

Thank you very much for purchasing Panasonic products. Please read this Instruction Manual carefully and thoroughly for the correct and optimum use of this product. Kindly keep this manual in a convenient place for quick reference. English is original instructions.

**1 SAFETY CAUTIONS** Always observe

In this operating instruction sheet, safety precautions are categorized to Warning and Caution:

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

**2 TYPE**

- Model No. : **SG-B2-K2AD-L5**
- Key removal position
    - A** : LOCK and UNLOCK
    - B** : UNLOCK
    - C** : LOCK
  - Cable length : **5.5m**
  - Rear unlock
    - None** : Without rear manual unlock
    - L** : Push button
  - Door monitor contacts/ Lock monitor contacts
    - C** : 1NO+1NC
    - D** : 2NC

**3 SPECIFICATIONS AND RATINGS**

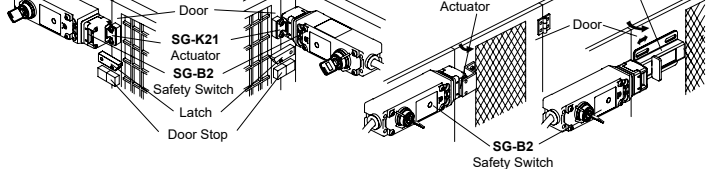
Applicable Standards	EN 60947-5-1: 2017, GS-ET-19: 2019	
Standards for Use	IEC 60204-1 / EN 60204-1, ISO 14119, EN ISO 14119, IEC 60947-5-1, UL 508, CSA C22 No. 14	
Interlocking device Type / level of coded	Type 2 Interlocking device / low level coded actuator (EN ISO / ISO 14119)	
Conformity Directive(s)	Machinery Directive (2006/42/EC), Supply of Machinery (Safety) Regulations (2008/1597)	
Operating Conditions	Operating Temperature	-25°C to +70°C (no freezing)
	Operating Humidity	45% to 85%RH (no condensation)
	Storage Temperature	-40°C to +80°C (no freezing)
	Pollution Degree	3 (Inside 2)
	Altitude	2000m maximum
Impulse Withstand Voltage (U <sub>imp</sub> )	2.5 kV	
Rated Insulation voltage	250V (Note 1)	
Thermal Current <I <sub>th</sub> >	2.5A	
	-25°C < Operating temperature < 60°C : 2.5A	
	60°C < Operating temperature < 65°C : 1.5A	
	65°C < Operating temperature < 70°C : 1.0A	
Contact Ratings (Reference Values) <U <sub>e</sub> ,I <sub>e</sub> >	30V 125V 250V	
	AC Resistive load (AC-12) 2.5A 1.5A Inductive load (AC-15) 1.5A 0.75A	
	DC Resistive load (DC-12) 2.5A 0.1A 0.55A Inductive load (DC-13) 2.3A 0.55A 0.27A	
Operating Frequency	900 operations/hour	
Operating Speed	0.05m/s to 1.0m/s	
Buse	2,000,000 (EN ISO 13849-1 Annex C Table C.1)	
Mechanical Durability	1,000,000 operations min. (GS-ET-19) the Rear Unlock Button: 3000 operations min. (Type <b>SG-B2-L5</b> )	
Electrical Durability	100,000 operations min. (AC-12 250V-1A) 1,000,000 operations min. (AC/DC 24V 100mA) (900 operations / hour)	
Class of Protection	Class II (IEC61140)(Note 2) <input type="checkbox"/>	
Actuator Tensile Strength/when Locked	1,400N min. (GS-ET-19)(Note 3) (500N min. <b>SG-K24</b> actuator)	
Direct Opening Travel	11mm min. (actuator: <b>SG-K21</b> ) 12mm min. (for other actuators)	
Direct Opening Force	80N min.	
Contact Resistance	500 mΩmax. (initial value, 3m cable)	
Degree of Protection	IP65 (IEC60529)	
Shock Resistance	Operating extremes: 100 m/s <sup>2</sup> , Damage limits: 1000 m/s <sup>2</sup>	
Vibration Resistance	Operating extremes: 10 to 55 H, amplitude 0.35 mm minimum Damage limits: 30 Hz, amplitude 1.5 mm minimum	
Short-circuit Protective Device	Use 250V / 10A fast acting type fuse	
Key	Operating Specifications	2 Positions
	Mechanical Durability	100,000 operations min.
	Key Operating Durability	10,000 operations min.
	Key Tensile Strength	1.0N·m min.
	Direct Opening Force	0.6N·m min.
	Direct Opening Degree	60° min.

