Panasonic

Non-Contact Safety Door Switch

SG-P Series

Instruction Manual

WUME-SGPUM-2

2020.12 | panasonic.net/id/pidsx/global

(MEMO)

Before Using this Device

Thank you for purchasing Non-contact Safety Door Switch **SG-P** Series.

Please read this Instruction Manual carefully and thoroughly for the correct and optimum use of this device.

Kindly keep this manual in a convenient place for quick reference.

This device is a non-contact safety door switch that protects persons from injury or accident which can be caused by dangerous parts of a machine.

This manual is for the following persons who have received appropriate training and have knowledge of non-contact safety door switches and safety.

- Those who are in charge of introduction of this device.
- Those who incorporate this device into systems or design them.
- Those who install and/or connect this device.
- Those who manage or perform operations at sites where this device is used.

Please Note

1. No part of this Instruction Manual should be copied or reprinted in any form or by any means without prior permission in writing from the publisher.
2. The contents of this Instruction Manual are subject to change without notice for future improvement.
3. Every effort is made to produce this Instruction Manual. If you find any question, error, incorrect collating and/or missing page, please do not hesitate to contact our nearest local office to you: Panasonic Industrial Devices SUNX.
4. The original version of this description is written in Japanese and English.

Manual Configuration

1 Introduction	This chapter describes safety precautions, handling precautions, applicable standards, and other information required to be checked before using the device.
2 Overview of Product	This chapter describes the main features and parts of the device.
3 Installation and Connections	This chapter describes installation, connections, wiring, and other work.
4 Function	This chapter describes details of various functions and settings.
5 Maintenance	This chapter describes maintenance and inspection.
6 Troubleshooting	This chapter describes troubleshooting.
7 Specifications and Dimensions	This chapter describes the specifications and dimensions.
8 Appendix	This chapter describes glossary and CE Marking Declaration of Conformity.

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Table of Contents

1 INTRODUCTION

1.1 Safety Precautions (Always observe)

This section explains important rules that must be observed to prevent personal injury and property damage.

- The hazards that may occur if the product is used incorrectly are described and classified by level of harm.

⚠ **WARNING**	Risk of death or serious injury.
⚠ **CAUTION**	Risk of minor injury or property damage.

⚠ WARNING

- Machine designer, installer, employer and operator
  - The machine designer, installer, employer and operator are solely responsible to ensure that all applicable legal requirements relating to the installation and the use in any application are satisfied and all instructions for installation and maintenance contained in the instruction manual are followed.
  - Whether this device functions as intended to and systems including this device comply with safety regulations depends on the appropriateness of the application, installation, maintenance and operation. The machine designer, installer, employer and operator are solely responsible for these items.
- Engineer
  - The engineer would be a person who is appropriately educated, has widespread knowledge and experience, and can solve various problems which may arise during work, such as a machine designer, installer or employer etc.
- Operator
  - The operator should read this instruction manual thoroughly, understand its contents, and perform operations following the procedures described in this manual for the correct operation of this device.
  - In case this device does not perform properly, the operator should report this to the person in charge and stop the machine operation immediately. The machine must not be operated until correct performance of this device has been confirmed.
- Environment
  - This device is suitable for indoor use only.
  - Do not use this product in an explosion-proof area.
  - Do not install this device in the following places:
    1. Areas with high humidity where condensation is likely to occur
    2. Areas exposed to corrosive or explosive gases
    3. Areas exposed to contact with water
    4. Areas exposed to too much steam or dust
  - Do not use this device near equipment that emits strong electromagnetic waves.
- Machine in which this device is installed
  - Do not install this device with a machine whose operation cannot be stopped immediately in the middle of an operation cycle by an emergency stop equipment.
  - This device starts the performance after approximately 2 seconds from the power ON. Have the control system started to function with this timing.
  - Do not use the device improperly or do not invalidate the settings after installing the device. Otherwise, the safety functions of the apparatus which uses this device may not work properly, resulting in death or serious injury.
  - Do not install the switch body of this device on a movable door.
  - When installing this device, always consider the time required to ensure a safe state and provide a distance equal to or longer than the correctly calculated safety distance between the apparatus which uses this device and the dangerous parts of the machine.
  - Confirm that the response time of the entire machine is less than the calculated value before designing the equipment.
- Wiring
  - Be sure to carry out the wiring in the power supply OFF condition.
  - All electrical wiring should conform to the regional electrical regulations and laws. The wiring should be done by engineer(s) having the special electrical knowledge.

⚠ WARNING

- After completing wiring, check the wiring state before supplying power.
- Do not wire the controller in parallel with a high-voltage line or power line or use the same conduit as these lines. Doing so may result in malfunctioning due to induction.
- Do not apply stress such as excessive bending or pulling to a cable or the extracted part of a cable. In particular, when the temperature is low, cable materials harden, and when the temperature is high, the materials soften, and so take care that cables may break if they are subject to stress such as bending or pulling when the temperature is low or high.
- When connecting multiple switch bodies, arrange their layout so that the total cable length is 100 m or less. Furthermore, determine the distance between the switch bodies so that the maximum cable length between them is 20 m or less.
- When using only one switch body, arrange its layout so that the maximum cable length is 20 m or less.
- When extending the cable of this device, use 0.3 mm^2 or larger cable.
- When wiring, make sure that liquid such as water or oil does not intrude from the end of the cable.

● Maintenance

- When replacement parts are required, always use only genuine supplied replacement parts. Using substitute parts from another manufacturer may cause the device not to detect objects, resulting in death or serious injury.
- The periodical inspection of this device must be performed by an engineer having the special knowledge.
- After maintenance or adjustment, and before starting operation, test this device following the procedure specified in “Chapter "5 Maintenance"”.
- Clean this device with a clean cloth. Do not use any volatile chemicals.

● Other precautions

- Never modify this device. Modification may cause the device not to detect objects, resulting in death or serious injury.

⚠ CAUTION

- Specifications
  - This product has been developed / produced for industrial use only.
  - Do not use this product outside the range of the specifications. Risk of an accident and product damage. There is also a risk of a noticeable reduction of service life.
  - Use this device by installing suitable protection equipment as a countermeasure for failure, damage, or malfunction of this device.
  - Before using this device, check whether the device performs properly with the functions and capabilities as per the design specifications.
  - Note that this device may be damaged if it is subject to a strong shock (if it is dropped onto the floor, for example).
  - Do not use the device near an apparatus that generates magnetic fields. Otherwise, the operating distance may be affected.
  - Do not apply an excessive shock to the safety switch when opening or closing the door.
  - Use of this device under the following conditions or environments is not presupposed. Please consult us if there is no other choice but to use this device in such an environment.
    1. Operating this device under conditions or environments not described in this manual.
    2. Using this device in the following fields: nuclear power control, railroad, aircraft, auto mobiles, combustion facilities, medical systems, aerospace development, etc.
  - When the apparatus that uses this device is to be used for enforcing protection of a person from any danger occurring around the area where machines are operated, the user should satisfy the regulations established by national or regional security committees (Occupational Safety and Health Administration: OSHA, the European Standardization Committee, etc.). Contact the relative organization(s) for details.
- Power supply
  - Verify that the supply voltage fluctuations are within the rating.
  - When using a commercial switching regulator for the power supply, be sure to ground the frame ground (F.G.) terminal of the power supply.
  - When using the device, avoid the transient state that occurs when the power supply is turned ON.
  - When connecting multiple devices together, connect all the devices including control outputs (OSSD1 and OSSD2) to the same power supply.
- Other precautions
  - Never attempt to disassemble, repair, or modify the product.
  - When this device becomes inoperable or unnecessary, dispose of the product properly as industrial waste by abiding by the applicable law in the country.

1.2 Handling Precautions

■ **In this manual, the following symbols are used to indicate safety information that must be observed.**

Stop	Indicates an action that is prohibited or a matter that requires caution.
!	Indicates an action that must be taken.
Info.	Indicates supplemental information.
Note	Indicates details about the subject in question or information useful to remember.
1 2 Procedure	Indicates operation procedures.

1.3 Applicable Standards / Regulations

This device complies with the following standards / regulations.

1.3.1 Safety Standards

■ **<EU Directives>**

Machinery Directive 2006/42/EC
RE Directive 2014/53/EU
RoHS Directive 2011/65/EU

■ **<European Standards>**

EN ISO 13849-1: 2015 (Category 4, PLe)
EN ISO 14119: 2013 (Type 4, Low level coded and High level coded)
EN 60947-5-3: 2013
EN 300 330 V2.1.1
EN 301 489-1 V1.9.2
EN 50581: 2012

■ **<International Standards>**

ISO 13849-1: 2015 (Category 4, PLe)
IEC 61508-1/2/3/4/5/6/7 (SIL3)
IEC 62061 (SIL3)
IEC 60947-5-3: 2013
ISO 14119: 2013 (Type 4, Low level coded and High level coded)

■ **European Standards (JIS)**

JIS B 9705-1 (ISO 13849-1)
JIS C 0508 1 to 7 (IEC 61508-1/2/3/4/5/6/7)
JIS B 9961 (IEC 62061)
JIS C 8201-5-2 (IEC 60947-5-2)
JIS B 9710 (ISO 14119)

For Machinery Directive, type certification by a Notified Body TÜV SÜD has been acquired.
The EU Declaration of Conformity can be downloaded from the following website.
https://industrial.panasonic.com/ac/e/fasys/information/re_dl/index.jsp

Note

- The conformance of this device to JIS is based on our self-evaluation.

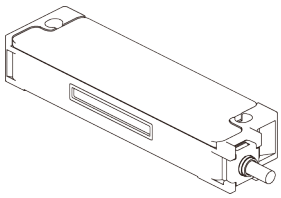
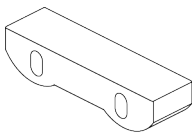
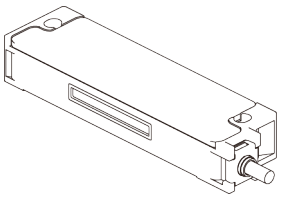
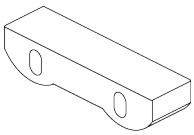
⚠ CAUTION

- Before using this device in a target region other than the above, be sure to confirm the standards / regulations applied in the relevant nation and region.

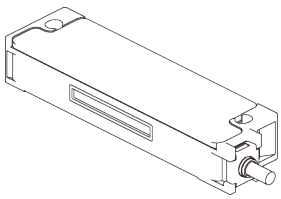
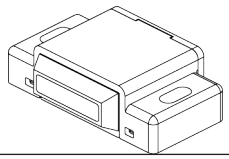
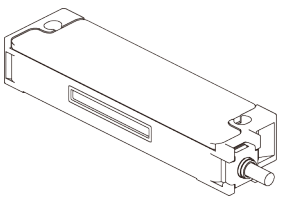
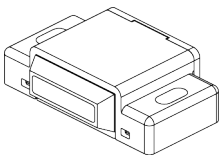
1.4 Contents of Package

The following accessories are included in the product package. Before usin g the product, make sure that no items are missing.

■ Compact type

Standard	Sub
SG-P1010-M-P / Low code, PNP output **SG-P1010-M-N** / Low code, NPN output **SG-P2010-M-P** / High code, PNP output **SG-P2010-M-N** / High code, NPN output ● Switch body: 1 unit  ● Actuator: 1 unit  ● Quick Instruction Manual (Japanese / English, Chinese): 1 pc. each	**SG-P1010-S** / Low code **SG-P2010-S** / High code ● Switch body: 1 unit  ● Actuator: 1 unit  ● Quick Instruction Manual (Japanese / English, Chinese): 1 pc. each

■ Visible type

Standard	Sub
SG-P1020-M-P / Low code, PNP output **SG-P1020-M-N** / Low code, NPN output **SG-P2020-M-P** / High code, PNP output **SG-P2020-M-N** / High code, NPN output ● Switch body: 1 unit  ● Actuator: 1 unit 	**SG-P1020-S** / Low code **SG-P2020-S** / High code ● Switch body: 1 unit  ● Actuator: 1 unit  ● Quick Instruction Manual (Japanese / English, Chinese): 1 pc. each

Standard	Sub
● Quick Instruction Manual (Japanese / English, Chinese): 1 pc. each	

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2 Overview of Product

2.1 Glossary

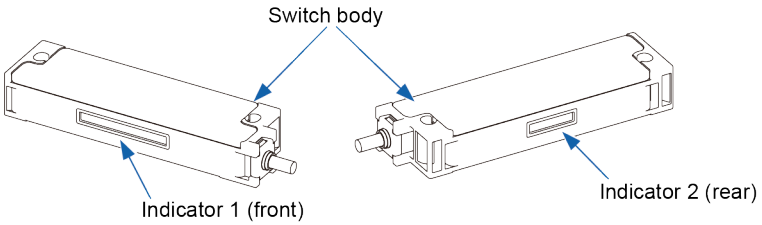
Term	Description
Machinery Directive	This directive applies to assemblies of linked parts or components powered by electricity, compressed air, oil pressure, or other means, consisting of at least one component which moves and a component which fulfills a safety function, and which is sold in the market as a single unit.
RE Directive	This directive applies to radio equipment exported to Europe.
ISO 14119	General requirements for the design and selection of interlocking devices associated with safety guards of machinery.
ISO 13849-1	Standards that specify safety-related parts of the safety and control systems of machinery. These standards specify levels (categories) of structure and fault detection reliability, and levels of safety function performance capability (PL: Performance Level).
IEC 61508-1/2/3/4/5/6/7	Standards that pertain to general functional safety for electrical, electronic, and programmable electronic devices. These standards prescribe methods, safety integrity levels (SIL), and other specifications that reduce risk to a tolerable level of probability.
Control output (OSSD)	Abbreviation for Output Signal Switching Device. A component of the ESPE connected to a machine control system that turns OFF when detection device operates during normal operation.
Lockout	One of the safety states of the device. Operation stops when the self-diagnosis function determines that an irrecoverable failure (OSSDs not operating normally, etc.) has occurred.

