

OMRON



Model F3SG-□PG□ Series Safety Multi-Light Beam

EN Instruction Sheet

Thank you for purchasing the F3SG-PG Series Safety Multi-Light Beam (hereinafter referred to as the "F3SG-PG"). Be sure to have F3SG-PG be handled by a "Responsible Person" who is well aware of and familiar with the machine to be installed. The term "Responsible Person" used in this document means the person qualified, authorized and responsible to secure "safety" in each process of the design, installation, operation, maintenance services and disposition of the machine. It is assumed that F3SG-PG will be used properly according to the installation environment, performance and function of the machine.

Responsible Person should conduct risk assessment on the machine and determine the suitability of this product before installation. Read this document and reference manuals for F3SG-PG thoroughly to understand and make good use of the descriptions before installing and operating the product. Keep this document at the place where the operator can refer to whenever necessary.

This device is electro-sensitive protective equipment for the purpose of protecting the human body.

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Original instructions ⓘ 2865475-2D

Instructions in the EU languages and a signed EU Declaration of Conformity are available on our website at www.industrial.omron.eu/safety.

Declaration of Conformity

OMRON declares that the F3SG-PG is in conformity with the requirements of following EU Directives and UK Legislations:

EU: Machinery Directive 2006/42/EC, EMC Directive 2014/30/EU, RoHS Directive 2011/65/EU,

UK: 2008 No 1597 Machinery (Safety) , 2016 No 1091 EMC, 2012 No 3032 RoHS

Safety Standards

- The F3SG-PG is designed and manufactured according to the following standards. EN61496-1 (Type 4 and Type 2 ESPE), EN 61496-2 (Type 4 and Type 2 AOPD), EN61508-1 through -4 (SIL 3 for Type 4 and SIL 1 for Type 2), EN ISO 13849-1:2015 (PL e, Category 4 for Type 4 and PL c, Category 2 for Type 2)
- Dispose in accordance with applicable regulations.



Safety Precautions

●Indications and Meanings for Safe Use

The precautions listed in this document indicated by alert symbols and statements must be followed for the safe use of the F3SG-PG. Failure to follow all precautions and alerts may result in an unsafe use or operation. Thoroughly read this document before using the F3SG-PG. The following word and symbols are used in this document.

●Alert Statements

⚠ DANGER

Make sure that the machine can be controlled correctly and as intended. Also make sure that the machine can be stopped immediately at any time of the operation cycle without danger to machine operators when the machine behavior does not meet safety-related requirements. Otherwise, continued use of the machine may result in serious injury or death. ⓘ

Users

⚠ WARNING

The F3SG-PG must be installed, configured, and incorporated into a machine control system by a sufficiently trained and qualified person. An unqualified person may not be able to perform these operations properly, which may cause a person to go undetected, resulting in serious injury. ⓘ

Machines

⚠ WARNING

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

To use the F3SG-PG in PSDI mode (initiation of cyclic operation by a presence sensing device), you must configure an appropriate circuit between the F3SG-PG and the machine. For details about PSDI, refer to OSHA 1910.217, IEC 61496-1, and other relevant standards and regulations. ⓘ

Installation

⚠ WARNING

Make sure Responsible Person tests the operation of the F3SG-PG and F39-SGIT-IL3 after installation to verify that the F3SG-PG and F39-SGIT-IL3 operate as intended. Make sure to stop the machine until the test is complete. Unintended installation, wiring or function settings may cause a person to go undetected, resulting in serious injury. ⓘ

Make sure to install the F3SG-PG at the safety distance from the hazardous part of the machine. Otherwise, the machine may not stop before a person reaches the hazardous part, resulting in serious injury. ⓘ

Install a protective structure so that the hazardous part of a machine can only be reached by passing through the sensor's detection zone. If access to the hazardous part by reaching over the detection zone of a vertically mounted F3SG-PG cannot be excluded, the height of the detection zone and the safety distance shall be determined in consideration of such a risk. Install the sensors so that part of the person is always present in the detection zone when working in a machine's hazardous zones. If a person is able to step into the hazardous zone of a machine and remain behind the F3SG-PG's detection zone, configure the system with Restart Interlock function. Failure to do so may result in serious injury due to unexpected startup. ⓘ