Notes: 1) Ratings approved by UL:UL : 125V  
 2) Basic insulation of 2.5kV impulse withstand voltage is ensured between different contact circuits and between contact circuits and LED or solenoid in the enclosure. When both SELV (safety extra low voltage) or PELV (protective extra low voltage) circuits and other circuits (such as 230V AC circuits) are used for the solenoid power and contact circuits at the same time, the SELV or PELV requirements are not met any more.  
 3) The actuator locking strength is rated at 1400N of static load. Do not apply a load higher than the rated value. When a higher load is expected to work on the actuator, provide an additional system consisting of another safety switch without lock or a sensor to detect door opening and stop the machine.

- Ratings approved by safety agencies
- |               |                  |                    |                         |
|---------------|------------------|--------------------|-------------------------|
| (1)TUV rating | AC-15 250V/0.75A | (2)UL, c-UL rating | AC 125V/1.5A Pilot Duty |
|               | DC-13 125V/0.22A |                    | DC 30V/2.3A Pilot Duty  |
|               | DC-13 30V/2.3A   |                    |                         |

**4 MOUNTING EXAMPLES**

- Install the interlock switch on the immovable machine or guard, and install the actuator on the movable door. Do not install both interlock switch and actuator on the movable door, otherwise failure will occur.
- See the figures below.



- The SG-B2 Head**
- Changing the Mounting Directions of the **SG-B2** Head. The head of the **SG-B2** can be mounted in four directions by removing the four screws from the corners of the **SG-B2** head.



**WARNING**

- Mounting directions of the SG-B2 head**
  - When replacing the **SG-B2** head, make sure that no foreign object enters into the safety switch. Tighten the screws tightly, without leaving space between the head and body, otherwise the safety switch may malfunction. Don't remove the screws of head except when the mounting directions of head is changed.

Head removal detection function (Type **SG-B2-K**)

When the key is operated, the operation of the monitor circuit (41-42) and monitor circuits (51-52) are the same. However, when the head is removed, disparity is detected (41-42 : OFF, 51-52 : ON). The disparity of the contacts detects the removal of the head.

	Actuator Unlocked	Actuator Locked	When the <b>SG-B2-K</b> head is removed
Monitor Circuit: PK Ⓞ41	[Diagram showing contact states]		
Monitor Circuit: BN Ⓞ51	[Diagram showing contact states]		

- (Type **SG-B2-K** -L5)
- Installing the manual rear unlocking button
    - After installing the interlock switch on the panel, put the manual rear unlocking button (supplied) on the rod on the back of the interlock switch, and fasten using the mounting screw, and fasten using the mounting screw. When installing on the aluminum frame of the thickness of 6mm or more, use the rear unlocking button for frame kit (**MS-SG-23 / MS-SG-22**) sold separately.

**CAUTION**

- After installing the manual rear unlocking button, apply Loctite to the screw so that the screw does not become loose. The base is made of glass-reinforced PA66 (66 nylon). The mounting screw is iron. Take the compatibility of plastic material and Loctite into consideration.

**5 PRECAUTIONS FOR OPERATION**

- For Mounting**
  - Do not apply an excessive shock to the safety switch when opening or closing the door. A shock to the safety switch exceeding 1,000 m/s<sup>2</sup> may cause failure.
  - Regardless of door types, do not use the safety switch as a door lock. Install a separate lock as shown in 3.
  - Do not open the lid of the switch. Loosening the screws may cause damage to the switch.
  - Entry of foreign objects in the actuator entry slot may affect the mechanism of the switch and cause a breakdown. If the operating atmosphere is contaminated, use a protective cover to prevent the entry of foreign objects into the switch through the actuator entry slots.
  - Do not fasten and loosen the conduit at the bottom of the safety switch.
  - When wiring, make sure that liquid such as water and oil does not intrude from the tip of cable.
  - When bending the cable during wiring, secure the cable radius of 30 mm at the minimum.
  - Use the dedicated actuators only. Other actuators will cause damage to the switch.