2.2 Features

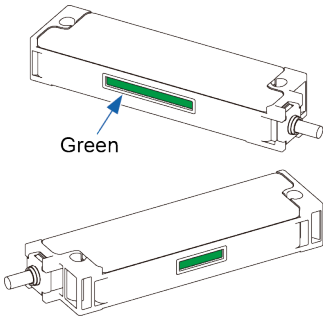
This device is a non-contact safety door switch to be installed on the door of the machine.

A large indicator is mounted on the switch body. This allows workers to easily check whether the indicator shows the safety state, unsafe state, or error state even from a distant place.

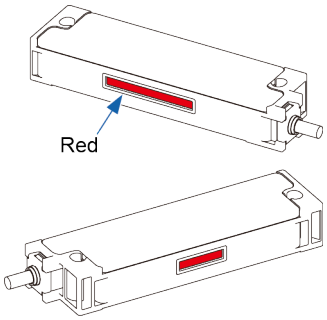
This device is available in two types: Compact type and Visible type. Select either one depending on the mounting conditions.



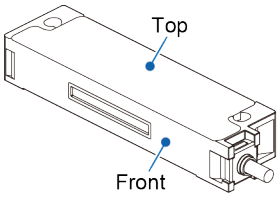
When the actuator is detected

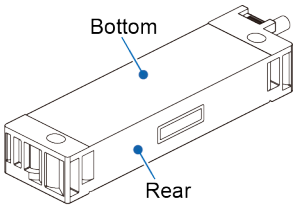


When the actuator is not detected



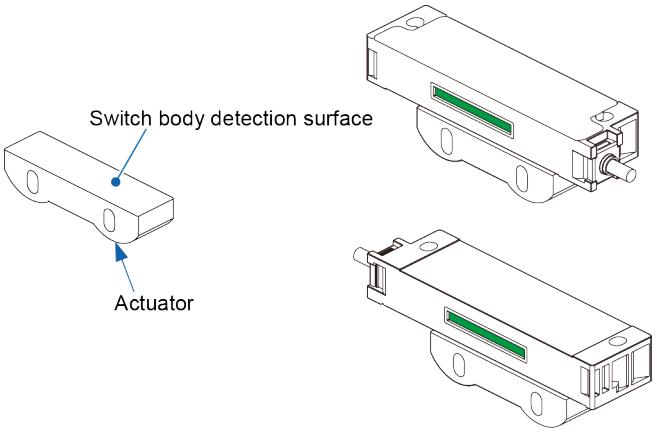
Each side of the switch body is defined as follows.



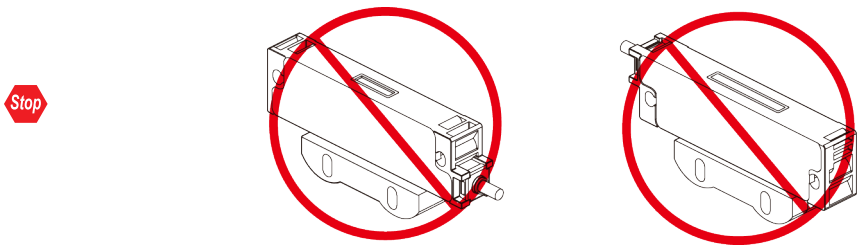


■ Compact type

As the actuator is small, space-saving mounting is possible.

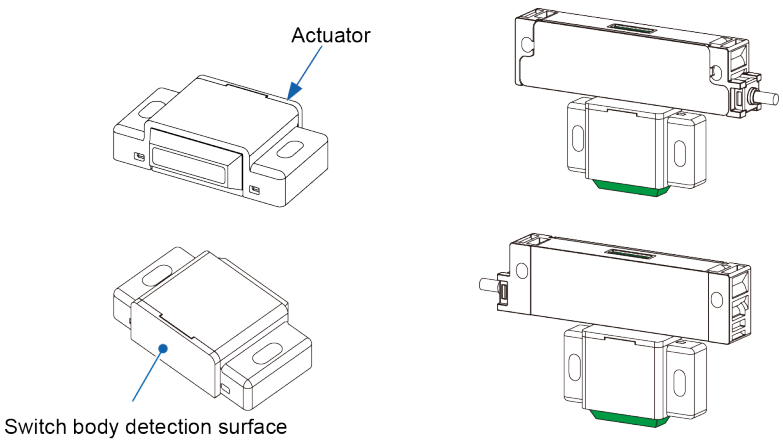


- The Compact type switch body cannot detect the actuator with its front or rear surface.

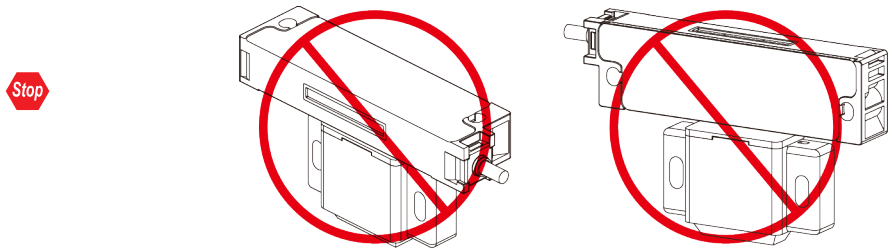


■ Visible type

The actuator attached to the Visible type is uniquely designed to transmit and recognize the light of the switch body indicator. Even if the indicator of the switch body is hidden when the actuator is detected, the visibility is not degraded.



- The Visible type switch body cannot detect the actuator with its top, bottom, or rear surface.

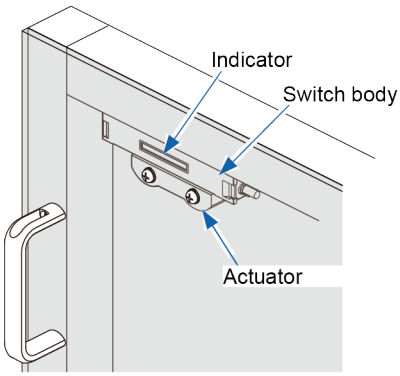


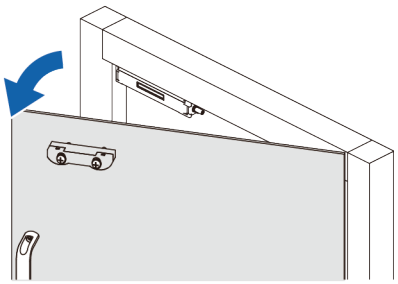
2.2.1 Product Configuration

Mount the switch body of this device on a machine unit or on a guard and mount the actuator on the door of a movable member. The switch body must be connected to a power supply unit and a safety device such as a safety controller.

Select either the Compact type or Visible type depending on how the door opens or how it is installed.

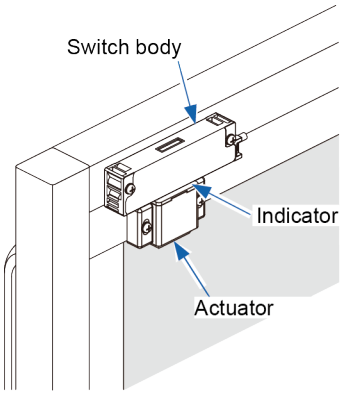
■ Compact type

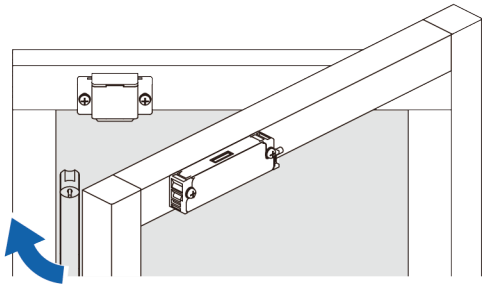




When the movable door is open

■ **Visible type**





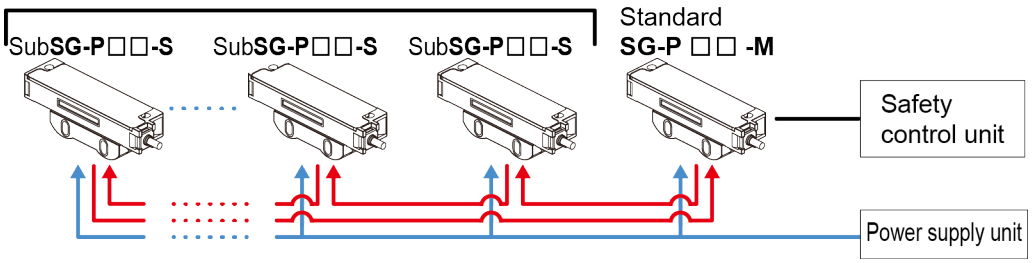
When the movable door is open

- Use the **SG-P** Series switch body in combination with the designated actuator.
  If the switch body is used in combination with an actuator other than the designated one, they will not operate correctly.

2.2.2 System Configuration

This device is available as the **SG-P□□-M** standard units and as the **SG-P□□-S** sub units.
For one **SG-P□□-M** standard unit, up to a maximum of 29 **SG-P□□-S** sub units can be operated by connecting them in a series connection.

Possible to connect a maximum of 29 units.

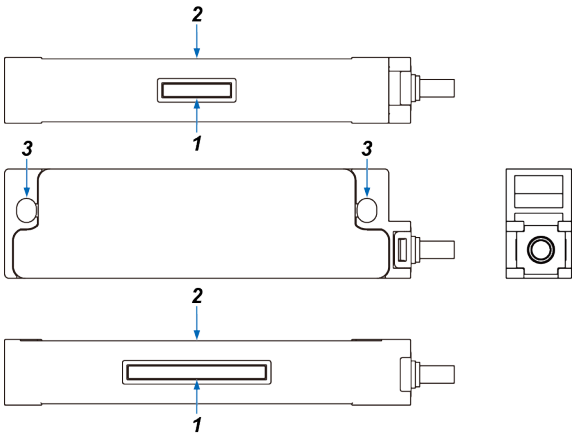


- Note that the **SG-P□□-S** sub unit cannot be used alone. When using a single device, use the **SG-P□□-M** standard unit. When connecting multiple devices together, use the **SG-P□□-S** sub unit for the second unit onwards.
- The **SG-P□□-M** standard unit can be connected with all **SG-P□□-S** sub units.
- Be sure to use this device together with a safety device such as a safety controller.

2.3 Parts of the Device

■ Compact type

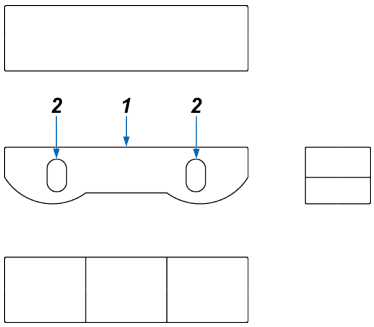
Switch body



	Name	Function	
1	Indicator	Lights green “ ”	When the actuator is detected
		Lights red “ ”	When the actuator is not detected
		Blinks red “ ”	● Lockout state, error occurrence(Note 1) ● When the teaching sequence was incorrect (only when using high-code models)(Note 1)
		Blinks green “ ”	● When multiple units are connected, the actuator is not detected by other switch bodies (standard unit or sub unit). ● When multiple units are connected, an error has occurred in other switch bodies (standard unit or sub unit).
		Lights yellow “ ” (Simultaneously light green and red)	After the power supply is turned ON, during self-diagnosis
		Alternately blinking red to yellow “ ⇔ ” (lights red, blinking green)	When an unpaired actuator is detected (only when using high-code models)
2	Actuator detection surface	When the actuator is brought near to the surface, the switch body detects the actuator.	
3	Mounting hole	Use M4 screws, flat washers, and spring washers to mount the switch body on a machine unit or on a guard.	

(Note 1) Error contents are different depending on the number of blinkingsFor details, refer to "6 Troubleshooting".

