E1 sends data to the F3S-B via RS-485.

SEND to RS-232C Indicator (Yellow) Lit when the F39-E1 sends data to the PC via RS-232C.

COMMUNICATION Indicator (Green) Flashing during communication between the F3S-B and the F39-E1.

■ HARDWARE CONNECTION



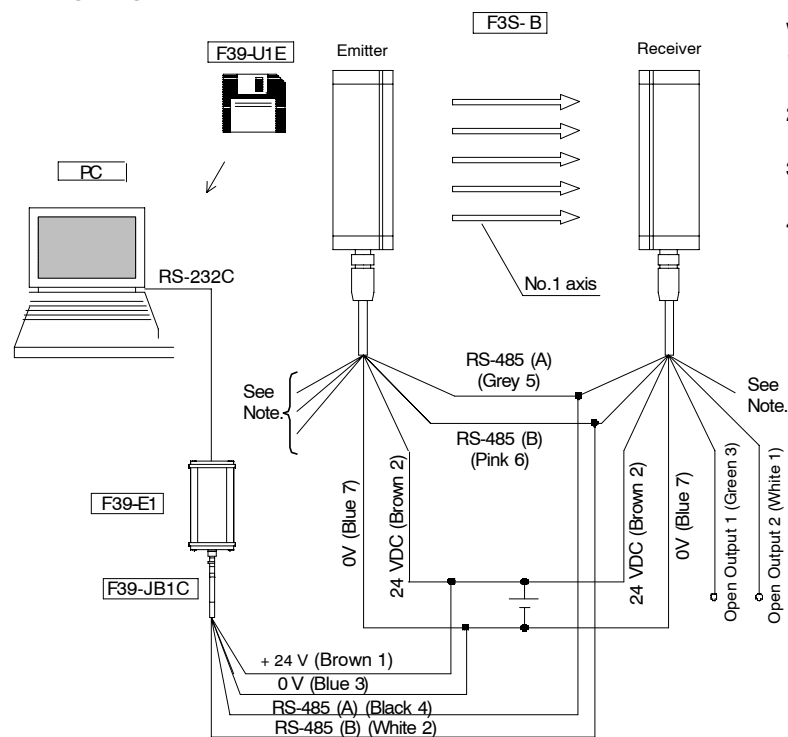
WARNING

Disconnect the outputs of the F3S-B from the load when programming it using the F39-U1E software and with F39-E1 Interface Unit. Failure to do so may result in serious injury.

Do not connect the F39-E1 to a power supply with a voltage higher than 24 VDC +20 %.

Do not connect the F39-E1 to an AC power supply.

Wiring Diagram



Wiring Procedure

1. For wiring connections, use the *F3S-B Instruction Manual* (enclosed with the product).
2. Connect the Interface Cable (F39-JB1C) to the Interface Unit (F39-E1).
3. Connect the 4 wires of the Interface Cable to each appropriate line of the F3S-B.
4. Connect an RS-232C Cable to the PC and to the Interface Unit.

■ SOFTWARE INSTALLATION

Copy the file "F39-U1E_ver#.exe" and F39-U1E_ver#.dat from the 3.5-inch floppy disk (enclosed with the product) onto the hard disk of the PC.

■ FUNCTION DESCRIPTION

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 of the F3S-B then starts normal operation. The duration of the interruption must be equal or shorter as defined in the »Max. interruption time (sec)« .

Max. Interruption Time

The max interruption time can be set between **0.3 and 2 s**.

Note: In the case both the Start interlock and the Start/restart interlock are selected, only the Start/restart interlock will be activate.

Start/Restart interlock is a function which is selected by wiring. Refer to the instruction manual of the F3S-B for more detailed information.

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 (Supplied voltage to F3S-B) 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 the F3S-B manual for wiring information). To ensure this logic relation, the MPCEs must be safety approved types, with forcibly guided contacts.

■ RATINGS AND PERFORMANCE

Type	F39-E1 Interface Unit
Supply voltage	24 VDC \pm 20% (including 5 Vp-p ripple)
Current consumption	120 mA max.
Interface	RS-232C interface, RS-485 interface
Connection method	RS-485: 4pins, M 8 connector, RS-232C: D-SUB connector, 9 pins
Protection circuit	RS 485 protection against wrong wiring
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)
Ambient humidity	During storage: 35 to 95% RH
Insulation resistance	20 M Ω min. (at 500 VDC)
Dielectric strength voltage	500 VAC, 50/60 Hz, for 1 min.
Degree of protection	IEC60529, IP20
Shock resistance	Normal operation: 150 m/s ² [15 G], \pm X, \pm Y and \pm Z directions: 3 times
Vibration resistance	Normal operation: 10 to 55 Hz, double-amplitude: 0.3 mm, X, Y and Z directions: 10 sweeps
Cable length	RS-485 cable: 5 m (4 pin 0.25 mm ²), RS-232C cable: Standard
Materials	Case: Aluminum
Size	122 x 60 x 35 mm
Conformity	EMC Directive

Allowed Relay Delay Time

The allowed relay delay time can be set between **20 and 300 ms**. This delay time has to be set at least 20 milliseconds shorter than the Outputs ON delay time.