**CAUTION**

- Regardless of door types, do not use the safety switch as a door stop. Install a mechanical door stop to the end of the door to protect the safety switch against excessive force.
- Mount the actuator so that it will not hit the operator when the door is open, otherwise injury may be caused.
- Turn off the power to the safety switch before starting installation, removal, wiring, maintenance, and inspection on the safety switch. Failure to turn power off may cause electrical shocks or fire hazard.
- Mount the actuator so that it will not hit the operator when the door is open, otherwise injury may be caused.
- Pay attention to the management of spare actuator. Safety function of door interlock switch will be lost in case the spare actuator is inserted into the interlock switch.
- Ensure that the actuator is firmly fastened to the door (welding, rivet, special screw) in the appropriate location, so that the actuator cannot be removed easily.
- Do not cut or remodel the actuator, otherwise failure will occur.
- If multiple safety components are wired in series, the Performance Level to EN ISO13849-1 will be reduced due to the restricted error detection under certain circumstances.
- The entire concept of the control system, in which the safety component is integrated, must be validated to EN ISO 13849-2.

**WARNING**

- Turn off the power to the safety switch before starting installation, removal, wiring, maintenance, and inspection on the safety switch. Failure to turn power off may cause electrical shocks or fire hazard.
- Do not disassemble or modify the switch. Also do not attempt to disable the interlock switch function, otherwise a breakdown or an accident will result.

- Do not mount the interlock switch facing down as shown in the figure on the right. The key may fall due to vibration.
- Key**
- Be sure to take the following precautions. Otherwise, failure or damage may occur.
- When using the key, insert the key all the way.
  - Do not apply a rotative force when inserting or removing the key. Also, do not pull the key during operation. Otherwise failure or damage may occur.
  - Other than the standard key, there are 15 key variations. Be sure to use a key and cylinder with the same number.
  - Do not apply excessive force to the key. Otherwise failure or damage may occur.
  - With the key in the UNLOCK position, do not turn the key to the LOCK position with the actuator removed (door open). Otherwise failure or damage may occur.



(Type **SG-B2-K** □ -L5)

- For the Rear Unlock Button
  - The Rear Unlock Button is used for an emergency escape when the worker is confined in the safety hedge (the dangerous area).
  - The lock is released when the Rear Unlock Button is pressed, and the door can be opened.
  - To return to locked status, pull back the button. While the Rear Unlock Button is depressed, the main circuit remains open and the door is unlocked.

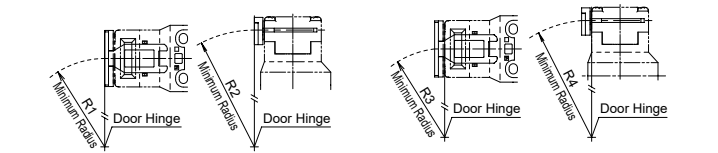
**CAUTION**

- Install the **SG-B2** to ensure that a worker can operate the Rear Unlock Button from inside the safety hedge (the dangerous area). It is dangerous to install the **SG-B2** in the position where the Rear Unlock Button can be operated from outside the safety hedge (the dangerous area), because it is possible to unlock while the machine is operating.
- Use hand to press the button, and do not use a tool. Do not apply excessive force to the Rear Unlock Button.

- SG-K21A / SG-K22A**
  - When there is a displacement of safety switch and actuator, the actuator may hit the entry slot of safety switch hardly, thus damaging the entry slot and actuator. The rubber cushions on the actuator prevent the actuator from damaging the entry slit by absorbing the shock with movement flexibility. Do not, however, exert excessive shocks, otherwise the failure of safety switch may be caused.
  - The rubber cushions may deteriorate depending on the operating environment and conditions. Immediately replace the deformed or cracked rubber cushions with new ones.

**6 ADJUSTMENTS**

- Minimum Radius of Hinged Door
  - When using the safety switch for a hinged door, the minimum radius of the applicable door is shown in the following figures.



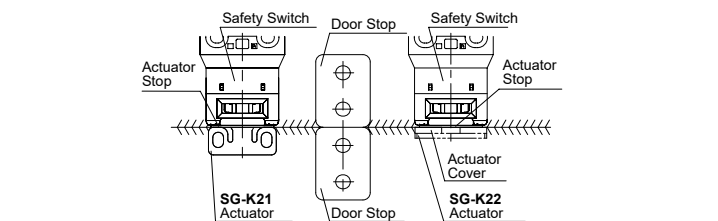
	Minimum Radius			
	R1	R2	R3	R4
<b>SG-K22</b>	230mm	260mm	170mm	190mm
<b>SG-K22A</b>	Mounting centers : 12mm			
	230mm	260mm	120mm	140mm
<b>SG-K24</b>	Mounting centers : 20mm			
	70mm (Horizontal Swing)	70mm (Vertical Swing)	50mm (Horizontal Swing)	50mm (Vertical Swing)

**CAUTION**

- The values shown above are based on the condition that the actuator enters and exits the actuator entry slot smoothly when the door is closed or opened. Since there may be deviation or dislocation of the hinged door, make sure of correct operation in the actual application before installation.