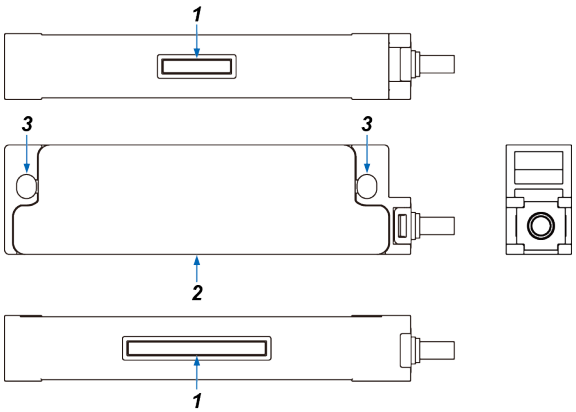
Actuator



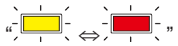
	Name	Function
1	Switch body detection surface	When the actuator is brought near to the switch body, the switch body detects the actuator.
2	Mounting hole	Use M4 screws, flat washers, and spring washers to mount the switch body on a machine unit or on a guard.

■ Visible type

Switch body



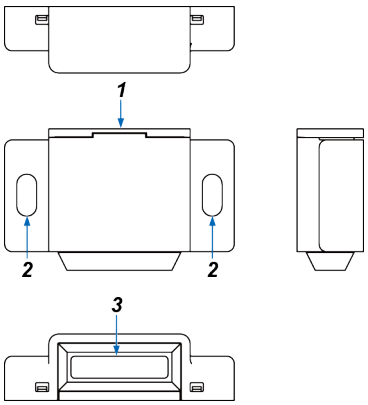
	Name	Function	
1	Indicator	Lights green “ ”	When the actuator is detected
		Lights red “ ”	When the actuator is not detected
		Blinks red “ ”	● Lockout state, error occurrence(Note 1) ● When the teaching sequecnce was incorrect (only when using high-code models)(Note 1)
		Blinks green “ ”	● When multiple units are connected, the actuator is not detected by other switch bodies (standard unit or sub unit). ● When multiple units are connected, an error has occurred in other switch bodies (standard unit or sub unit).
		Lights yellow “ ”	After the power supply is turned ON, during self-diagnosis

	Name	Function	
		(Simultaneously light green and red)(Note 2)	
		Alternately blinking red to yellow  (lights red, blinking green) (Note 2)	When an unpaired actuator is detected (only when using high-code models)
2	Actuator detection surface	When the actuator is brought near to the surface, the switch body detects the actuator.	
3	Mounting hole	Use M4 screws, flat washers, and spring washers to mount the switch body on a machine unit or on a guard.	

(Note 1) Error contents are different depending on the number of blinkings For details, refer to "6 Troubleshooting".

(Note 2) When the LED light is checked through the actuator, it may appear segregated between green and red depending on the observing angle.

Actuator



	Name	Function
1	Switch body detection surface	When the actuator is brought near to the switch body, the switch body detects the actuator.
2	Mounting hole	Use M4 screws, flat washers, and spring washers to mount the switch body on a machine unit or on a guard.
3	Transmission part	The light of the indicator is transmitted through the part.

3 Installation and Connections

3.1 Installation Conditions

When installing the device on a machine, pay attention to the following points.

3.1.1 Distances from Surrounding Metals

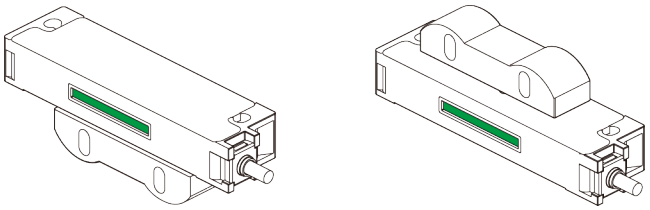
⚠ CAUTION

- The operating distance of the device may be affected by the metals in the vicinity. Check the actual equipment whether the safety distance is provided depending on the operating distance.

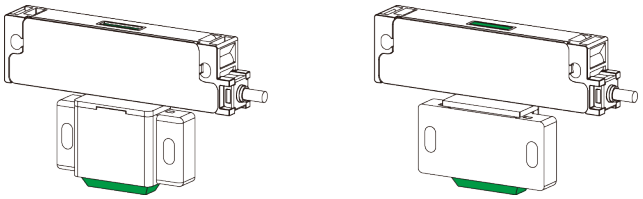
3.1.2 Switch body and Actuator Orientation

■ **Correct mounting orientation**

When the compact type is installed

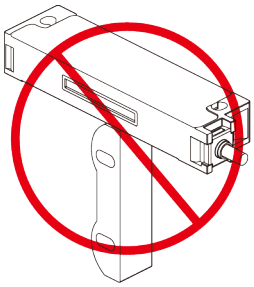


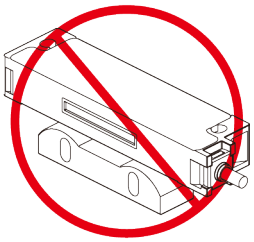
When the visible type is installed



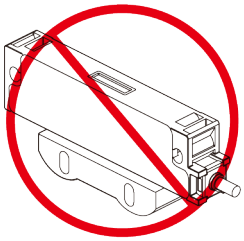
■ **Incorrect mounting orientation**

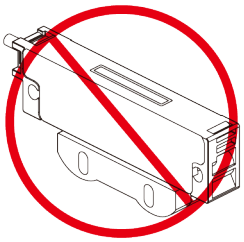
When the compact type is installed



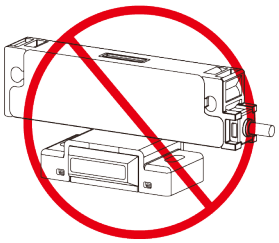


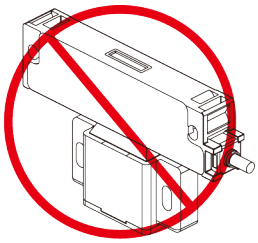
Reverse orientation





When the visible type is installed

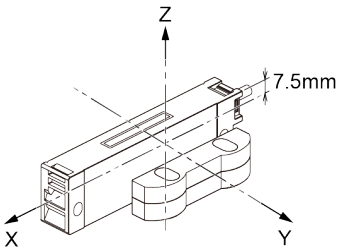


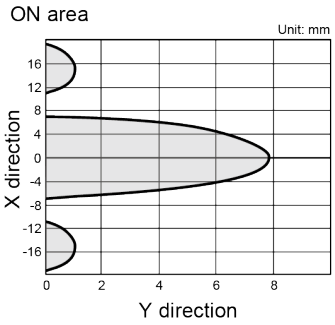


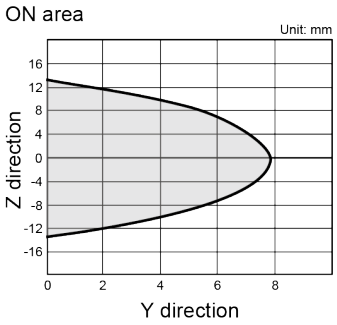
Reverse orientation

3.1.3 Sensing Area

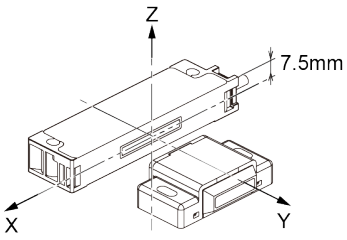
■ **Compact type**

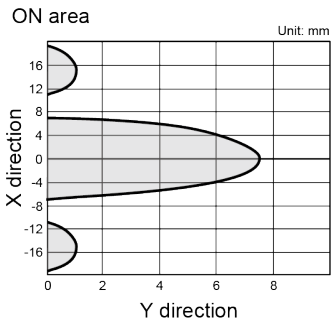


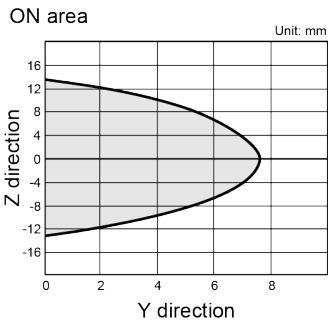




■ **Visible type**







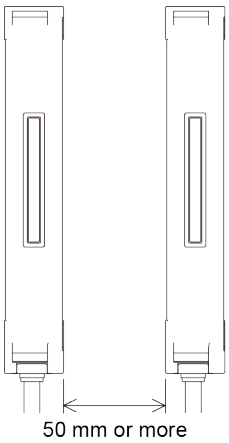
- The above figure represents typical data. Check the actual installation environment to make sure that there is no problem.

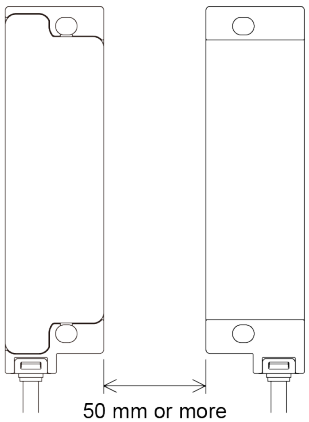
3.1.4 Mutual Interference

When multiple devices are installed next to one another, mutual interference may occur and cause malfunctioning.

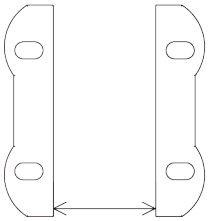
When using them next to one another, provide a distance between one another as shown below.

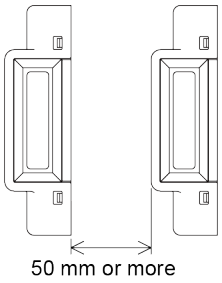
■ **Switch body**





■ **Actuator**

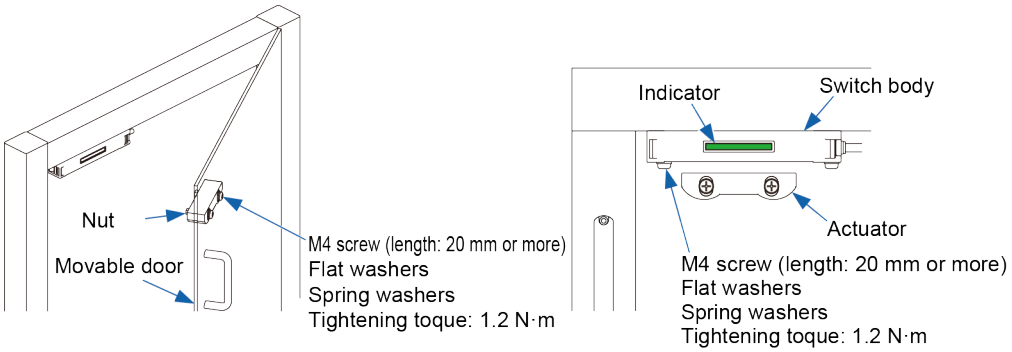




3.2 Mounting Methods

Mount the switch body on a machine unit or on a guard and mount the actuator on a movable door. Use M4 screws, flat washers, and spring washers to mount the device and firmly tighten them to the specified tightening torque.

3.2.1 When using the Compact Type

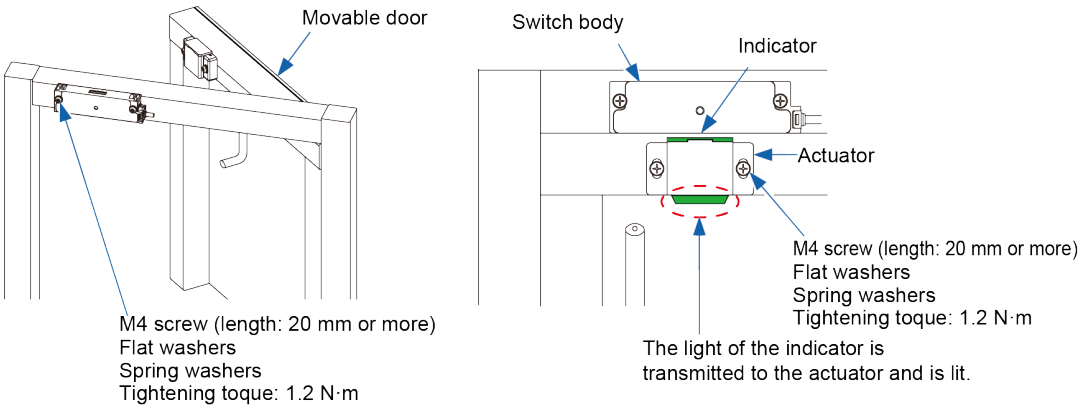


- Do not use the visible type actuator for detection
- Do not install the switch body of this device on a movable door.
- With the low-code type of this device, the switch body detects another **SG-P** Series actuator. Do not carelessly disable the switch body and pay careful attention to the management of the actuators.

- Mount the switch body carefully so that it does not come in contact with the movable door.
- Mount the switch body in a location where it cannot be reached or it is hidden so that it cannot be easily disabled. Or, mount the switch body using M4 screws that require special tools or mount it in such a way that it cannot be removed with ordinary tools.
- For detailed information about minimizing the probability that it might be disabled, refer to relevant precautions described in ISO14119.

