F3SG-RE

Easy-to-use Safety Sensor Ideal for Simple On/Off Detection Applications

- Provides simple safety functions - saving TCO by reducing errors
- Simple wiring with only 4 wires
- Fast response time of 5 ms

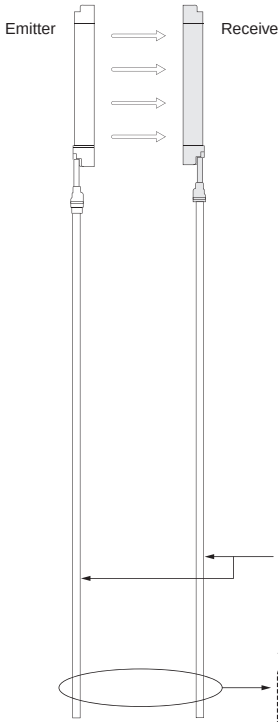
System Configuration

Mounting bracket

F39-LGF
Standard Fixed Bracket
(included as standard)

F39-LGA
Standard Adjustable Bracket

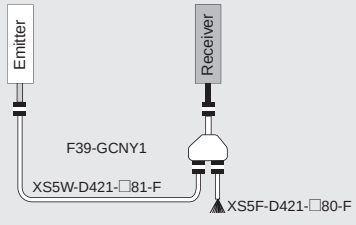
F39-LGTB
F39-LGTB-1
Top/Bottom Adjustable Bracket



XS5W-D421-□81-F
Double-Ended Cable
XS5F-D421-□80-F
Single-Ended Cable
or

Accessory

F39-GCNY1
XS5W-D421-□81-F
XS5F-D421-□80-F
Reduced wiring connector system



Accessory

F39-HGB□□□□
Spatter Protection Cover
(for F3SG-RE)

F39-PTG
Laser Pointer

Recommended safety controller *

- **NX/NE1A-series Safety Network Controller**
- **G9SP-series Safety Controller**
- **G9SE/G9SA-series Safety Relay Unit**
- **G9SX-series Flexible Safety Unit**
- **G7SA/G7S-E Relays with Forcibly Guided Contacts**

* The recommended safety controller is required to build a safety circuit using emergency stop switches and door switches.

Ordering Information

Main Units

Safety Light Curtain
Finger protection

Number of beams	Protective height (mm)	Model	
		PNP output	NPN output
15	160	F3SG-4RE0160P14	F3SG-4RE0160N14
23	240	F3SG-4RE0240P14	F3SG-4RE0240N14
31	320	F3SG-4RE0320P14	F3SG-4RE0320N14
39	400	F3SG-4RE0400P14	F3SG-4RE0400N14
47	480	F3SG-4RE0480P14	F3SG-4RE0480N14
55	560	F3SG-4RE0560P14	F3SG-4RE0560N14
63	640	F3SG-4RE0640P14	F3SG-4RE0640N14
71	720	F3SG-4RE0720P14	F3SG-4RE0720N14
79	800	F3SG-4RE0800P14	F3SG-4RE0800N14
87	880	F3SG-4RE0880P14	F3SG-4RE0880N14
95	960	F3SG-4RE0960P14	F3SG-4RE0960N14
103	1,040	F3SG-4RE1040P14	F3SG-4RE1040N14
111	1,120	F3SG-4RE1120P14	F3SG-4RE1120N14
119	1,200	F3SG-4RE1200P14	F3SG-4RE1200N14
127	1,280	F3SG-4RE1280P14	F3SG-4RE1280N14
135	1,360	F3SG-4RE1360P14	F3SG-4RE1360N14
143	1,440	F3SG-4RE1440P14	F3SG-4RE1440N14
151	1,520	F3SG-4RE1520P14	F3SG-4RE1520N14
159	1,600	F3SG-4RE1600P14	F3SG-4RE1600N14
167	1,680	F3SG-4RE1680P14	F3SG-4RE1680N14
175	1,760	F3SG-4RE1760P14	F3SG-4RE1760N14
183	1,840	F3SG-4RE1840P14	F3SG-4RE1840N14
191	1,920	F3SG-4RE1920P14	F3SG-4RE1920N14
199	2,000	F3SG-4RE2000P14	F3SG-4RE2000N14
207	2,080	F3SG-4RE2080P14	F3SG-4RE2080N14