Outputs ON Delay

You can set the ON delay time of control outputs between **80 and 400 ms**. This corresponds to the time which the control outputs go to ON-state after the detection zone is not interrupted.

- Note:
1. When the Relay monitoring function is also used, the ON delay time must meet the formula below.
 2. ON delay time \geq Allowed relay delay time + 20 ms
After the Relay monitoring function is set, if the ON delay time does not meet the above formula, the ON delay time will be changed automatically into *Allowed relay delay time + 20 ms*.

Blanking

With the Blanking function, one or more axes can be disabled. This function is useful in an application where a part of the F3S-B detection zone is always interrupted. The Manual setting and the Teaching setting are available to select the blanked axes.

- Note:
1. In the case the blanked zone is not filled with structure completely and remains some opening, the opening must be filled with the protective structure.
 2. All axes can not be disabled. At least one axis needs to be active.

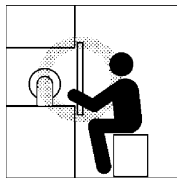
Precautions



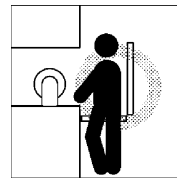
WARNING

1. Do not use the F3S-B on machines that can not be stopped by electrical control in case of an emergency.
2. Do not use the F3S-B in flammable or explosive environments.
3. Always maintain the safety distance between F3S-B and a hazardous part of the machine. Serious injury may result if the machine does not stop before someone reaches the hazardous part.
4. Install protective structures around a machine so that you must pass through the detection zone to reach a hazardous part of the machine.
5. Install F3S-B so that some parts of the operator's body remain in the detection zone at all times when the operator works in that hazardous area.
6. 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.

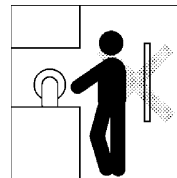


Some part of the operator's body remains in the detection zone while they are working.

■ INCORRECT INSTALLATION



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



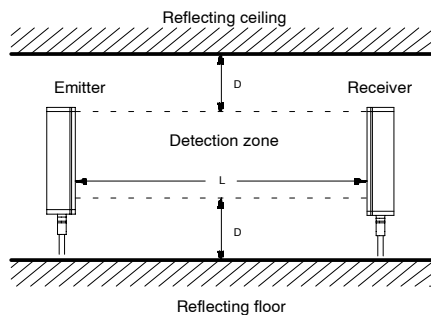
A worker is between the sensor detection zone and a hazardous part of a machine.



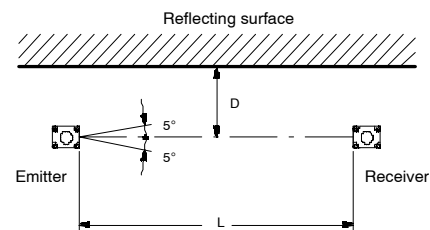
WARNING

1. Be sure to install the F3S-B to minimize the effects of reflections from reflective surfaces. Failure to do so will create an inability to detect and may result in serious injury.
2. Install the F3S-B with a minimum distance D as shown below from the reflective surface (highly reflective surfaces) like metal walls, floors, ceilings, and work pieces.