3.2.2 When using the Visible Type

In an application where the switch indicator is hidden by a movable door frame, etc., use a Visible type and install it as shown in the following diagram.



- Do not install the switch body of this device on a movable door.
- Do not use the compact type actuator for detection
- With the low-code type of this device, the switch body detects another **SG-P** Series actuator. Do not carelessly disable the switch body and pay careful attention to the management of the actuators.

- Mount the switch body carefully so that it does not come in contact with the movable door.
- Mount the switch body in a location where it cannot be reached or it is hidden so that it cannot be easily disabled. Or, mount the switch body using M4 screws that require special tools or mount it in such a way that it cannot be removed with ordinary tools.
- For detailed information about minimizing the probability that it might be disabled, refer to relevant precautions described in ISO14119.

3.3 Connecting the Switch Body with the Controller and Power Supply Unit

⚠ CAUTION

- Be sure to use this device together with a safety device such as a safety controller.

- If the power supply used for this device is shared by other devices, the device may be affected by noise emitted from other devices. Do not share the power supply used for this device with other devices.
- Note that our Safety Control Unit **SF-C21** cannot be connected to the NPN output type (**SG-P□□-M-N**).

- Note that the **SG-P□□-S** sub unit cannot be used alone. When using a single device, use the **SG-P□□-M** standard unit. When connecting multiple devices together, use the **SG-P□□-S** sub unit for the second unit onwards.
- The power supply unit used for this device must satisfy the following requirements.
  1. The power supply unit must be certified for use in your region.
  2. The power supply unit must have the rated output voltage of 24 VDC +10% / -20% and the ripple (P-P) of 10% or less.
  3. The power supply with SELV (Secondary Extra Low Voltage) or PELV (Protective Extra Low Voltage) that comply with the RE Directive must be used. (When CE Marking is required)
  4. The power supply must comply with Class 2 defined by UL508 or satisfy the output characteristics requirements of the limited voltage and current circuit.
  5. The power supply unit must have reinforced insulation or double insulation between the primary circuit and secondary circuit.
  6. When using a commercial switching regulator, the frame ground (F.G.) terminal must be connected to ground.
  7. The power supply unit must have an output holding time of 20 ms or more.
  8. If surges occur, take countermeasures such as connecting a surge absorber to the source of the surges.
- Our Safety Control Unit **SF-C21** can be connected only to the PNP output type (**SG-P□□-M-P**). For details, refer to the "SF-C21 Instruction Manual".

The following sections describe wiring examples for connecting the switch body (**SG-P□□-M**) of this device to the power supply unit and the safety control unit .

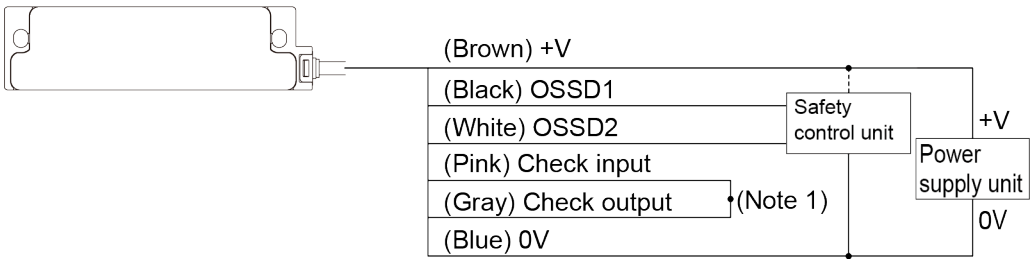
Info.

- Our Safety Control Unit **SF-C21** can be connected only to the PNP output type (**SG-P□□-M-P**). For details, refer to the "SF-C21 Instruction Manual".

3.3.1 Using Only One Switch Body

■ For PNP output

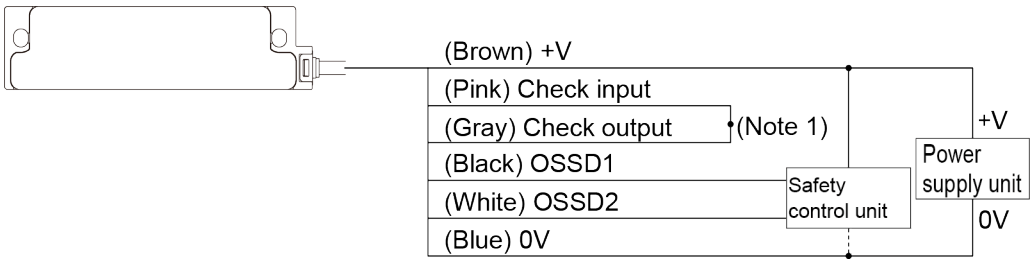
SG-P□□-M-P



(Note 1) Connect the "check input line (pink)" with the "check output line (gray)".

■ For NPN output

SG-P□□-M-N



(Note 1) Connect the "check input line (pink)" with the "check output line (gray)".

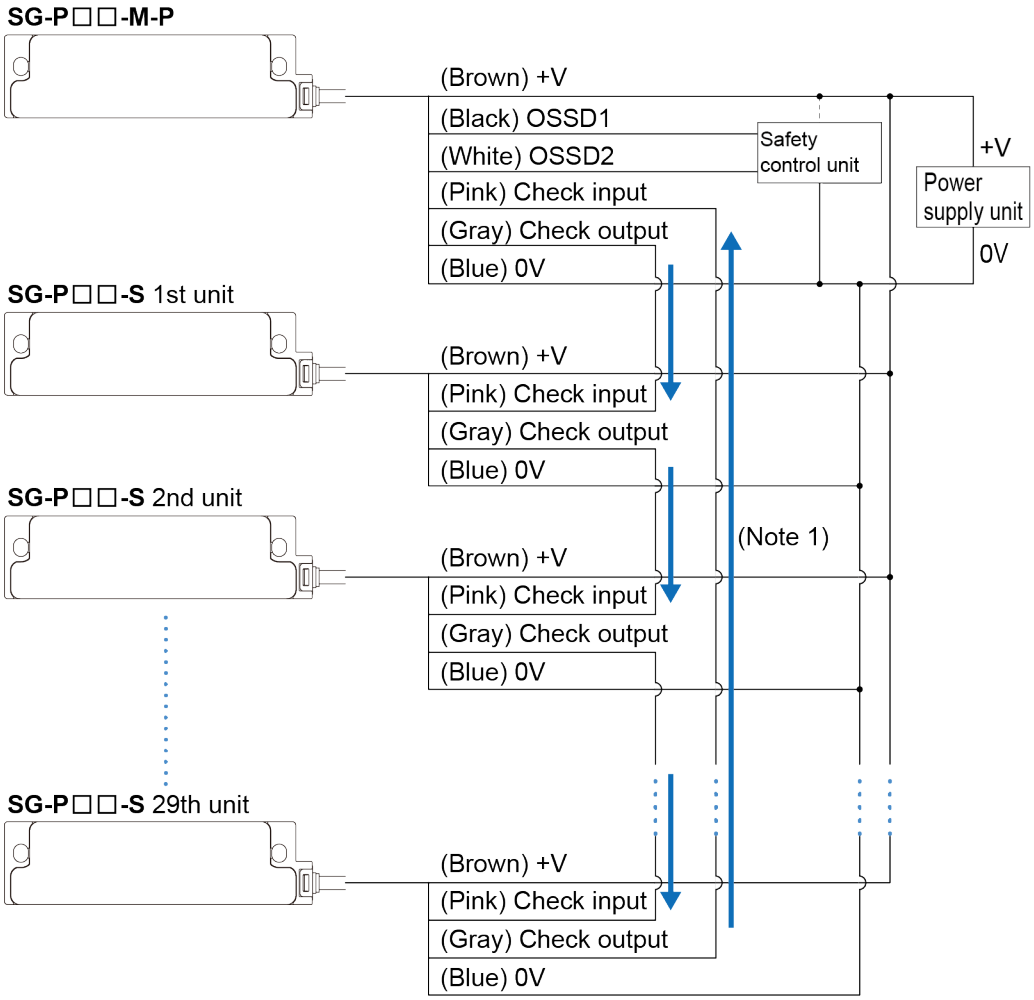
■ Maximum cable length

When using only one switch body, arrange its layout so that the maximum cable length between the switch body and the power supply unit is 20 m or less.

3.3.2 Series Connection

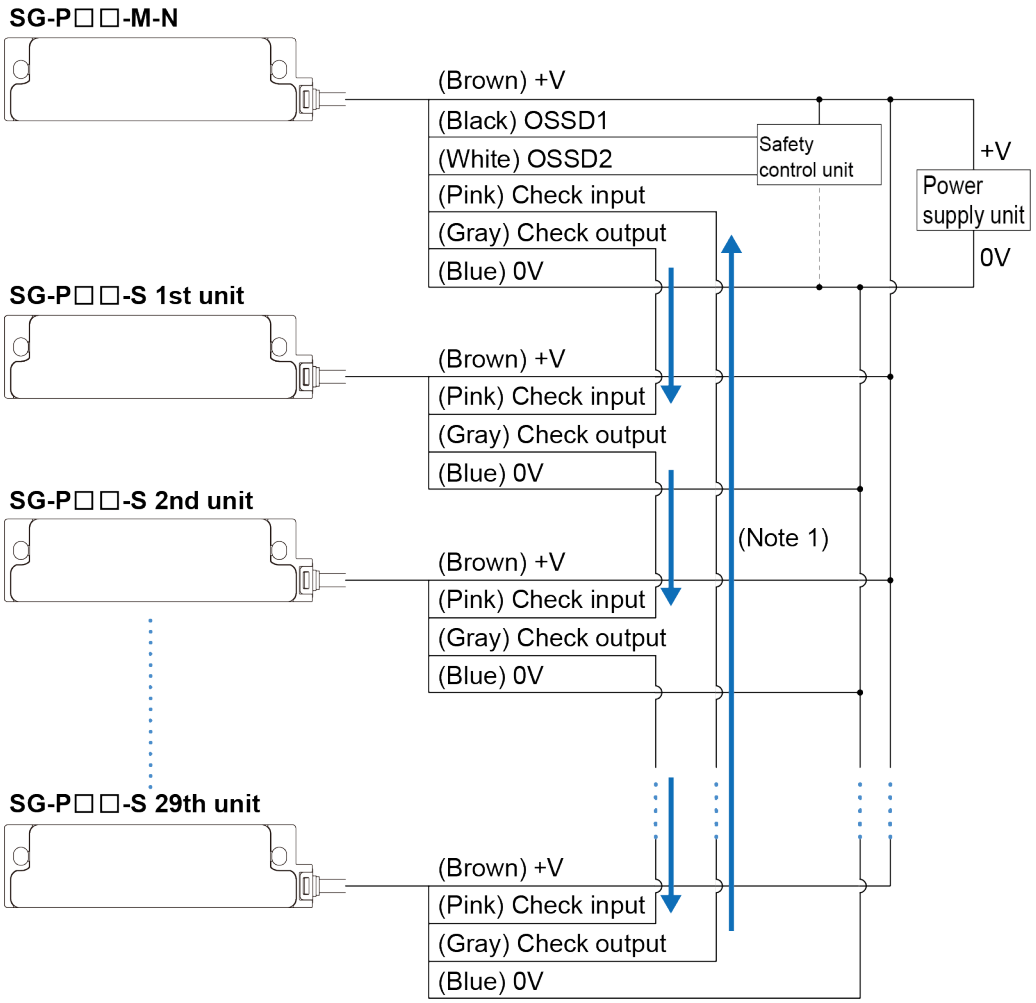
For one **SG-P□□-M** standard unit of this device, you can connect up to 29 **SG-P□□-S** sub units in a series connection. This allows you to monitor multiple switch bodies with a single safety device. When using them, wire as shown in the following diagram.

■ **For PNP output**



(Note 1) For connecting multiple units, connect the "check output line (gray)" with the "check input line (pink)" **SG-P□□-S** sub unit connected next. Connect the "check output line (gray)" of the **SG-P□□-S** sub unit connected at the end with the "check input line (pink) " of the **SG-P□□-M** standard unit placed at the beginning.