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

Install the pre-reset switch always in the hazardous zone and where it cannot be activated from outside the hazardous zone. ⓘ

The F3SG-PG cannot protect a person from an object flying from the hazardous zone. Install protective cover(s) or fence(s). ⓘ

The Muting and Override functions disable the safety functions of the device. Especially setting the Muting Time Limit parameter to infinite may cause the safety functions to be disabled for a long time. Install the F3SG-PG, muting sensor and physical barrier and configure time settings for Muting and Override so that an operator should not enter hazardous zone when the Muting and Override are active. ⓘ

Install muting sensors so that they can distinguish between the object that is being allowed to pass through the detection zone and a person. If the Muting function is activated by the detection of a person, the machine may not stop operating, resulting in serious injury. ⓘ

Muting lamps that indicate the state of the Muting and Override functions must be installed where they are clearly visible to workers from all the operating positions. ⓘ

Use two independent input devices for muting inputs. Failure to do so may cause the MUTING state due to a single muting sensor's failure. ⓘ

Install the switch to activate the Override function in a location that provides a clear view of the entire hazardous zone and where it cannot be activated from within the hazardous zone. Make sure that nobody is in the hazardous zone before activating the Override function. ⓘ

Make sure to connect an override cancel switch to the RESET line when using the Override function. Otherwise, the OVERRIDE state may not be released by the override cancel switch, resulting in serious injury. ⓘ

When muting error occurs with workpiece blocking the F3SG-PG, there are two methods to forcibly remove the workpiece. ⓘ

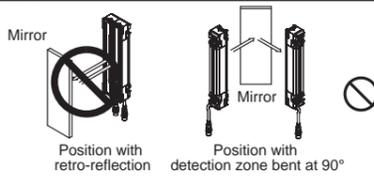
- 1) Manual operation (with additional safety measure); or
 - 2) Override function (Override at Normal Operation / Override upon Startup)
- Only one of the methods, either 1) or 2) must be used. If they are used at the same time, the Override may be activated at an unexpected timing. ⓘ

Install the F3SG-PG so that it is not affected by reflective surfaces. Failure to do so may hinder detection, resulting in serious injury. ⓘ

When using more than one set of F3SG-PG's in adjacent areas, the emitter of one F3SG-PG may interfere with the receiver of the other, causing the safety functions to stop working properly. Install, configure and maintain them so that mutual interference does not occur. ⓘ

To change the response time, calculate the safety distance based on the setting. Otherwise, the machine may not stop before a person reaches the hazardous part, resulting in serious injury. ⓘ

Do not use the F3SG-PG with mirrors in a retro-reflective configuration. Doing so may hinder detection. It is possible to use mirrors to alter the detection zone to a 90-degree angle. ⓘ



Wiring

⚠ WARNING

When using the PNP output, connect the load between the output and 0 V line. When using the NPN output, connect the load between the output and +24 VDC line. Connecting the load between the output and a different power supply line from the above line will result in a dangerous condition because the operation mode of safety outputs are reversed to "Dark-ON". ⓘ

When using the PNP output, do not ground +24 VDC line. When using the NPN output, do not ground 0 V line. Otherwise, a ground fault may turn the safety outputs ON, resulting in a failure of stopping the machine. ⓘ

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

Do not connect each line of the F3SG-PG to a DC power supply of higher than 24 VDC+20%. Also, do not connect it to an AC power supply. Failure to do so may result in electric shock. ⚠

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

Do not use the output signal of the auxiliary output or IO-Link output for safety applications. Failure to do so may result in serious injury when the F3SG-PG fails. ⓘ

For the F3SG-PG to comply with IEC 61496-1 and UL 508, the DC power supply unit must satisfy all of the following conditions:

- The DC power supply operates within the rated power voltage (24 VDC ± 20%).
- The DC power supply has tolerance against the total rated current of devices if it is connected to multiple devices.
- The DC power supply complies with EMC directives (industrial environment).
- Double or reinforced insulation is applied between the primary and secondary circuits.
- The DC power supply has an automatic recovery type of overcurrent protection characteristics. ⓘ
- Output holding time is 20 ms or longer.
- The DC power supply satisfies output characteristic requirements for class 2 circuit or limited voltage current circuit defined by UL 508.
- The DC power supply complies with laws and regulations, regarding EMC and electrical equipment safety, of the country or region where the F3SG-PG is used. (For example, in EU, the power supply must comply with the EMC Directive and the Low Voltage Directive.)