Hand and arm protection

Number of beams	Protective height (mm)	Model	
		PNP	NPN
8	190	F3SG-4RE0190P30	F3SG-4RE0190N30
12	270	F3SG-4RE0270P30	F3SG-4RE0270N30
16	350	F3SG-4RE0350P30	F3SG-4RE0350N30
20	430	F3SG-4RE0430P30	F3SG-4RE0430N30
24	510	F3SG-4RE0510P30	F3SG-4RE0510N30
28	590	F3SG-4RE0590P30	F3SG-4RE0590N30
32	670	F3SG-4RE0670P30	F3SG-4RE0670N30
36	750	F3SG-4RE0750P30	F3SG-4RE0750N30
40	830	F3SG-4RE0830P30	F3SG-4RE0830N30
44	910	F3SG-4RE0910P30	F3SG-4RE0910N30
48	990	F3SG-4RE0990P30	F3SG-4RE0990N30
52	1,070	F3SG-4RE1070P30	F3SG-4RE1070N30
56	1,150	F3SG-4RE1150P30	F3SG-4RE1150N30
60	1,230	F3SG-4RE1230P30	F3SG-4RE1230N30
64	1,310	F3SG-4RE1310P30	F3SG-4RE1310N30
68	1,390	F3SG-4RE1390P30	F3SG-4RE1390N30
72	1,470	F3SG-4RE1470P30	F3SG-4RE1470N30
76	1,550	F3SG-4RE1550P30	F3SG-4RE1550N30
80	1,630	F3SG-4RE1630P30	F3SG-4RE1630N30
84	1,710	F3SG-4RE1710P30	F3SG-4RE1710N30
88	1,790	F3SG-4RE1790P30	F3SG-4RE1790N30
92	1,870	F3SG-4RE1870P30	F3SG-4RE1870N30
96	1,950	F3SG-4RE1950P30	F3SG-4RE1950N30
100	2,030	F3SG-4RE2030P30	F3SG-4RE2030N30
104	2,110	F3SG-4RE2110P30	F3SG-4RE2110N30
108	2,190	F3SG-4RE2190P30	F3SG-4RE2190N30
112	2,270	F3SG-4RE2270P30	F3SG-4RE2270N30
116	2,350	F3SG-4RE2350P30	F3SG-4RE2350N30
120	2,430	F3SG-4RE2430P30	F3SG-4RE2430N30
124	2,510	F3SG-4RE2510P30	F3SG-4RE2510N30

Accessories (Sold separately)

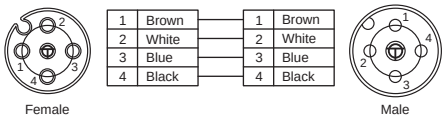
Safety light curtain connecting cable

Single-Ended Cable (Round Water-resistant Connector: Connector Connected to Cable, Socket on One Cable End)

Appearance	Type	Cable length	Specifications	Model
	M12 connector (4-pin), 4 wires	1 m	 Female PIN / Emitter / Receiver / Color 1 / +24 VDC / +24 VDC / Brown 2 / Range setting / OSSD 2 / White 3 / 0 VDC / 0 VDC / Blue 4 / Not used / OSSD 1 / Black	XS5F-D421-C80-F
		2 m		XS5F-D421-D80-F
		3 m		XS5F-D421-E80-F
		5 m		XS5F-D421-G80-F
		10 m		XS5F-D421-J80-F
		20 m		XS5F-D421-L80-F

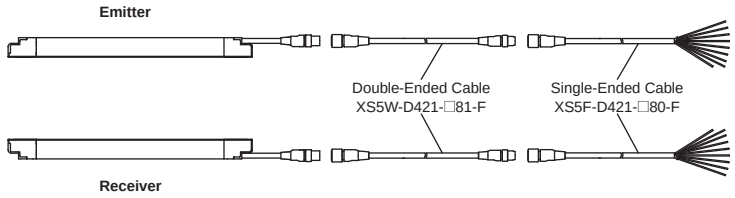
Note: 1. One cable that can be used for both emitter and receiver is provided. Order two cables for one set of safety light curtains.
2. To extend the cable length to 20 m or more, add the XS5W-D421-□81-F Double-Ended Cable.