■ **For NPN output**

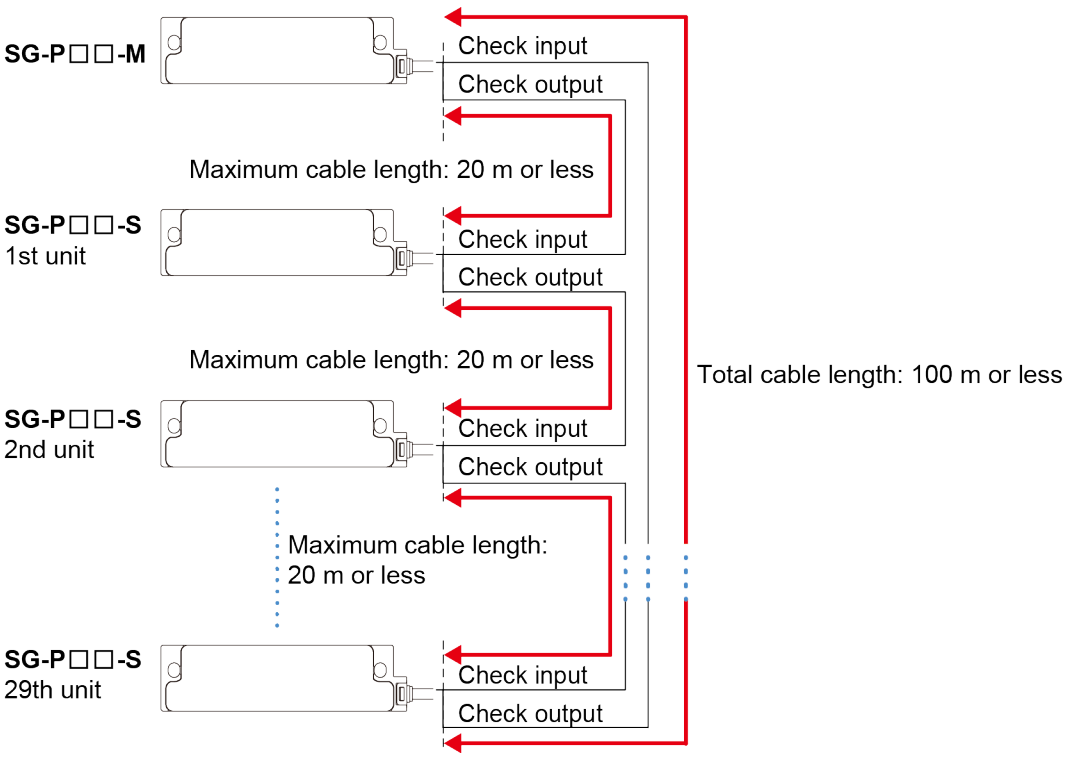


(Note 1) For connecting multiple units, connect the "check output line (gray)" with the "check input line (pink)" **SG-P□□-S** sub unit connected next. Connect the "check output line (gray)" of the **SG-P□□-S** sub unit connected at the end with the "check input line (pink) " of the **SG-P□□-M** standard unit placed at the beginning.

3.3.3 Maximum Cable Length and Total Cable Length for Series Connection

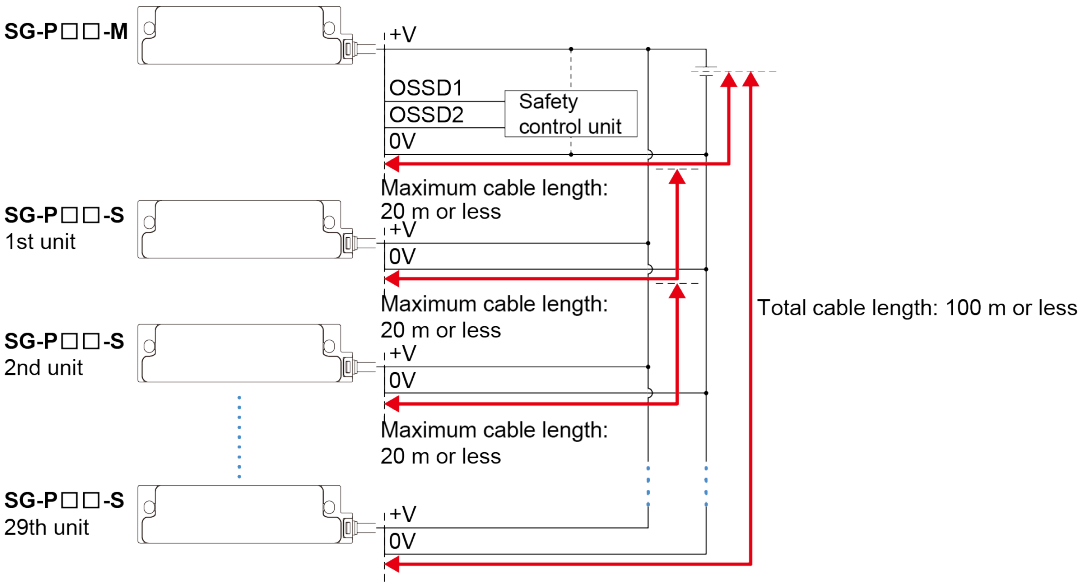
The maximum cable length and total cable length when connecting multiple switch bodies are as follows.

■ **Maximum cable length and total cable length of the check input line and check output line**



Arrange the layout so that the total cable length between the **SG-P□□-M** standard unit and the **SG-P□□-S** sub unit connected at the end is 100 m or less. Furthermore, determine the distance between the neighboring sensor bodies so that the maximum cable length is 20 m or less.

■ **Total cable length and maximum cable length of the power supply line and OSSD line**



When connecting multiple switch bodies, arrange the layout so that the total cable length between the switch body and the power supply unit and between the switch body and the safety controller is 100 m or less. Furthermore, determine the distance between the neighboring sensor bodies so that the maximum cable length is 20 m or less.

(MEMO)

4 Functions

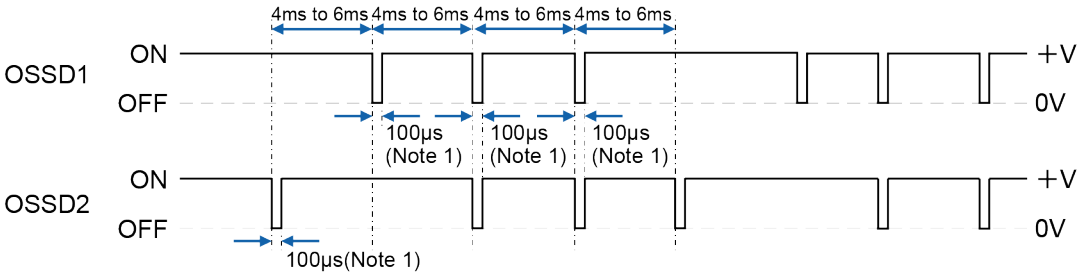
4.1 Control Outputs (OSSD)

The **SG-P□□-M** standard units of this device generates pulse signals from the control outputs (OSSD1 and OSSD2) to perform self-diagnosis when the power supply is turned ON and periodically during operation.

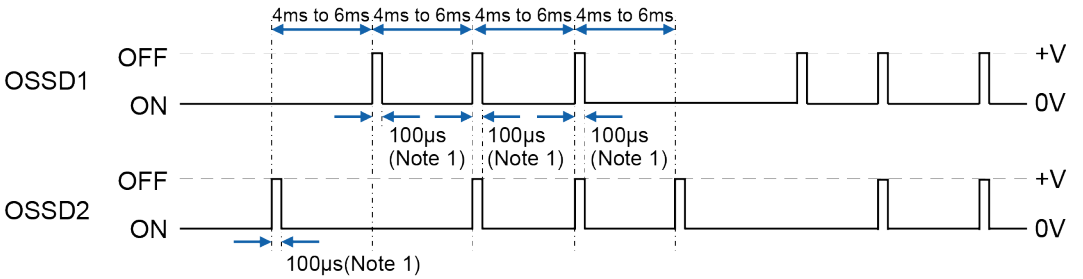
When an error occurs, it enters the lockout state and the control outputs (OSSD1 and OSSD2) are set to OFF.

■ Timing chart

For PNP output



For NPN output



(Note 1) Extended up to a maximum of 150 µs when the load is a capacitance load.

⚠ WARNING

- Do not control the machine using only one point of the control outputs (OSSD1 and OSSD2). When an OSSD malfunction occurs, the machine cannot be stopped, which may cause death or serious injury.

⚠ CAUTION	
⊘	● When using the PNP output type, do not short circuit the OSSD output line with the + V line. Otherwise, the OSSD constantly remains ON, which may cause an accident or breakdown.
⊘	● When using the PNP output type, do not connect a load between the OSSD output line and the + V line. Otherwise, the OSSD operation is inverted, which may cause an accident or breakdown.
⊘	● When using the NPN output type, do not short circuit the OSSD output line with the 0-V line. Otherwise, the OSSD constantly remains ON, which may cause an accident or breakdown.
⊘	● When using the NPN output type, do not connect a load between the OSSD output line and the 0-V line. Otherwise, the OSSD operation is inverted, which may cause an accident or breakdown.

❗	● The **SG-P□□-S** sub unit is not equipped with the OSSD. ● Turn ON the power supply again only after removing the cause of an error.

4.2 Coding

This device is available in models for two coding levels so that the switch body and the actuator operate only when they are used in a specified combination.

■ Low-code (multi-code) model

Detects only the **SG-P** Series actuators.

- Applicable models

  SG-P1010-M-P / Standard, Compact type, PNP output
  SG-P1020-M-P / Standard, Visible type, PNP output
  SG-P1010-M-N / Standard, Compact type, NPN output
  SG-P1020-M-N / Standard, Visible type, NPN output
  SG-P1010-S / Sub, Compact type
  SG-P1020-S / Sub, Visible type

■ High-code (unique-code) model

The switch body detects only the specifically paired actuators. It does not detect actuators even if they have the same model number unless they are ones that are specifically paired.

- Applicable models

  SG-P2010-M-P / Standard, Compact type, PNP output
  SG-P2020-M-P / Standard, Visible type, PNP output
  SG-P2010-M-N / Standard, Compact type, NPN output
  SG-P2020-M-N / Standard, Visible type, NPN output
  SG-P2010-S / Sub, Compact type
  SG-P2020-S / Sub, Visible type

4.3 Pairing (Only High-code Models)

4.3.1 Initial Pairing Setting

For the high-code model (**SG-P20□-□**) of this device, the pairing between the switch body and the actuator is not set as default (factory settings). Before using the product, make sure to let the switch body detect the actuator to implement the pairing.

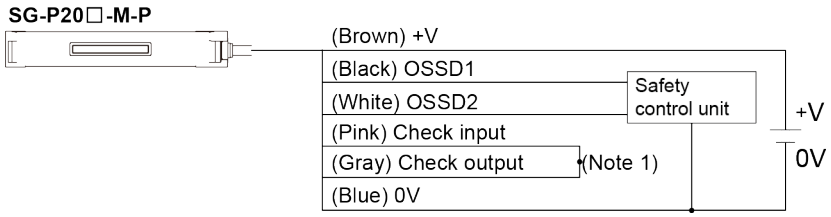
- The high-code model (**SG-P20□-□**) of this device cannot be used unless the pairing is implemented.

The following section describes the procedure for paring the standard unit **SG-P20□**-M-□ and the actuator.

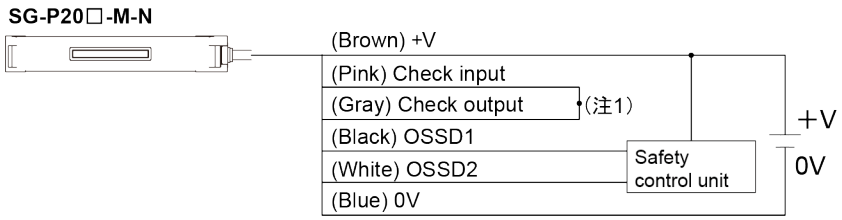
Procedure

1. Wire the **SG-P20□-M-□** and turn ON the power supply.

SG-P20□-M-P (PNP output)

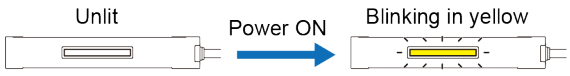


SG-P20□-M-N (NPN output)

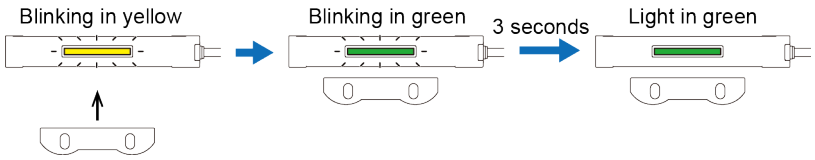


Note 1: Using only one switch body

2. When the power is turned ON, the **SG-P20□-M-□** transitions to the pairing mode and the indicator blinks in yellow.



3. After transitioning to the pairing mode, make the **SG-P20□-M-□** detect the actuator you want to pair to establish pairing between them. When the actuator is detected, the indicator blinks in green. In three seconds after the actuator is detected, the indicator is lit in green to indicate that the pairing has been established.



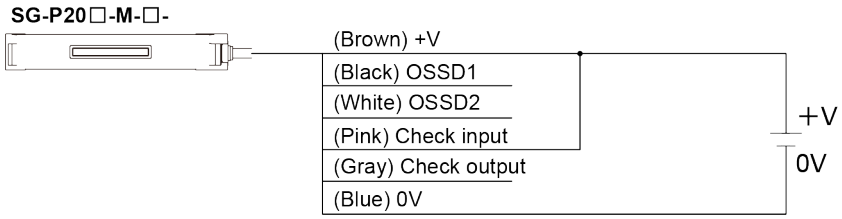
4.3.2 Teaching Setting

If pairing is required again when the actuator is replaced or for other reason, perform teaching on the switch body (**SG-P20□-M-□** standard unit or **SG-P20□-S** sub unit).