Double or reinforced insulation from hazardous voltage must be applied to all input and output lines. Failure to do so may result in electric shock. ⚠

Extension of the cable must be within a specified length. If it isn't, safety functions may not work properly, resulting in danger. ⓘ

Settings

⚠ WARNING

Make sure the Responsible Person tests the operation of the F3SG-PG after setting with the DIP Switch on the F39-SGIT-IL3, Teach-in, SD Manager 3 or End Cap to verify that the F3SG-PG operates as intended. Make sure to stop the machine until the test is complete. Unintended settings may cause a person to go undetected, resulting in serious injury. ⓘ

Other

⚠ WARNING

Perform daily and 6-month inspections for all F3SG-PG as described in the User's Manual or the Quick Installation Manual. Otherwise, the system may fail to work properly, resulting in serious injury. ⓘ

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

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

Do not use the F3SG-PG in environments where strong electromagnetic field may be produced. Doing so may cause the safety functions to stop working properly. ⓘ

Precautions for Safe Use

Make sure to observe the following precautions that are necessary for ensuring safe use of the product.

- Storage conditions and installation environment
- Do not install, use, or store the product in the following types of environments:
 - Areas exposed to intense interference light, such as direct sunlight
 - Areas with high humidity where condensation is likely to occur
 - Areas where corrosive gases are present
 - Areas exposed to vibration or shock levels higher than in the specification provisions
 - Areas where the pollution degree is harsher than 3, such as outdoor environment
 - Areas where the product may get wet with liquid that can solve adhesive
- Do not drop the product.
- Wiring and installation
- The rated life of the LEDs used for this product is 6 years.
- Loads must satisfy both of the following conditions:
 - Not short-circuited
 - Not used with a current that is higher than the rating
- Make sure that the mounting brackets, fixing screws and connectors are properly secured with the torque recommended in the User's Manual or the Quick Installation Manual.
- Bending radii of cables must be equal to or higher than specified minimum values.
- When replacing the cables with those other than the dedicated cables, use cable connectors that provide a protection grade of IP54 or higher, for the cables.
- To extend a cable length with a cable other than the dedicated cable, use a cable with the same or superior specifications.
- Be sure to route the input/output lines for the F3SG-PG separate from high-potential power lines or through an exclusive conduit.
- Make sure that foreign material such as water, oil, or dust does not enter the F3SG-PG, F39-SGIT-IL3 or the connector while the end cap and root cables of the F3SG-PG or the cover of the DIP Switch on the F39-SGIT-IL3 is removed.
- The F39-SGIT-IL3 is dedicated to the F3SG-SR/PG series. Do not use it for the equipment other than F3SG-SR/PG.
- In environments where foreign material such as spatter adheres to the F3SG-PG, attach a cover to protect the F3SG-PG from the spatter.
- Oil resistance
- Some cutting oils may affect the product. Before using cutting oils, make sure that the oils should not cause deterioration or degradation of the product.
- Do not use the product with degraded protective structure such as swelling and crack in housing and/or sealing components. Otherwise cutting oil or other substance may enter the product, resulting in a risk of corruption or burning.
- Use the F39-JG□C-□Root-Straight Cables, F39-JGR3K-□ Root-Plug Cables for Extended or F39-JGR3K-□□-□ Conversion Cables in environment where the product may be exposed to oil. Using the other cables in such an environment may cause cutting oils or other substances to enter the cables, resulting in a risk of damaging or burning the product.
- Do not connect the Conversion Cable for the following purposes. Failure to do so may result in failure.
 1. Connecting with the F39-SGIT-IL3, F39-GCNY2 or F39-GCNY3
 2. Connecting between the F3SG-SR ,F3SG-PG
- Disposal
- Dispose of the product in accordance with the relevant rules and regulations of the country or area where the product is used.

Precautions for Correct Use

Observe the precautions described below to prevent operation failure, malfunctions, or undesirable effects on product performance.