- (Type **SG-K24**)
- Adjusting the Angle Adjustable (vertical/horizontal) Actuator
    - Using the angle adjustment screw (M3 hexagon socket set screw), the actuator angle can be adjusted up to 20°(refer to dimensions).
    - The larger the actuator angle, the smaller the applicable radius of the door swing. After installing the actuator, open the door. Then adjust the actuator angle so that the actuator enters the entry slot of the safety switch properly.
    - After adjusting the actuator angle, apply loctite or the like on the adjustment screw to prevent loosening.
    - Use screw locking agent that is compatible with the base material.  
Base: PA66 (66 nylon) of glass reinforced grade  
Angle adjustment screws: stainless steel

- Actuator Mounting Reference Position**
  - As shown below, the mounting reference position of the actuator inserted into the safety switch is:



- Actuator Mounting Tolerance**
  - Mounting tolerance of the actuator is 1.0 mm in the four lateral directions.
  - When closing the door, the actuator is inserted and locked within a certain distance from the reference position. After the actuator has been locked, the contact operation is not affected by the actuator movement in the locked state.

	(Actuator deviation) + (Door movement)
<b>SG-K21</b>	≤ 3.3mm
<b>SG-K22</b>	≤ 3.3mm
<b>SG-K21A</b>	≤ 4.6mm
<b>SG-K22A</b>	≤ 4.6mm
<b>SG-K24</b>	≤ 4.6mm

**Recommended Screw Tightening Torque**

Name or Use	Recommended Screw Tightening Torque
For mounting the safety switch (M4 screw)(Note 1)	1.8N·m to 2.2N·m
For mounting the actuator	
( <b>SG-K21</b> two M4 screws)(Note 1)	1.8N·m to 2.2N·m
( <b>SG-K22</b> two M4 Phillips screws)	0.8N·m to 1.2N·m
( <b>SG-K21A/SG-K22A</b> two M4 screws)(Note 1)(Note 2)	1.0N·m to 1.5N·m
( <b>SG-K24</b> two M4 screws)(Note 1)	1.0N·m to 1.5N·m
For mounting the <b>SG-B2</b> head(m3)	0.9N·m to 1.1N·m
For mounting the manual rear unlocking button(M3 semi screw)	0.5N·m to 0.7N·m

Notes: 1) The above recommended tightening torques of the mounting screws are the values confirmed with hex socket head bolts. When other screws are used and tightened to a smaller torque, make sure that the screws do not come loose after mounting.  
 Notes: 2) In the case of **SG-K21A** or **SG-K22A**, Using two M4 screws and two attached washers, fasten the actuator securely on the door.

**7 CONTACT OPERATION AND WIRING**

•Contact configuration and operation

Contact Configuration

Type(Note)	Contact Configuration	
<b>SG-B2-L5</b>		
<b>SG-B2--D</b>		

Contact Operation(reference)

Type(Note)	Contact Operation(reference)	
<b>SG-B2-L5</b>		0 (Actuator Mounting Reference Position) Approx. 3.3 (Lock) Approx. 5.3 Approx. 26.4 (Travel:mm)
<b>SG-B2--D</b>		(Actuator Completely Inserted) (Actuator Pulled Out)

Note: ) The Actuator is inserted, and **SG-B2** is Locked.

**CAUTION**

- When using the outputs from the **SG-B2** safety switch as inputs to safety circuits, connect the door monitor circuits(11-12,21-22) ⊕ and lock monitor circuits(41-42,51-52) in series.(GS-ET-19)