The following section describes the procedure for performing teaching on the **SG-P20□-M-□** standard unit and the actuator.

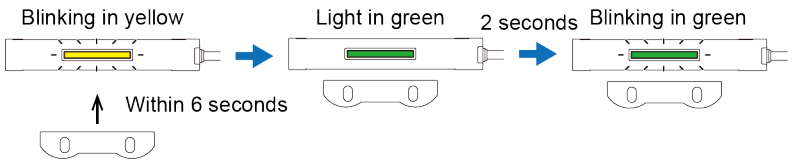
1 2 Procedure

1. Perform wiring and short circuit the check input (pink) of the **SG-P20□-M-□** with the +V (brown).

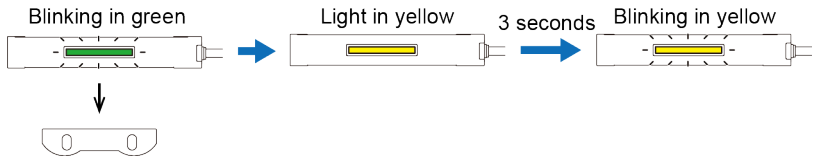


2. Turn ON the power supply and start teaching settings. At that time, make sure that the actuator is in a non-detection state. When the teaching is started normally, the indicator is lit in yellow. In four seconds after the power is turned ON, the **SG-P20□-M-□** transitions to the teaching mode and the indicator blinks in yellow.

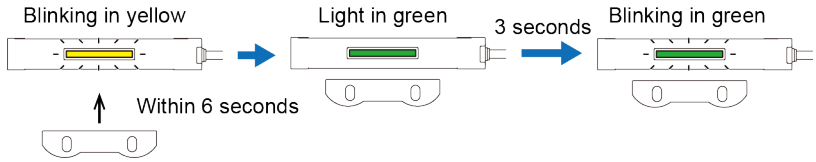
3. Within six seconds after transitioning to the teaching mode, make the **SG-P20□-M-□** detect the actuator you want to teach. When the actuator is detected, the indicator is lit in green. After the detection state is maintained for two seconds, the indicator blinks in green.



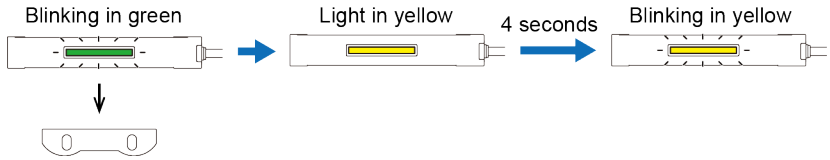
4. Move the actuator away from the **SG-P20□-M-□** and maintain a non-detection state. During the non-detection state, the indicator is lit in yellow. After the non-detection state is maintained for three seconds, the **SG-P20□-M-□** transitions to the second teaching mode and the indicator blinks in yellow.



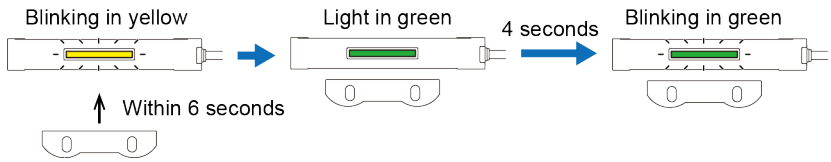
5. Within six seconds after transitioning to the teaching mode, make the **SG-P20□-M-□** detect the same actuator. When the actuator is detected, the indicator is lit in green. After the detection state is maintained for three seconds, the indicator blinks in green.



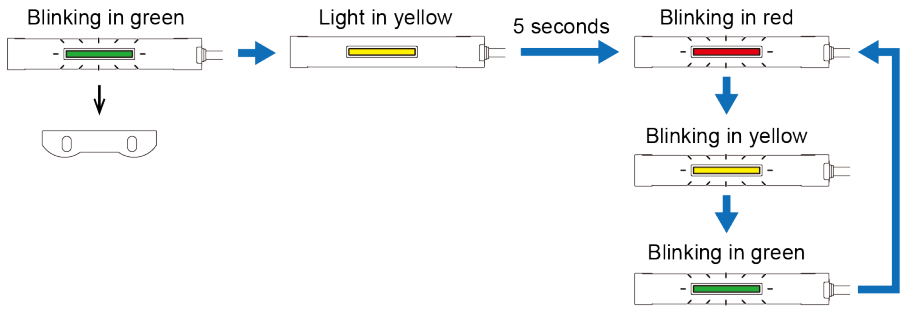
6. Move the actuator away from the **SG-P20□-M-□** and maintain a non-detection state. During the non-detection state, the indicator is lit in yellow. After the non-detection state is maintained for four seconds, the **SG-P20□-M-□** transitions to the second teaching mode and the indicator blinks in yellow.



7. Within six seconds after transitioning to the teaching mode, make the **SG-P20□-M-□** detect the same actuator. When the actuator is detected, the indicator is lit in green. After the detection state is maintained for four seconds, the indicator flashes in green.

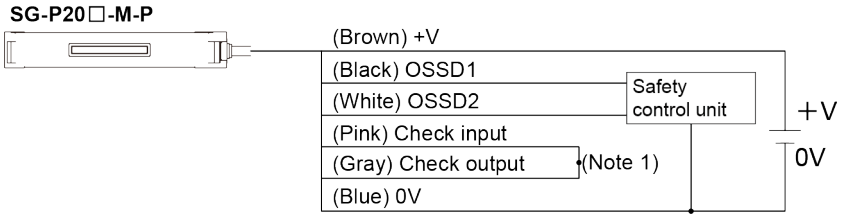


8. Move the actuator away from the **SG-P20□-M-□** and maintain a non-detection state. During the non-detection state, the indicator is lit in yellow. When the non-detection state is maintained for five seconds, the indicator of **SG-P20□-M-□** is lit in the order of red, yellow, and green.

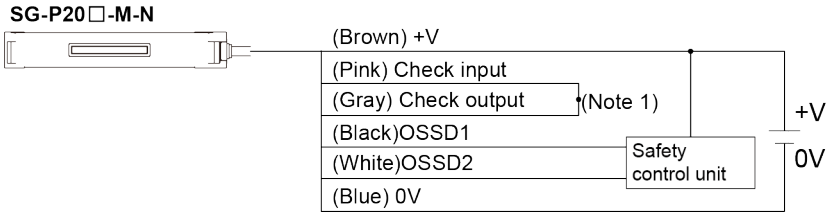


9. Turn OFF the power supply to the **SG-P20□-M-□** and release the short circuit of the check input (pink).

SG-P20□-M-P (PNP output)



SG-P20□-M-N (NPN output)



Note 1: Using only one switch body

10. Turn ON the power supply to complete the teaching.

- If a mistake is made in the teaching procedure or if the actuator was not detected or non-detection state was not maintained for the specified time, the indicator blinks in red. If the indicator blinks in red, turn OFF and then ON the power supply and redo from step "Step 2".

Blinking in red

- If an unpaired **SG-P** Series actuator is detected, the indicator alternately blinks in red and yellow. When the indicator alternately blinks in red and yellow, turn OFF and then ON the power supply and make the switch body detect the paired actuator.

Blinking in red　　Blinking in yellow

5 Maintenance

5.1 When Performing Maintenance

When performing maintenance, observe the following points.

- If you discover an abnormal condition, refer to "6 Troubleshooting" and inform your technician.
- If you are unsure what action to take, contact our office.
- Make a copy of the checklist, put a checkmark after checking each item, and retain the checklist.

5.2 Daily Inspection

⚠ WARNING

- Before starting work, inspect the following items and verify that there are no abnormalities. Operating this device without performing the inspection or without removing the abnormal condition may cause death or serious injury.

■ Checklist (daily inspection)

Check column	Inspection item
□	The switch body and the actuator are mounted according to the mounting and wiring specifications and the door and other structures where they are mounted are installed according to the installation conditions.
□	The door is not deformed or warped.
□	Check each door to confirm that the machine stops when the door opens.
□	There is no change in the installation environment that may affect the results of the risk assessment performed before this device was installed.
□	If seal was applied to the mounting screw, the seal must remain unchanged.
□	There is no scratch, dirt, or damage in this device.
□	There is no scratch, bent, or damage in the wiring.

5.3 Periodic Inspection

⚠ WARNING

- According to the periodic inspection frequency as specified in ISO 14119, inspect the following items and verify that there are no abnormalities. Operating this device without performing the inspection or without removing the abnormal condition may cause death or serious injury.

■ Inspection frequency

SIL3 / PLe: At least once a month, SIL2 / PLd: At least once a year

Checklist (periodic inspection)

Check column	Inspection item
□	The structure of the machine does not prevent any safety mechanisms from causing the machine to stop or to make an emergency stop.
□	No modification has been made in the machine control system that obstructs the safety mechanisms.
□	There is no change in the installation environment of the switch body, the actuator and the door where they are mounted.
□	Check each door to confirm that the machine stops when the door opens.
□	No screws or connectors related to the device are loose.

5.4 Inspection after Maintenance on the Equipment where this Device Is Used

When the status of this device is as described below, inspect all items listed in "5.2 Daily Inspection" and "5.3 Periodic Inspection".

1. When changes are made to the installation, wiring, or functions of the device.
2. When the switch body or actuator is replaced.
3. When changes are made to the settings of the safety devices such as the safety controller.
4. When an abnormal condition is noticed during operation of this device.

(MEMO)

6 Troubleshooting

6.1 Troubleshooting

Solutions to frequently encountered problems and errors are described below.

Info.

- Check the wiring.
- Check the voltage and capacity of the power supply.
- If the indicator blinks in red, check the number of blinkings after the indicator remains unlit for approximately two seconds. Error contents are different depending on the number of blinkings.

Symptom	Indicator	Number of blinkings	Cause	Solution	Reference page
The OSSD does not turn ON.	Lights red	-	The actuator is not detected correctly.	Move the actuator to within the sensing range.	"P. 7-2"
			The actuator is faulty.	Replace the actuator.	-
			Affected by the surrounding metal.	Check the installation environment around this device.	"P.3-2"
			Affected by the interference from other sensors.	Check the installation environment around this device.	"P.3-4"
			The distance between the switch body and the actuator is longer than the specified operating distance Sao (OFF→ON).	Make sure that the distance between the switch body and the actuator within the specification range.	"P. 7-2"
	Alternately blinking red and yellow	-	When using a high-code model, an actuator not paired is detected.	Make the switch body detect the paired actuator.	"P.4-5"
	Blinks red(Note 1)	1	Switch body is faulty.	Replace the switch body.	-
		2	The number of connectable switch bodies (sub) is exceeded.	Connect switch bodies (sub) up to the maximum of 29 units.	"P.2-6"
		3	The check input / check output wiring is short circuited or disconnected.	Correctly wire the check input (pink) and check output (gray) lines according to the wiring diagram.	"P.3-8"
			The check input / check output wiring is not correct.	Correctly wire the check input (pink) and check output (gray) lines according to the wiring diagram.	"P.3-8"
			Two or more switch bodies (standard) are connected.	When connecting multiple switch bodies, use sub units for the second unit onwards.	"P.2-6"
		4	Made a mistake in the teaching procedure.	Refer to "4.3.2 Teaching Setting" and perform teaching again.	"P.4-6"
			The time elapsed beyond the specified time during teaching.	Refer to "4.3.2 Teaching Setting" and perform teaching again.	"P.4-6"

Symptom	Indicator	Number of blinkings	Cause	Solution	Reference page
		5	The OSSD wiring is short circuited. (Standard unit only)	Correctly wire the OSSD1 (black) and OSSD2 (white) lines according to the wiring diagram.	"P.3-8"
			The OSSD wiring is not correct. (Standard unit only)	Correctly wire the OSSD1 (black) and OSSD2 (white) lines according to the wiring diagram.	"P.3-8"
			The check input / check output wiring is short circuited or disconnected. (Standard unit only)	Correctly wire the check input (pink) and check output (gray) lines according to the wiring diagram.	"P.3-8"
			The check input / check output wiring is not correct. (Standard unit only)	Correctly wire the check input (pink) and check output (gray) lines according to the wiring diagram.	"P.3-8"
		8	The power supply voltage supplied to this device is beyond the usage range.	Use the power supply unit with the supply voltage of 24 VDC +10%/ -20%.	"P. 7-2"
		9	Affected by the noise.	Check the noise environment around this device. Check the wiring and the voltage and capacity of the power supply. If the device does not operate properly even after checking, please contact our office.	-
		10			
The indicator does not light at all.	Turns OFF	-	The power wiring is short circuited or disconnected.	Correctly wire the check +V (brown) and 0V (blue) lines according to the wiring diagram.	"P.3-8"
			Power is not supplied.	Check if the capacity of the power supply is sufficient. Correctly connect the power supply unit.	"P. 7-2"
			The power supply voltage is not within the specifications.	Use the power supply unit with the supply voltage of 24 VDC +10%/ -20%.	"P. 7-2"
			Switch body is faulty.	Replace the switch body.	-
The OSSD does not turn OFF.	-	-	The distance between the switch body and the actuator is longer than the specified operating distance Sar (ON→OFF).	Make sure that the distance between the switch body and the actuator within the specification range.	"P. 7-2"
The OSSD repeatedly turns ON and OFF at high speed.			The pulse signal (OFF) that is periodically generated by the OSSD is recognized by a connected device.	Connect a device that does not detect the periodical pulse signal (OFF).	-
The switch body does not detect the actuator.			An actuator manufactured by other company is used.	Use an **SG-P** Series actuator.	-

(Note 1) The following sequence is repeated: unlit for approximately two seconds, blinking in red for the number of times that indicates error contents, and then unlit for approximately two seconds.