Double-Ended Cable (Round Water-resistant Connector: Connectors Connected to Cable, Socket and Plug on Cable Ends)
For cable extension and simple wiring

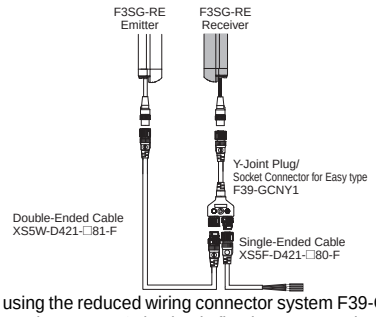
Appearance	Type	Cable length	Specifications	Model
	M12 connector (4-pin) on both ends	1 m	 Female / Male 1 Brown — 1 Brown 2 White — 2 White 3 Blue — 3 Blue 4 Black — 4 Black	XS5W-D421-C81-F
		2 m		XS5W-D421-D81-F
		3 m		XS5W-D421-E81-F
		5 m		XS5W-D421-G81-F
		10 m		XS5W-D421-J81-F
		20 m		XS5W-D421-L81-F

Note: 1. One cable that can be used for both emitter and receiver is provided. Order two cables for one set of safety light curtains.
2. To extend the cable length to more than 20 m, add the XS5W-D421-□81-F Double-Ended Cable to the XS5F-D421-□80-F Single-Ended Cable.
To extend the cable length to more than 40 m, add several Double-Ended Cables to the Single-Ended Cable.
Example: To extend the cable length to 50 m, connect two XS5W-D421-L81-F (20 m) cables and one XS5F-D421-J80-F (10 m) cable.

<Connection example>



Y-Joint Plug/Socket Connector for Easy type F3SG-RE

Appearance	Type	Cable length	Specifications	Model
	M12 connectors. Used for reduced wiring.	0.5 m	 F3SG-RE Emitter F3SG-RE Receiver Y-Joint Plug/ Socket Connector for Easy type F39-GCNY1 Double-Ended Cable XS5W-D421-□81-F Single-Ended Cable XS5F-D421-□80-F When using the reduced wiring connector system F39-GCNY1, the Operating Range Selection is fixed to Long Mode.	F39-GCNY1

Sensor Mounting Brackets

Appearance	Specification	Application	Model
	Standard Fixed Bracket	Bracket to mount the F3SG-R. Side mounting and backside mounting possible. (This is included as a standard accessory with the product. It comes as a set of two Brackets. Refer to note *1 for the number of sets provided with each model.)	**F39-LGF**
	Standard Adjustable Bracket	Bracket to mount the F3SG-R. Beam alignment after mounting possible. The angle adjustment range is ±15°. Side mounting and backside mounting possible. (Sold separately as a set of two Brackets. Refer to note *1 for the number of sets required for each model.)	**F39-LGA**
	Top/Bottom Adjustable Bracket *2	Bracket to mount the F3SG-R. Use this bracket at the top and bottom positions of the F3SG-R. Beam alignment after mounting possible. The angle adjustment range is ±22.5°. Side mounting and backside mounting possible. (Sold separately. 4 brackets per set.)	**F39-LGTB**
	Top/Bottom Adjustable Bracket *2 (For user-made mounting part)	Top/Bottom Adjustable Bracket without a bracket to mount to the wall. Use the user's own wall mounting part to suit the machine. (Sold separately. 4 brackets per set.)	**F39-LGTB-1**

*1. [for F3SG-4RE□□□□14] Protective height of 0160 to 1200: 2 sets, Protective height of 1280 to 2080: 3 sets
[for F3SG-4RE□□□□30] Protective height of 0190 to 1230: 2 sets, Protective height of 1310 to 2270: 3 sets, Protective height of 2350 to 2510: 4 sets

*2. Top/Bottom Adjustable Bracket cannot be used with the Standard Fixed Bracket. Use with the Standard Adjustable Bracket.
Using Top/Bottom Adjustable Brackets with Standard Adjustable Brackets

