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INSTRUCTION MANUAL

Safety Door Switch with Key SG-B2 Series

MJE-SGB2 No.0078-96V

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.

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, IEC 60947-5-1, UL 508, CSA C22.2 No.14
Interlocking device Type / the 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 (2008/1567)
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 (Uimp)	2.5 kV
Rated Insulation voltage	250V (Note 1)
Thermal Current <Ith>	2.5A
Contact Ratings (Reference Values) <Ile, Ie>	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
B10L	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 SG-B2-□-L5)
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) □
Actuator Tensile Strengthwhen Locked	1,400N min. (GS-ET-19)(Note 3) (500N min. : SG-K24 actuator)
Direct Opening Travel	11mm min. (actuator: SG-K21) 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 Hz, amplitude 0.35 mm minimum Damage limits: 30 Hz, amplitude 1.5 mm minimum Use 250V / 10A fast acting type fuse
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,c-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 250V 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.

(Examples of Mounting on Sliding Doors)

(Examples of Mounting on Hinged Doors)

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.

When Shipped

Alternative Mounting Directions

⚠ 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 expect when the mounting directions of head is changed.

- Head removal detection function

(Type SG-B2-K □ -L5)

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 SG-B2-K□ head is removed
<div><div>Contact Closed</div><div>Contact Open</div></div>			
Monitor Circuit: PK Ⓞ 41 42 PKWH			
Monitor Circuit: BN Ⓞ 51 52 BNWH			

(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. 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 circumstance.
- 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.

When the center of the hinged door is on the extension line of the actuator mounting surface.

When the center of the hinged door is on the extension line of the contact surface of actuator and safety switch.

	R1	R2	R3	R4
SG-K22	230mm	260mm	170mm	190mm
SG-K22A	Mounting centers : 12mm 230mm	260mm	170mm	140mm
SG-K24	310mm	70mm (Horizontal 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:

The actuator and actuator cover touches the actuator stop placed on the safety switch lightly. (After mounting the actuator, remove the actuator stop from the safety switch.)

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)
SG-K21	≤ 3.3mm
SG-K22	≤ 4.6mm
SG-K21A	≤ 4.6mm
SG-K22A	≤ 4.6mm
SG-K24	≤ 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 (SG-K21: two M4 screws)(Note 1) (SG-K22: two M4 Phillips screws) (SG-K21A/SG-K22A: two M4 screws)(Note 1)(Note 2) (SG-K24: two M4 screws)(Note 1)	1.8N·m to 2.2N·m 0.8N·m to 1.2N·m 1.0N·m to 1.5N·m 1.0N·m to 1.5N·m
For mounting the SG-B2 head(M3)	0.9N·m to 1.1N·m
For mounting the manual rear unlocking button(M3 sems 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

Type(Note)	Contact Configuration
SG-B2-□-C	
SG-B2-□-D	

Type(Note)	Contact Operation(reference)
SG-B2-□-C	
SG-B2-□-D	

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	Closed
Main Circuit	11-42 21-52	Closed	Open	Open
Monitor Circuit	11-12 21-22	Closed	Open	Closed
Monitor Circuit	23-24	Open	Open	Closed
Monitor Circuit	41-42 51-52	Closed	Open	Open
Monitor Circuit	53-54	Open	Closed	Closed
Key Position /Rear Unlock Button	Lock Position /Returned status	Unlock Position /Returned status	Unlock Position /Returned status	Lock Position /When operating the Button
	Door is locked. The machine can be operated.	Door is unlocked. The machine can not be operated.	The machine can not be operated.	The machine can not be operated.

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-K24

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 Industrial Devices SUNX Co., Ltd.

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

EU Representative's Name: Panasonic Marketing Europe GmbH Panasonic Testing Centre

EU Representative's Address: Winsberg 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 UKCA MARKING DECLARATION OF CONFORMITY

Itemized Essentials of UK Declaration of Conformity

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

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

Authorized Representative: Panasonic Testing Centre on behalf of Panasonic UK

Panasonic UK, a branch of Panasonic Marketing Europe GmbH

Maxis 2, Western Road, Bracknell, Berkshire, RG12 1RT

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

Panasonic Industry Co., Ltd.

Panasonic Industrial Devices SUNX Co., Ltd.

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