- Storage conditions and installation environment
- Do not install, use, or store the product in the following types of environments:
 - Areas with a temperature or humidity out of the specified range
 - Areas submerged in water or subject to rain water
- This is a class A product (for industrial environments). In residential areas it may cause radio interference, in which case the Responsible Person may be required to take adequate measures to reduce interference.
- Wiring and installation
- Properly perform the wiring after confirming the signal names of all the terminals.
- Do not operate the control system until 3 s or more after turning ON the power of the F3SG-PG.
- When using a commercially available switching regulator power supply, make sure to ground the PE terminal (protective earth terminal).
- Install the emitter and receiver, emitter/receiver, and passive mirror to the same vertical direction.
- Use brackets of specified quantities and locations according to the dimensions. If the brackets described above are not used, ratings and performance cannot be met.
- Do not install the F3SG-PG close to a device that generates high-frequency noise. Otherwise, take sufficient blocking measures.
- Sharing the power supply with other devices may cause the F3SG-PG to be affected by noise or voltage drop. It is recommended that the F3SG-PG use a power supply dedicated for safety components, not shared with other devices.
- Do not change the scan code during normal operation. The F3SG-PG transitions to lockout.
- Do not apply load to the connectors.
- Cleaning
- Do not use thinner, benzene, or acetone for cleaning. They affect the product's resin parts and paint on the housing.
- Use a soft cloth which is dry or wetted with clean water for cleaning. Do not use solvents.
- Object detection
- The F3SG-PG cannot detect transparent and/or translucent objects.
- Settings
- Do not operate the DIP Switch on the F39-SGIT-IL3 during normal operation of the F3SG-PG. Otherwise, the F3SG-PG enters the LOCKOUT state.
- Do not operate the DIP Switch and Push Switch on the F39-SGIT-IL3 with tools that may damage the product.
- Be sure that the F3SG-PG is in the SETTING state when making a change to the setting.

Reference Manuals

Document Title	Cat. No.
Safety Light Curtain F3SG-□SR□ Series Safety Multi-Light Beam F3SG-□PG□ Series User's Manual	Z405-E1
Safety Multi-Light Beam F3SG-□PG□ Series Quick Installation Manual	5605730-1

In the interest of product improvement, specifications are subject to change without notice.

Suitability for Use

Omron Companies shall not be responsible for conformity with any standards, codes or regulations which apply to the combination of the Product in the Buyer's application or use of the Product. At Buyer's request, Omron will provide applicable third party certification documents identifying ratings and limitations of use which apply to the Product. This information by itself is not sufficient for a complete determination of the suitability of the Product in combination with the end product, machine, system, or other application or use. Buyer shall be solely responsible for determining appropriateness of the particular Product with respect to Buyer's application, product or system. Buyer shall take application responsibility in all cases.

NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY OR IN LARGE QUANTITIES WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT(S) IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

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LED Indicators

■ LED Indicators of the Emitter (F3SG-PGA-L/-A)

Location	Indicator	Name	Color	Illuminated	Blinking
1	C or CODE	Scan code	Green	Code A is selected	---
			Orange	Code B is selected	
			OFF	Automatic interference prevention by wired synchronization being performed	
2	E or ERR	Lockout	Red	LOCKOUT state. The indicator is illuminated in the emitter of another sensor segment than that having a lockout error (when in cascade connection or between the emitter and receiver in the Wired Synchronization)	LOCKOUT state. The indicator is illuminated in the emitter of a sensor segment having a lockout error
3	L or LONG	Operating range	Green	Long Mode (*8) is selected	LOCKOUT state due to Operating range selection setting error
			OFF	Short Mode (*8) is selected	---
4	T or TEST	Test	Yellow	---	External Test is being performed
5	---	Area Beam Indicator (ABI) (*1)	Green	The target beams of the ABI are unblocked and the safety outputs are turned ON	MUTING or OVERRIDE state. In the MUTING state, only the ABI indicators in the muting zone are blinking. Or the target beams of the ABI are blocked instantaneously
			Orange	Incident light level of the target beams of the ABI is 170% (factory default setting (*2)) or less of ON-threshold (for 5 to 10 s)	Incident light level of the target beams of the ABI is 170% (factory default setting (*2)) or less of ON threshold 5 to 10 s after illuminated when incident light level of the target beams of the ABI is 170% (factory default setting (*2)) or less of ON threshold. Or one muting input becomes the ON state and the MUTING state has not been started yet, or one muting input becomes the OFF state and the other is not in the OFF state yet. (*3)
			Red	The target beams of the ABI are blocked	LOCKOUT state due to Cap error or Other sensor error (*4), or Lockout state due to DIP Switch setting error (*5)
			OFF	The target beams of the ABI are unblocked (The ABI then will be illuminated in green when the safety outputs are turned ON.)	---