F3SG-4RE□□□□14:	Protective height of 1040 or less:	The Standard Adjustable Bracket is not required. Please purchase 1 set of Top/Bottom Adjustable Brackets (F39-LGTB(-1)).
	Protective height of 1120 to 1920:	Please purchase 1 set of Top/Bottom Adjustable Brackets (F39-LGTB(-1)) and 1 set of Standard Adjustable Brackets (F39-LGA).
	Protective height of 2000 to 2080:	Please purchase 1 set of Top/Bottom Adjustable Brackets (F39-LGTB(-1)) and 2 sets of Standard Adjustable Brackets (F39-LGA).
F3SG-4RE□□□□30:	Protective height of 1070 or less:	The Standard Adjustable Bracket is not required. Please purchase 1 set of Top/Bottom Adjustable Brackets (F39-LGTB(-1)).
	Protective height of 1150 to 1950:	Please purchase 1 set of Top/Bottom Adjustable Brackets (F39-LGTB(-1)) and 1 set of Standard Adjustable Brackets (F39-LGA).
	Protective height of 2030 to 2510:	Please purchase 1 set of Top/Bottom Adjustable Brackets (F39-LGTB(-1)) and 2 sets of Standard Adjustable Brackets (F39-LGA).

Laser Pointer for F3SG-R

Appearance	Specifications	Model
	The laser pointer is attached on the optical surface of the F3SG-R to help coarse adjustment of beams.	**F39-PTG**

			F3SG-4RE□□□□-14, F3SG-2RE□□□□-14	F3SG-4RE□□□□-30, F3SG-2RE□□□□-30
Perfor-mance	Light Source		Infrared LEDs, Wavelength: 870 nm	
	Startup Waiting Time		2 s max.	
Electricall	Power Supply Voltage (Vs)		SELV/PELV 24 VDC±20% (ripple p-p 10% max.)	
	Current Consumption		Refer to page 79	
	Safety Outputs (OSSD)		F3SG-□RE□□□□P□□: Two PNP transistor outputs F3SG-□RE□□□□N□□: Two NPN transistor outputs	
			Load current of 300 mA max., Residual voltage of 2 V max. (except for voltage drop due to cable extension), Capacitive load of 1 μF max., Inductive load of 2.2 H max. *1 Leakage current of 1 mA max. (PNP), 2 mA max. (NPN) *2 *1.The load inductance is the maximum value when the safety output frequently repeats ON and OFF. When you use the safety output at 4 Hz or less, the usable load inductance becomes larger. *2.These values must be taken into consideration when connecting elements including a capacitive load such as a capacitor.	
	Output Operation Mode	Safety Output	Light-ON (Safety output is enabled when the receiver receives an emitting signal.)	
	Input Voltage	ON Voltage	Operating Range Select Input: Long: 9 V to Vs (sink current 3 mA max.) * Short: 0 to 3 V (source current 3 mA max.)	
		OFF Voltage		
		*	* The Vs indicates a supply voltage value in your environment.	
	Overvoltage Category (IEC60664-1)		II	
	Indicators		Refer to page 80	
	Protective Circuit		Output short protection, Power supply reverse polarity protection	
	Insulation Resistance		20 MΩ or higher (500 VDC megger)	
	Dielectric Strength		1,000 VAC, 50/60 Hz (1 min)	
Functional	Test Function		Self-test (at power-on, and during operation)	
Environ-mental	Ambient Temperature	Operating	-10 to 55°C (14 to 131°F) (non-icing)	
		Storage	-25 to 70°C (-13 to 158°F)	
	Ambient Humidity	Operating	35% to 85% (non-condensing)	
		Storage	35% to 95%	
	Ambient Illuminance		Incandescent lamp: 3,000 lx max. on receiver surface Sunlight: 10,000 lx max. on receiver surface	
	Degree of Protection (IEC 60529)		IP65 and IP67	
	Vibration Resistance (IEC 61496-1)		10 to 55 Hz, Multiple amplitude of 0.7 mm, 20 sweeps for all 3 axes	
	Shock Resistance (IEC 61496-1)		100 m/s^2, 1000 shocks for all 3 axes	
	Pollution Degree (IEC 60664-1)		Pollution Degree 3	
Connec-tions	Power cable	Type of Connection	M12 connectors: 4-pin, IP67 rated when mated,Cables prewired to the sensors	
		Number of Wires	Emitter: 4, Receiver: 4	
		Cable Length	0.3 m	
		Cable Diameter	6 mm	
		Minimum Bend-ing Radius	R5 mm	
	Extension cable - Single-Ended Cable - Double-Ended Cable	Type of Connection	Use the XS5□-D42□ series cables.	
		Number of Wires		
		Cable Length		
		Cable Diameter		
		Minimum Bend-ing Radius		
	Extension of Power Cable		100 m max.	
Material	Material		Housing: Aluminum alloy Cap: PBT resin Front window: Acrylic resin Cable: Oil-resistant PVC resin Standard Fixed Bracket (F39-LGF): Zinc alloy FE plate: Stainless steel	
	Weight		Refer to page 79.	
	Included Accessories		Safety Precautions, Quick Installation Manual, Standard Fixed Bracket*1, Troubleshooting Guide Sticker *1.The quantity of Standard Fixed Brackets included varies depending on the protective height. [F3SG-□RE□□□□□14] - Protective height of 0160 to 1200: 2 sets - Protective height of 1280 to 2080: 3 sets [F3SG-□RE□□□□□30] - Protective height of 0190 to 1230: 2 sets - Protective height of 1310 to 2270: 3 sets - Protective height of 2350 to 2510: 4 sets	
Conformity	Conforming standards		Refer to page 26	
	Performance Level (PL)/Safety category	Type 4	PL e/Category 4 (EN ISO 13849-1:2015)	
		Type 2	PL c/Category 2 (EN ISO 13849-1:2015)	
	PFH_D		9.1×10^{-9} (IEC 61508)	
	Proof test interval T_M		Every 20 years (IEC 61508)	
	SFF		99% (IEC 61508)	
	HFT		1 (IEC 61508)	
	Classification		Type B (IEC 61508-2)	