Side View



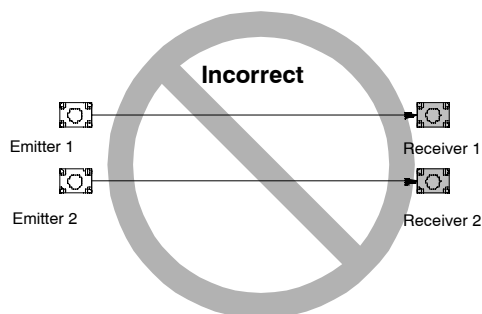
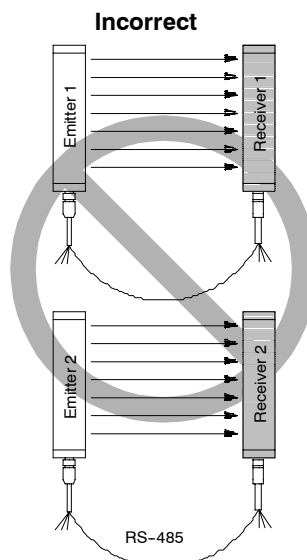
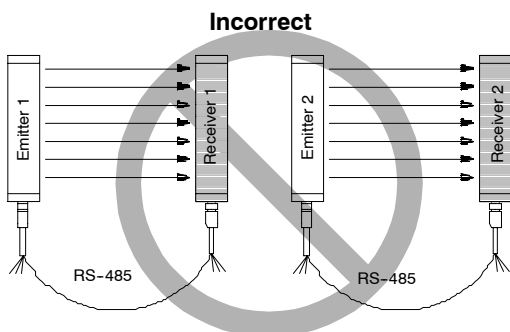
Top View



Distance between emitter and receiver (detection distance L)	Minimum installation (distance D)
0.3 to 3 m	0.27 m
3 to 5 m	$L \times \tan 5^\circ = L \times 0.087$ (m)

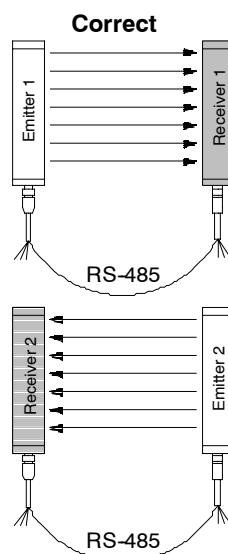
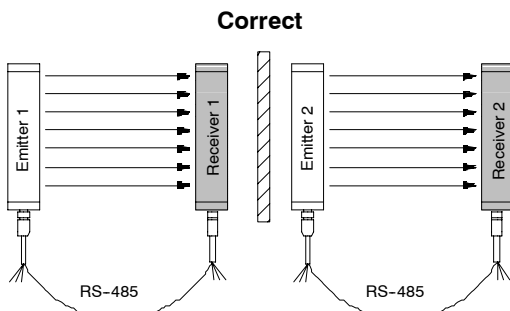
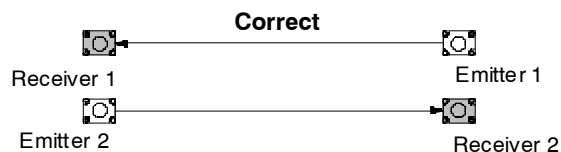
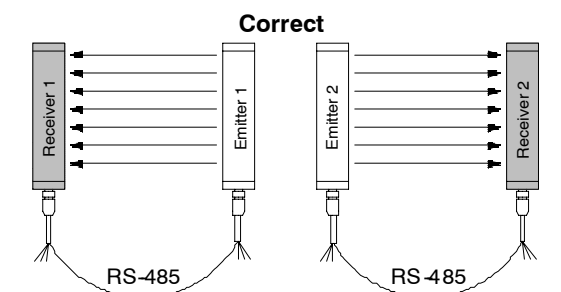
**WARNING**

When using multiple sets of the F3S-B, install them so that mutual interference is not incurred.



■ ALTERNATE EMITTERS AND RECEIVERS

Correct installations are shown below to prevent mutual interference.



**WARNING**

1. 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.

2. A qualified person, as determined by local regulations, must confirm that installation, inspection and maintenance are implemented correctly.
3. 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.

4. 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.

5. Be sure to conduct inspections regularly.

6. The F3S-B cannot be used in applications where hazardous objects may exit the protected zone.

For details, see the user manual.

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.

- (1.) The power supply voltage must be within rating (24 VDC \pm 20 %).
- (2.) The power supply is connected only to the F3S-B and 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.
- (3.) The power supply uses double or reinforced insulation between the primary and secondary circuits.
- (4.) The power supply automatically resets overcurrent protection characteristics (voltage drop).

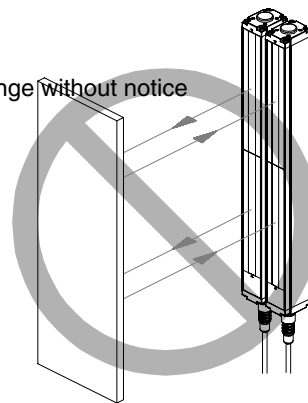
- (5.) The power supply maintains an output holding time of at least 20 ms.

- (6.) FG (frame ground terminal) must be connected to PE (protective earth) when using a commercially available switching regulator.

- (7.) 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.

- (8.) 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.

9. Do not use the F3S-B in a retroreflective configuration, or detection may fail.



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2/03

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