**Operation Cycle**

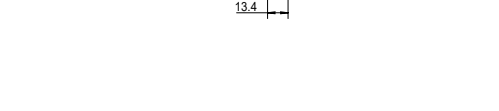
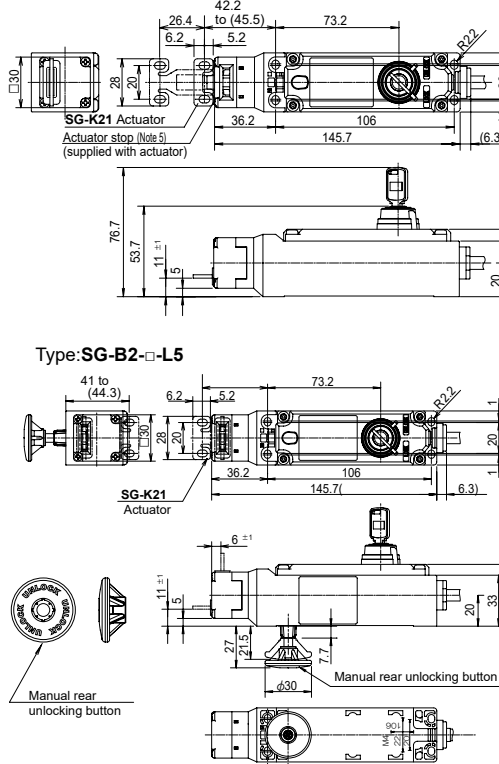
Door States	Closed	Closed	Open	Open
Main Circuit	11-42 21-52	Closed	Open	Open
Monitor Circuit	11-12 23-24 41-42 53-54	Closed	Closed	Open
Monitor Circuit	23-24	Open	Open	Closed
Monitor Circuit	41-42 51-52	Closed	Open	Open
Monitor Circuit	53-54	Open	Closed	Closed

- Wiring**
  - Cable specifications UL style 2464 (80°C 300V) 12c × No.22 AWG
  - Wire identification
    - Wires are identified by the color and white line printed on the wire.
    - Do not use wire which is Black, White, Gray, Gray / White.

- Terminal Number Identification**
  - When wiring, the terminal number on each contact is identified by wire color. The following shows the identification of terminal number
  - When wiring, cut unnecessary wires such as dummy insulator (white) and/ or unused wires to avoid incorrect wiring.

**8 DIMENSIONS (mm)**

- Dimensions



Main body mounting hole layout

Type : **SG-K21A**

Type : **SG-K22A**

Notes: 1) Mounting pitch is set to 12 mm in factory. When setting the mounting pitch to 20 mm, widen the pitch of rubber cushions to 20 mm.  
 2) The actuator has movement flexibility to the directions shown in ⊕ and ⊗.  
 Notes: 3) When the mounting pitch is 12 mm (factory setting), the actuator has movement flexibility to the directions shown in ⊕ and ⊗.  
 4) When the mounting pitch is 20 mm, the actuator has movement flexibility to the directions shown in ⊕. Side the rubber cushions together with the screws.

Type : **SG-K24**

(horizontal adjustment)(Note 6)

(vertical adjustment)(Note 6)

(vertical adjustment)(Note 6)

Notes: 5) The actuator stop and The Stopper film are used when adjusting the actuator position. Remove after the actuator position is determined.  
 6) The direction of adjustable angle can be changed (vertical or horizontal) by changing the insertion direction of the joint (white plastic part). Do not lose the joints. Actuators do not operate normally without a joint.

**9 PRECAUTION FOR DISPOSAL**

Dispose of the **SG-B2** safety switch as an industrial waste.

**10 CE MARKING DECLARATION OF CONFORMITY**

**Itemized Essentials of EU Declaration of Conformity**

**Manufacturer's Name:** Panasonic Industry Co., Ltd.  
**Manufacturer's Address:** 1006, Oaza Kadoma, Kadoma-shi, Osaka 571-8506, Japan  
**EU Representative's Name:** Panasonic Marketing Europe GmbH Panasonic Testing Centre  
**EU Representative's Address:** Winsbergring 15, 22525 Hamburg, Germany  
**Product:** Safety Door Switch with Key  
**Model Name:** **SG-B2** Series  
**Trade Name:** Panasonic  
**Application of Council Directive:** 2006/42/EC Machinery Directive 2011/65/EU RoHS Directive  
**Applicable standards:** EN 60947-5-1 GS-ET-19 EN IEC 63000

**11 UKKA MARKING DECLARATION OF CONFORMITY**

**Itemized Essentials of UK Declaration of Conformity**

**Manufacturer's Name:** Panasonic Industry Co., Ltd.  
**Manufacturer's Address:** 1006, Oaza Kadoma, Kadoma-shi, Osaka 571-8506, Japan  
**Product Name:** Safety Door Switch with Key  
**Trade Name:** Panasonic  
**Model Number:** **SG-B2** Series  
**Statutory Instruments:** 2008 No.1597 Supply of Machinery (Safety) Regulations 2008 2012 No.3032 RoHS Regulations 2012  
**Designated Standards:** EN 60947-5-1 GS-ET-19 EN IEC 63000

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