LED Indicator Status

Emitter

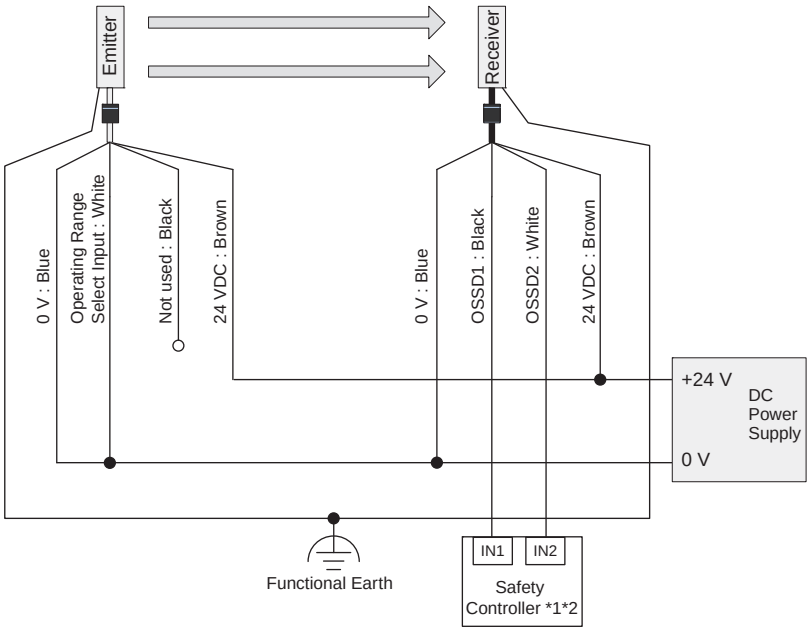
Name of Indicator		Color	Illuminated	Blinking
Operating range	LONG	Green	Long range mode is selected	Lockout state due to Operating range selection setting error
Power	POWER	Green	Power is ON.	Error due to noise
Lockout	LOCKOUT	Red	–	Lockout state due to error in emitter

Receiver

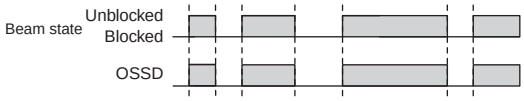
Name of Indicator		Color	Illuminated	Blinking
Top-beam-state	TOP	Blue	The top beam is unblocked	–
Internal error	INTERNAL	Red	–	Lockout state due to Internal error, or error due to abnormal power supply or noise
Lockout	LOCKOUT	Red	–	Lockout state due to error in receiver
Stable-state	STB	Green	Incident light level is 170% or higher of ON threshold	Safety output is instantaneously turned OFF due to ambient light or vibration
ON/OFF	ON/OFF	Green	Safety output is in ON state	–
		Red	Safety output is in OFF state	Lockout state due to Safety Output error, or error due to abnormal power supply or noise
Communication	COM	Green	Synchronization between emitter and receiver is maintained	Lockout state due to Communication error, or error due to abnormal power supply or noise
Bottom-beam-state	BTM	Blue	The bottom beam is unblocked	–