Note

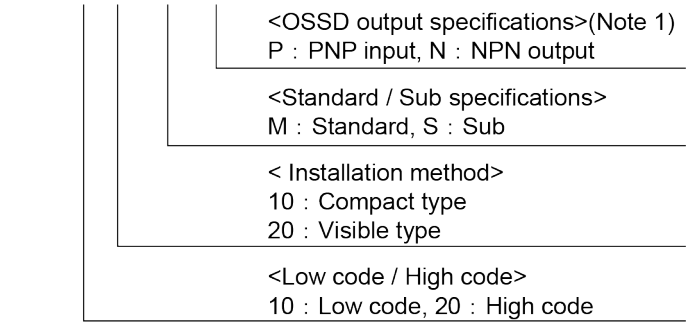
- If the device does not operate properly even after checking and taking actions as described above, please contact our office.

7 Specifications and Dimensions

7.1 Specifications

7.1.1 Model No.

SG-P□ □- □- □



(Note 1) Provided only on the **SG-P□□-M** standard unit.

7.1.2 Individual Specifications

Model	Standard PNP output	Standard NPN output	Sub
	SG-P□□-M-P	SG-P□□-M-N	SG-P□□-S
Operating distance Front / Side	Sao (OFF→ON): 5 mm, Sar (ON→OFF): 15 mm		
Power supply voltage	24V DC +10%/ -20% ripple (P-P) of 10% or less		
Current consumption	30 mA or less		20 mA or less
Control output (OSSD1 / 2)(Note 2)	PNP transistor ● Open collector 2 outputs	NPN transistor ● Open collector 2 outputs	-
	Maximum source current: 100 mA	Maximum sink current: 100 mA	-
	● Applied voltage: Same as the power supply voltage (PNP:between control output and 0V, NPN:between control output and +V) ● Residual voltage: 2V or less (source current and sink current: 100 mA) (excluding voltage drop due to cable) ● Leakage current: 0.2 mA or less (including power OFF state) ● Maximum load capacity: 0.47 μF ● Load wiring resistance: 3 Ω or less		-
Operation mode (output operation)	When the actuator is detected (safe state): ON When the actuator is not detected (unsafe state or lockout state): OFF When the switch body (sub) does not detect actuator (series connection): OFF		-

Model	Standard PNP output	Standard NPN output	Sub
	SG-P□□-M-P	SG-P□□-M-N	SG-P□□-S
Protection circuit (short-circuit protection)	Incorporated		-
Response time	For single unit: ON⇒OFF 100 ms or less For single unit: OFF⇒ON 100 ms or less For multiple units: Time for single unit ＋ 5 ms × (number of connected units - 1)		
Check input and output	Dedicated communication line between the switch body (standard) and the switch body (sub)(Note 3) *It is not for external input and output. (voltage range 0 V to 5 V DC)		
Number of units connected in series	30 units or less (Standard 1 unit, Sub 29 units)		
Contamination level	3		
Protective structure	IP65 (IEC)		
Ambient temperature	-10 to +55°C (No condensation or icing), storage: -25 to +65°C		
Ambient humidity	30 to 85% RH, storage: 30 to 95% RH		
Vibration resistance	Malfunction resistance: 10 to 55 Hz, 1 mm double amplitude, 2 hours each in X, Y, and Z directions		
Shock resistance	300 m/s^2 (approx. 30 G), 3 times each in X, Y, and Z directions		
Withstand voltage	1,000 VAC for one minute (between all supply terminals connected together and enclosure)		
Insulation resistance	20 MΩ or higher using 500 VDC megger (between all supply terminals connected together and enclosure)		
Material	Switch body: PBT, PC, stainless steel , Silicone rubber Actuator: PBT, PC (Only Visible type)		
Cable	6–core cabtyre cable Cable length: 5 m		4–core cabtyre cable Cable length: 3 m
Connected cable length	Maximum cable length:20 m Series connection: Total cable length: 100 m		
Mounting torque	1.2 N·m or less		
Weight	● Compact type Switch body (standard): Approx. 180 g, Switch body (sub): Approx. 110 g, Actuator: Approx. 10 g ● Visible type Switch body (standard): Approx. 180 g, Switch body (sub): Approx. 120 g, Actuator : Approx. 20 g		
Packing weight	● Compact type **SG-P□10-M-□**: Approx. 260 g, **SG-P□10-S-□**: Approx. 190 g ● Visible type **SG-P□20-M-□**: Approx. 270 g, **SG-P□20-S-□**: Approx. 210 g		

(Note 1) Unless otherwise specified, the measurement values are for the ambient temperature of +23°C.

(Note 2) Provided only on the **SG-P□□-M** standard unit.

(Note 3) When using the device as a single unit, connect the check input with the check output.

7.1.3 Safety-related parameters

Name	Parameter	
	Standard	Sub
Mission time	20 years	
SFF	99%	99%
PFHd	5.24×10^{-10}	4.03×10^{-10}
DC avg	96%	93%
Performance level	PLe	
Category	4	
SIL	3	
Risk time	200 msec	
HFT	1	
Sub system type	B	

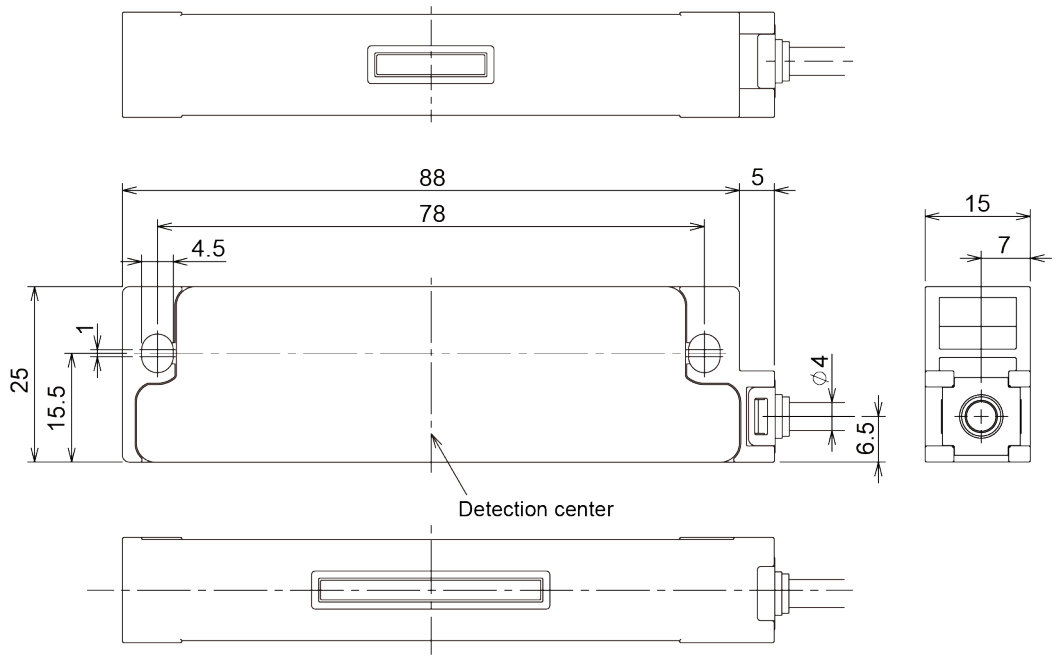
7.2 Dimensions

7.2.1 Compact Type

■ **Switch body**

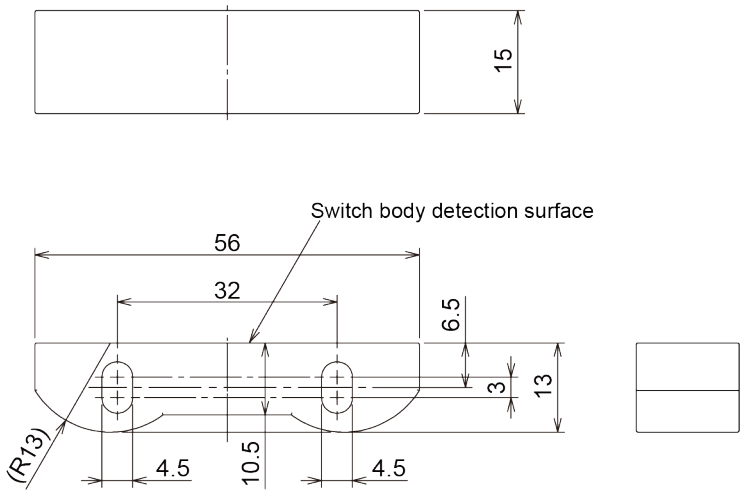
- Standard
  SG-P1010-M-P / Low code, PNP output
  SG-P1010-M-N / Low code, NPN output
  SG-P2010-M-P / High code, PNP output
  SG-P2010-M-N / High code, NPN output
- Sub
  SG-P1010-S / Low code
  SG-P2010-S / High code

Unit: mm



■ **Actuator**

Unit: mm

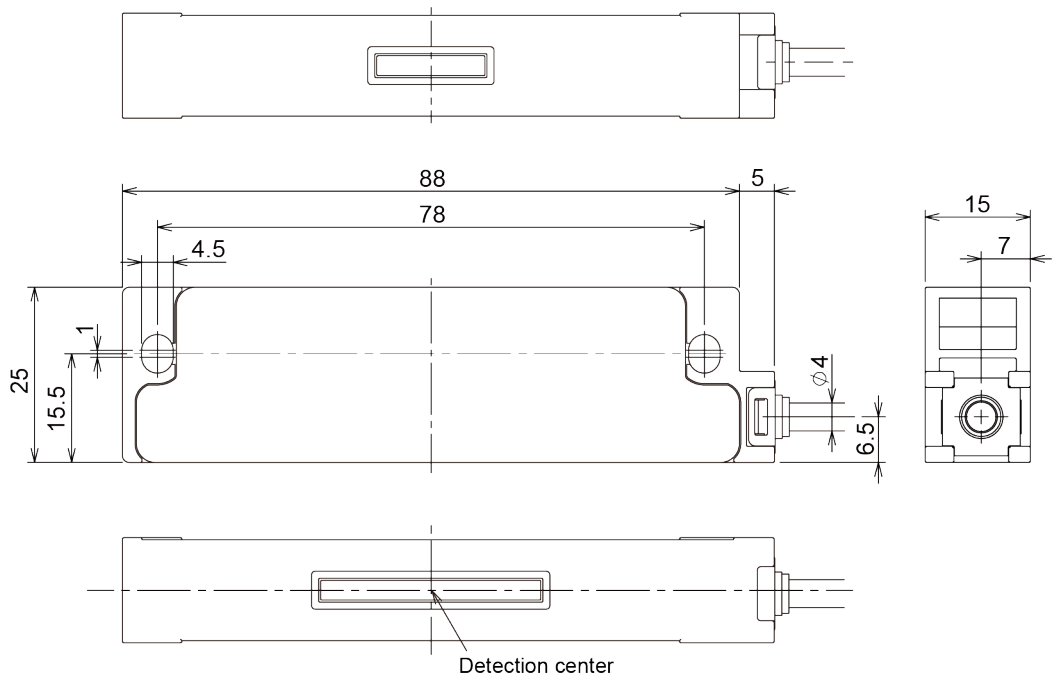

15
Switch body detection surface
56
32
6.5
3
13
(R13)
4.5
10.5
4.5

7.2.2 Visible Type

■ Switch body

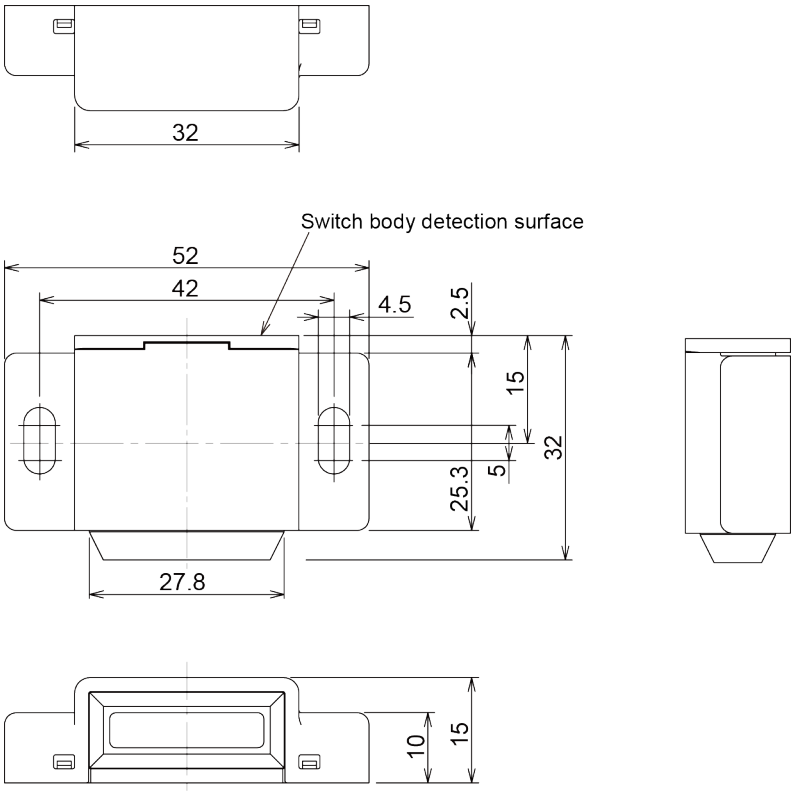
- Standard
  SG-P1020-M-P / Low code, PNP output
  SG-P1020-M-N / Low code, NPN output
  SG-P2020-M-P / High code, PNP output
  SG-P2020-M-N / High code, NPN output
- Sub
  SG-P1020-S / Low code
  SG-P2020-S / High code