■ LED Indicators of the Receiver (F3SG-PGA-L/-A), Emitter/Receiver (F3SG-PGA-C)

Location	Indicator	Name	Color	Illuminated	Blinking
1	C or CODE	Scan code	Green	Code A is selected	---
			Orange	Code B is selected	
			OFF	Automatic interference prevention by wired synchronization being performed	
2	E or ERR	Lockout	Red	LOCKOUT state. The indicator is illuminated in the receiver of another sensor segment than that having a lockout error (when in cascade connection or between the emitter and receiver in the Wired Synchronization)	LOCKOUT state. The indicator is illuminated in the receiver of a sensor segment having a lockout error
3	O or OSSD	ON/OFF	Green	Safety outputs are in ON state	---
			Red	Safety outputs are in OFF state	LOCKOUT state due to Safety Output error, or error due to abnormal power supply or noise
4	M or MAINT	Maintenance	Red	LOCKOUT state due to a recoverable error (When in cascade connection, the indicator of only the sensor segment having the error is illuminated)	LOCKOUT state due to a replacement- recommended error (When in cascade connection, the indicator of only the sensor segment having the error blinks)
			Orange	Safety outputs are instantaneously turned OFF due to ambient light, vibration or noise. Or sequence error in Muting or Pre-Reset	Intelligent Tap is in the LOCKOUT state
5	P or PNP	PNP/NPN mode	Green	PNP is configured	Polarity of PNP is changed to NPN, or vice versa, during operation, and internal circuit is defective
			OFF	NPN is configured	---
6	F or CFG	Configuration	Green	Slow mode of Response Time Adjustment is enabled.	LOCKOUT state due to Configuration error or Parameter error
7	S or SEQ	Sequence	Yellow	INTERLOCK state	Sequence or sequence error (*7) in Muting or Pre-Reset
8	---	Area Beam Indicator (ABI)	Green	The target beams of the ABI are unblocked and the safety outputs are turned ON	MUTING or OVERRIDE state. In the MUTING state, only the ABI indicators in the muting zone are blinking. Or the target beams of the ABI are blocked instantaneously
			Orange	Incident light level of the target beams of the ABI is 170% (factory default setting (*2)) or less of ON-threshold (for 5 to 10 s)	Incident light level of the target beams of the ABI is 170% (factory default setting (*2)) or less of ON threshold. Or one muting input becomes the ON state and the MUTING state has not been started yet, or one muting input becomes the OFF state and the other is not in the OFF state yet. (*3)
			Red	The target beams of the ABI are blocked	LOCKOUT state due to Cap error or Other sensor error (*4), or LOCKOUT state due to DIP Switch setting error (*5)
			OFF	The target beams of the ABI are unblocked (The ABI then will be illuminated in green when the safety outputs are turned ON.)	---

*1. The indicator of the emitter is illuminated only in the case the Wired Synchronization is enabled and is off in the case the Optical Synchronization is enabled.

*2. Configurable by SD Manager 3.

*3. This is the case for the Standard Muting mode. For other muting modes, refer to the F3SG-SR/PG User's Manual.

*4. The Area Beam Indicator closer to the "TOP" mark on the F3SG-SR/PG blinks.

*5. The Area Beam Indicator closer to the "BTM" mark on the F3SG-SR/PG blinks.

*6. DIP switches is on the Intelligent Tap.

*7. Refer to the F3SG-SR/PG User's Manual for more information on blinking patterns.

*8. F3SG-PGA-A/C does not support the Operating Range Selection function.

Note: In the SETTING state to make settings with the SD Manager 3, the TEST, LONG and CODE indicators on the emitter, and the CFG, PNP and CODE indicators on the emitter/receiver blink. (TEST: Yellow, LONG/CODE: Green, CFG/PNP/CODE: Green)