Connections (Basic Wiring Diagram)

Short Mode

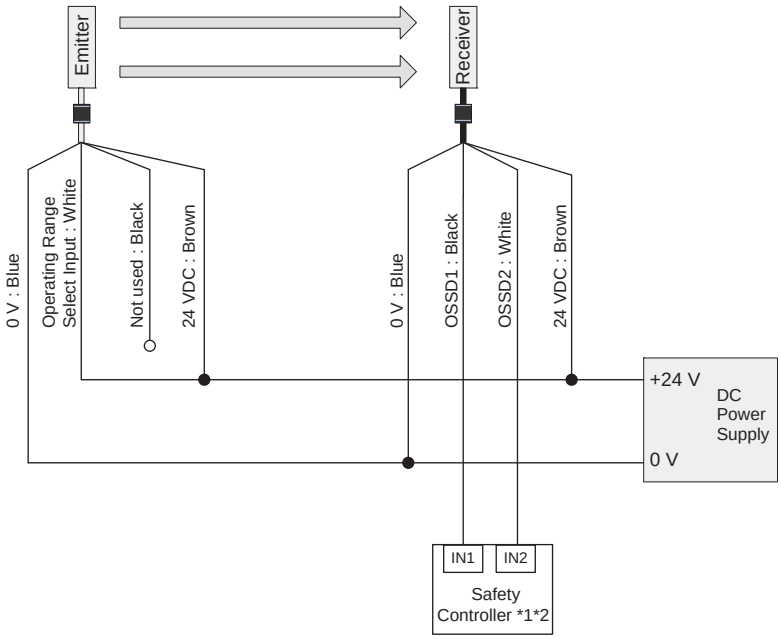


*1.Refer to page 82 for more information.
*2.The safety controller and the F3SG-RE must share the power supply or be connected to the common terminal of the power supply.

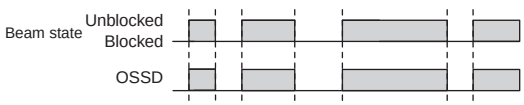


Note: Functional earth connection is unnecessary when you use the F3SG-RE in a general industrial environment where noise control or stable power supply is considered. However, when you use the F3SG-RE in an environment where there may be excessive noise from surroundings or stable power supply may be interfered, it is recommended the F3SG-RE be connected to functional earth.
The wiring examples in later examples do not indicate functional earth. To use functional earth, wire an earth cable according to the example above. Refer to *Safety Light Curtain F3SG-R Series User's Manual* for more information.