Unit: mm



■ Actuator

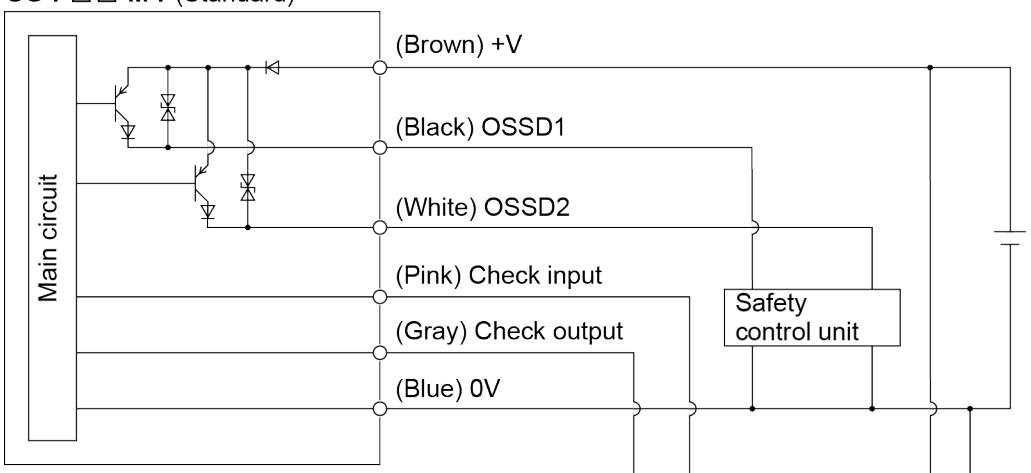
Unit: mm


32
Switch body detection surface
52
42
4.5
2.5
15
32
5
25.3
27.8
10
15

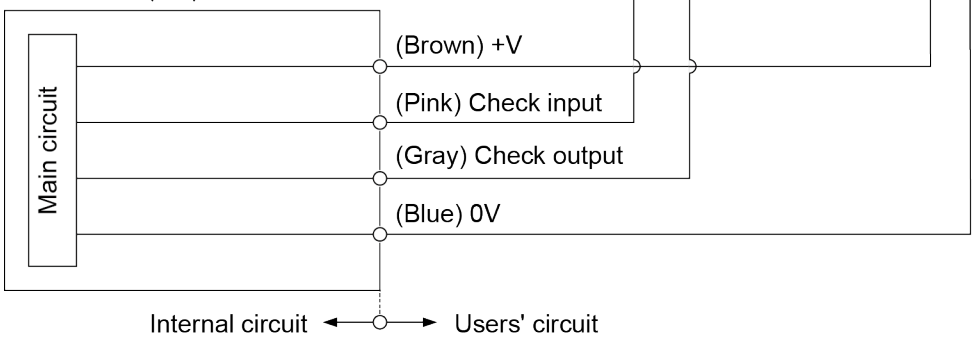
7.2.3 I/O Circuits

■ **PNP output**

SG-P□□-M-P(Standard)



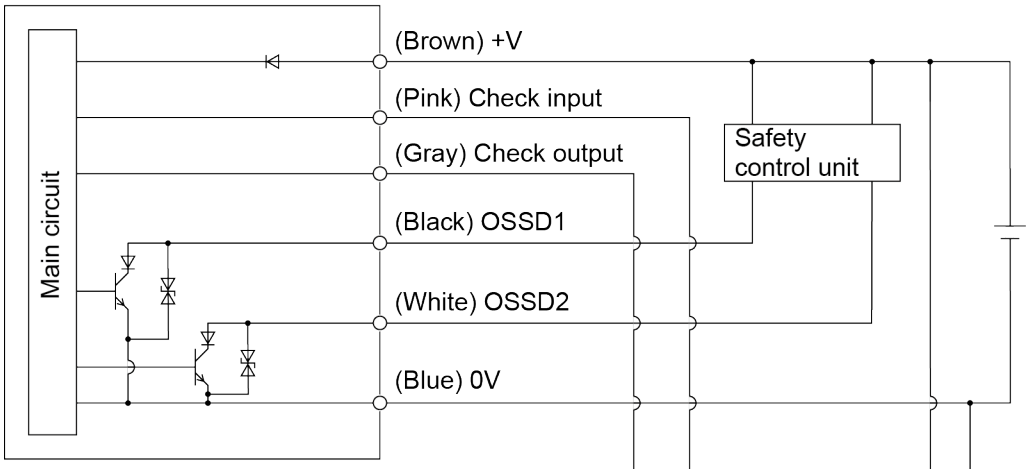
SG-P□□-S(Sub)



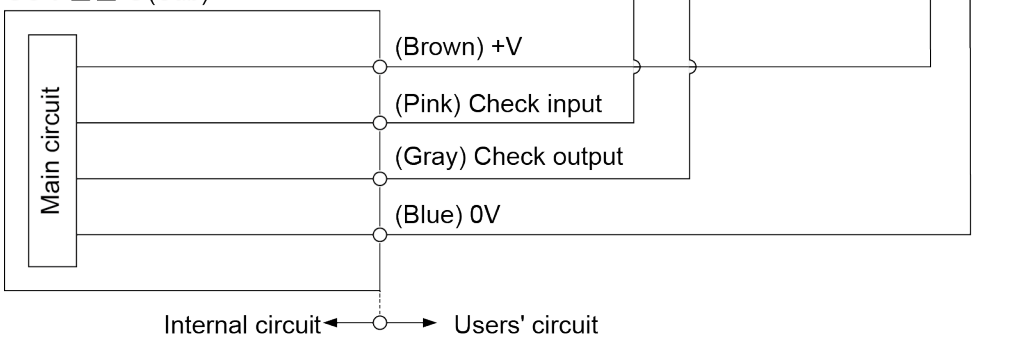
Internal circuit ◄——► Users' circuit

■ **NPN output**

SG-P□□-M-N (Standard)



SG-P□□-S (Sub)



(MEMO)

8 Appendix

8.1 CE Marking Declaration Conformity

Itemized Essentials of EC Declaration of Conformity

Manufacturer's Name:
Panasonic Industrial Devices SUNX Co., Ltd

Manufacturer's Address:
2431-1, Ushiyama-cho, Kasugai, Aichi 486-0901, Japan

EC Representative's Name:
Panasonic Marketing Europe GmbH Panasonic Testing Center

EC Representative's Address:
Winsbergring 15, 22525 Hamburg,Germany

Product:
Active Non-Contact Safety Door Switch

Model Name:
SG-P Series

Trade Name:
Panasonic

Application of Council Directive:
- 2006/42/EC Machinery Directive
- 2014/53/EU RE Directive
- 2011/65/EU RoHS Directive

Tested according to:
- EN ISO 13849-1
- EN ISO 14119
- EN 60947-5-3
- EN 300 330
- EN 50581

Type Examination:
Certified by TÜV SÜD Product Service GmbH Ridlerstrasse 65 80339 München Germany

Revision History

Revision history	Revision date	Revision item
1st edition	July 2020	-
2nd edition	September 2020	Corrected errors.

Order Placement Recommendations and Considerations

The Products and Specifications listed in this document are subject to change (including specifications, manufacturing facility and discontinuing the Products) as occasioned by the improvements of Products. Consequently, when you place orders for these Products, Panasonic Industrial Devices SUNX asks you to contact one of our customer service representatives and check that the details listed in the document are commensurate with the most up-to-date information.

[Safety precautions]
Panasonic Industrial Devices SUNX is consistently striving to improve quality and reliability. However, the fact remains that electrical components and devices generally cause failures at a given statistical probability. Furthermore, their durability varies with use environments or use conditions. In this respect, check for actual electrical components and devices under actual conditions before use. Continued usage in a state of degraded condition may cause the deteriorated insulation. Thus, it may result in abnormal heat, smoke or fire. Carry out safety design and periodic maintenance including redundancy design, design for fire spread prevention, and design for malfunction prevention so that no accidents resulting in injury or death, fire accidents, or social damage will be caused as a result of failure of the Products or ending life of the Products.

The Products are designed and manufactured for the industrial indoor environment use. Make sure standards, laws and regulations in case the Products are incorporated to machinery, system, apparatus, and so forth. With regard to the mentioned above, confirm the conformity of the Products by yourself.

Do not use the Products for the application which breakdown or malfunction of Products may cause damage to the body or property.
i) usage intended to protect the body and ensure security of life
ii)application which the performance degradation or quality problems, such as breakdown, of the Products may directly result in damage to the body or property

It is not allowed the use of Products by incorporating into machinery and systems indicated below because the conformity, performance, and quality of Products are not guaranteed under such usage.
i) transport machinery (cars, trains, boats and ships, etc.)
ii) control equipment for transportation
iii) disaster-prevention equipment / security equipment
iv) control equipment for electric power generation
v) nuclear control system
vi) aircraft equipment, aerospace equipment, and submarine repeater
vii) burning appliances
viii) military devices
ix) medical devices (except for general controls)
x) machinery and systems which especially require the high level of reliability and safety

[Acceptance inspection]
In connection with the Products you have purchased from us or with the Products delivered to your premises, please perform an acceptance inspection with all due speed and, in connection with the handling of our Products both before and during the acceptance inspection, please give full consideration to the control and preservation of our Products.

[Warranty period]
Unless otherwise stipulated by both parties, the warranty period of our Products is one year after the purchase by you or after their delivery to the location specified by you. The consumable items such as battery, relay, filter and other supplemental materials are excluded from the warranty.

[Scope of warranty]
In the event that Panasonic Industrial Devices SUNX confirms any failures or defects of the Products by reasons solely attributable to Panasonic Industrial Devices SUNX during the warranty period, Panasonic Industrial Devices SUNX shall supply the replacements of the Products, parts or replace and/or repair the defective portion by free of charge at the location where the Products were purchased or delivered to your premises as soon as possible.
However, the following failures and defects are not covered by warranty and we are not responsible for such failures and defects.
(1) When the failure or defect was caused by a specification, standard, handling method, etc. which was specified by you.
(2) When the failure or defect was caused after purchase or delivery to your premises by an alteration in construction, performance, specification, etc. which did not involve us.
(3) When the failure or defect was caused by a phenomenon that could not be predicted by the technology at purchasing or contracted time.
(4) When the use of our Products deviated from the scope of the conditions and environment set forth in the instruction manual and specifications.
(5) When, after our Products were incorporated into your products or equipment for use, damage resulted which could have been avoided if your products or equipment had been equipped with the functions, construction, etc. the provision of which is accepted practice in the industry.
(6) When the failure or defect was caused by a natural disaster or other force majeure.
(7) When the equipment is damaged due to corrosion caused by corrosive gases etc. in the surroundings.

The above terms and conditions shall not cover any induced damages by the failure or defects of the Products, and not cover your production items which are produced or fabricated by using the Products. In any case, our responsibility for compensation is limited to the amount paid for the Products.

[Scope of service]
The cost of delivered Products does not include the cost of dispatching an engineer, etc. In case any such service is needed, contact our sales representative.

Panasonic Industrial Devices SUNX Co., Ltd.

(MEMO)

Please contact .....

Panasonic Corporation

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