Long Mode

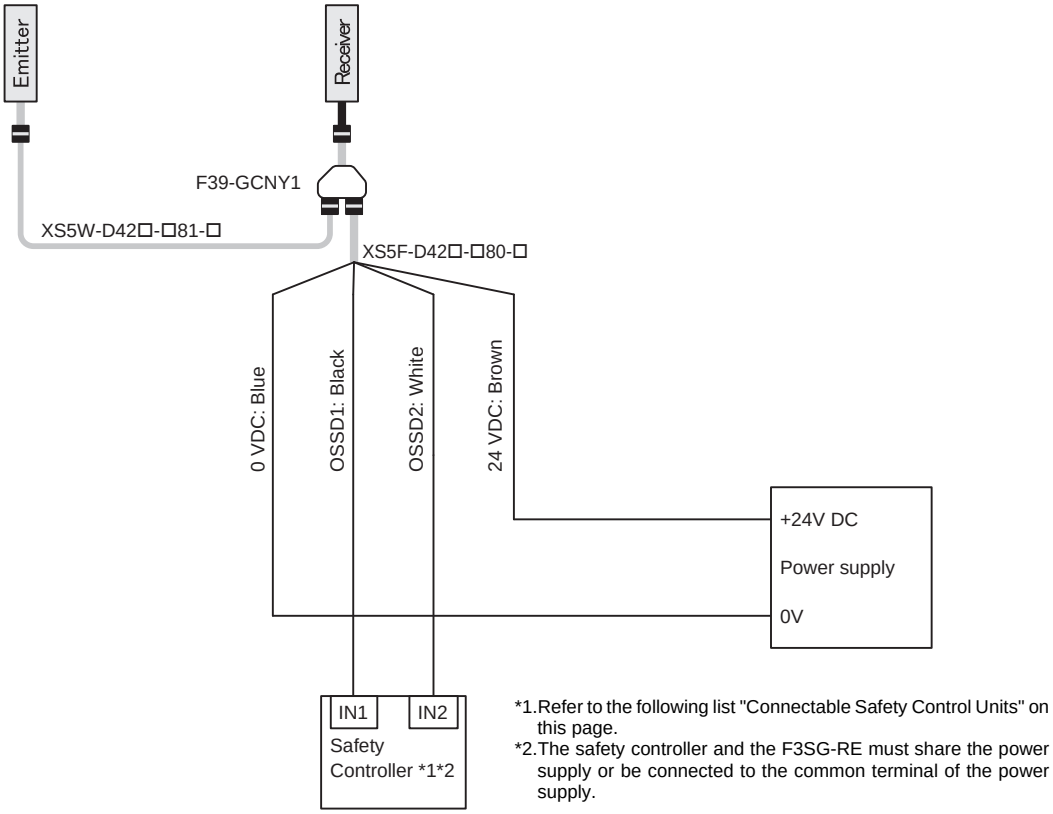


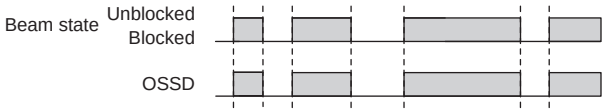
*1.Refer to page 82 for more information.
*2.The safety controller and the F3SG-RE must share the power supply or be connected to the common terminal of the power supply.



Note: For the functional earth connection, refer to the Short Mode example.

Standalone F3SG-RE with Y-Joint Plug/Socket Connector





Note: 1. When using the reduced wiring connector system F39-GCNY1, the Operating Range Selection is fixed to Long Mode.
2. For the functional earth connection, refer to the Short Mode example.

Connectable Safety Control Units

The F3SG-RE with PNP output can be connected to the safety control units listed in the table below.

Connectable Safety Control Units (PNP output)		
Safety Relay Units	**Flexible Safety Units**	**Safety Controllers**
G9SA-301 **G9SA-321-T□** **G9SA-501** **G9SB-200-B** **G9SB-200-D** **G9SB-301-B** **G9SB-301-D** **G9SE-201** **G9SE-401** **G9SE-221-T□**	**G9SX-AD322-T** **G9SX-ADA222-T** **G9SX-BC202** **G9SX-GS226-T15**	**G9SP-N10S** **G9SP-N10D** **G9SP-N20S** **NE0A-SCPU01** **NE1A-SCPU01** **NE1A-SCPU02** **DST1-ID12SL-1** **DST1-MD16SL-1** **DST1-MRD08SL-1** **NX-SIH400** **NX-SID800** **F3SP-T01**

The F3SG-R with NPN output can be connected to the safety control units listed in the table below.

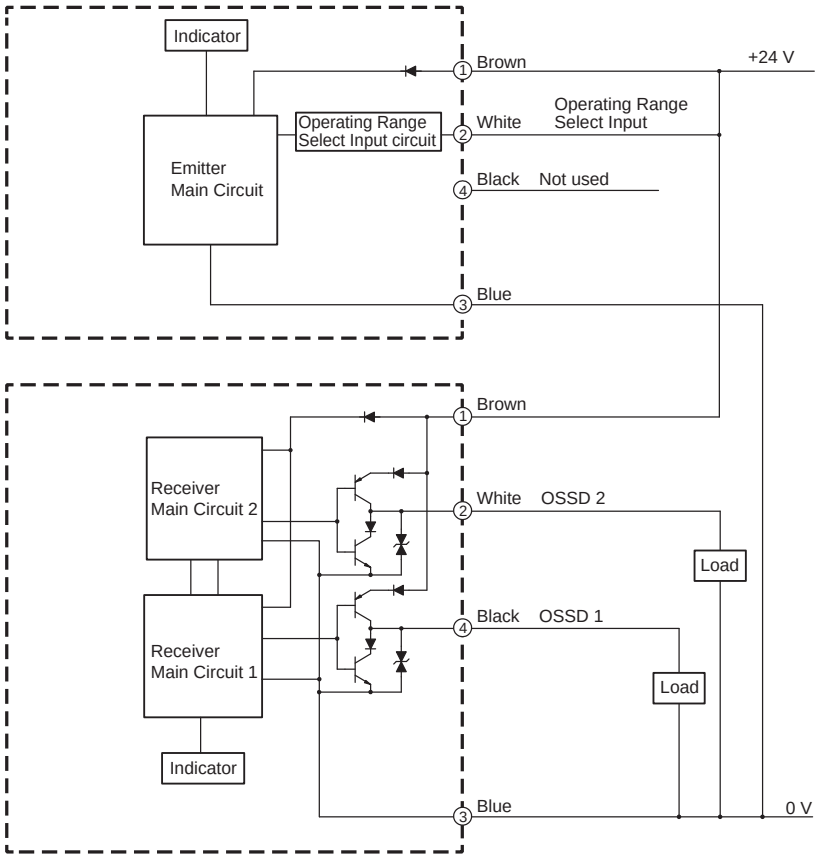
Connectable Safety Control Units (NPN output)
Safety Relay Units
G9SA-301-P

Input/Output Circuit

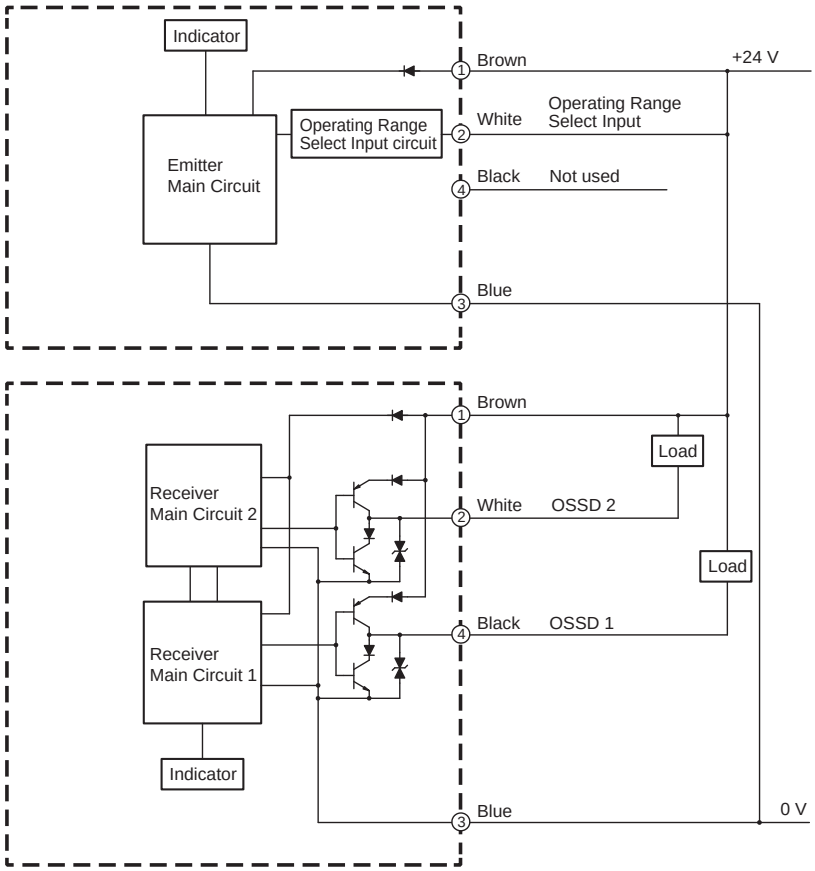
Entire Circuit Diagram

The entire circuit diagram of the F3SG-RE is shown below. The numbers in the circles indicate the connector's pin numbers.

PNP Output



NPN Output

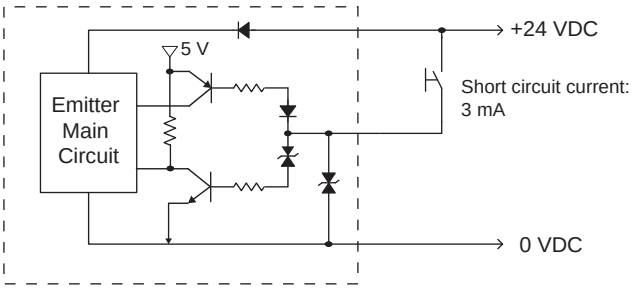


Input Circuit Diagram by Function

The input circuit diagrams of by function are shown below.

PNP Output

<Input circuit (Operating Range Select Input)>



NPN Output

<Input circuit (Operating Range Select Input)>