



**Safety is assured
during maintenance!**



**Introducing a safety door
switch with solenoid
interlock that is among
the world's thinnest***

Introducing a range of new safety devices!

Panasonic Industrial Devices SUNX offers comprehensive safety solutions through an extensive selection of safety devices and a robust support system.

SAFETY SOLUTION

NEW Pushbutton type

Emergency stop switch

SG-E1

P.16~



SEMI emergency off
(EMO) switch



NEW

Enable grip switch

SG-C1

▶ P.14~

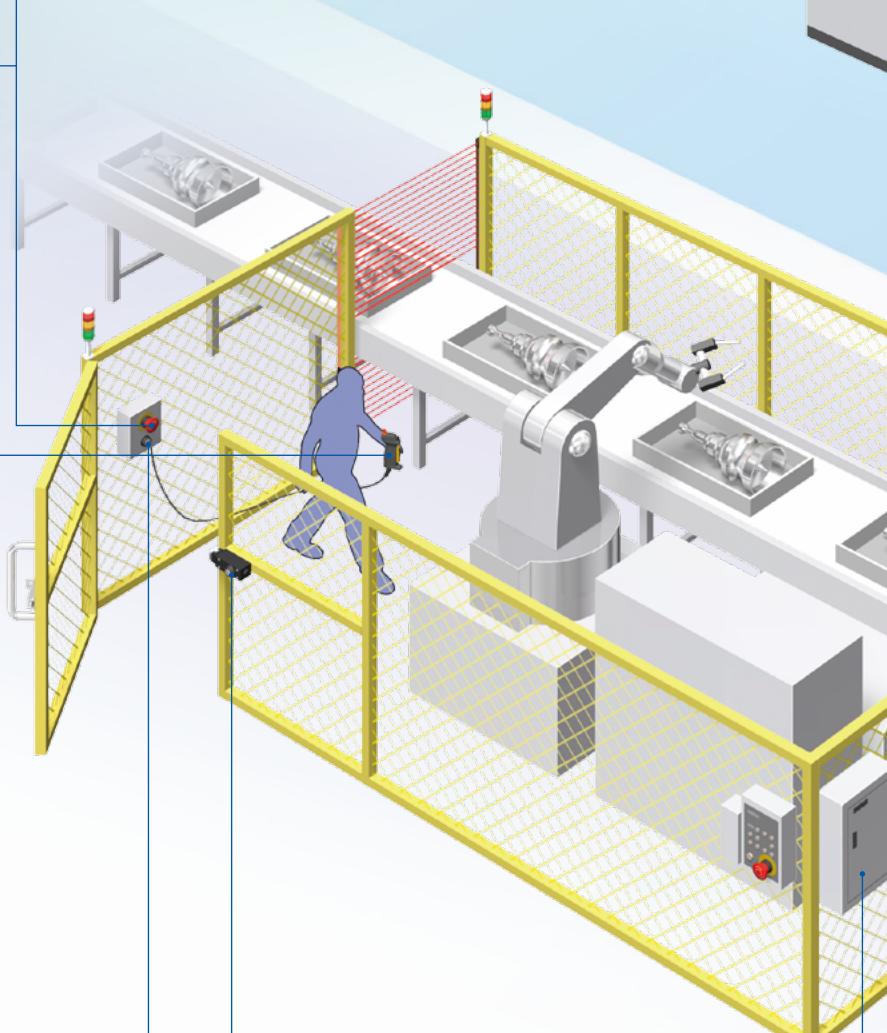


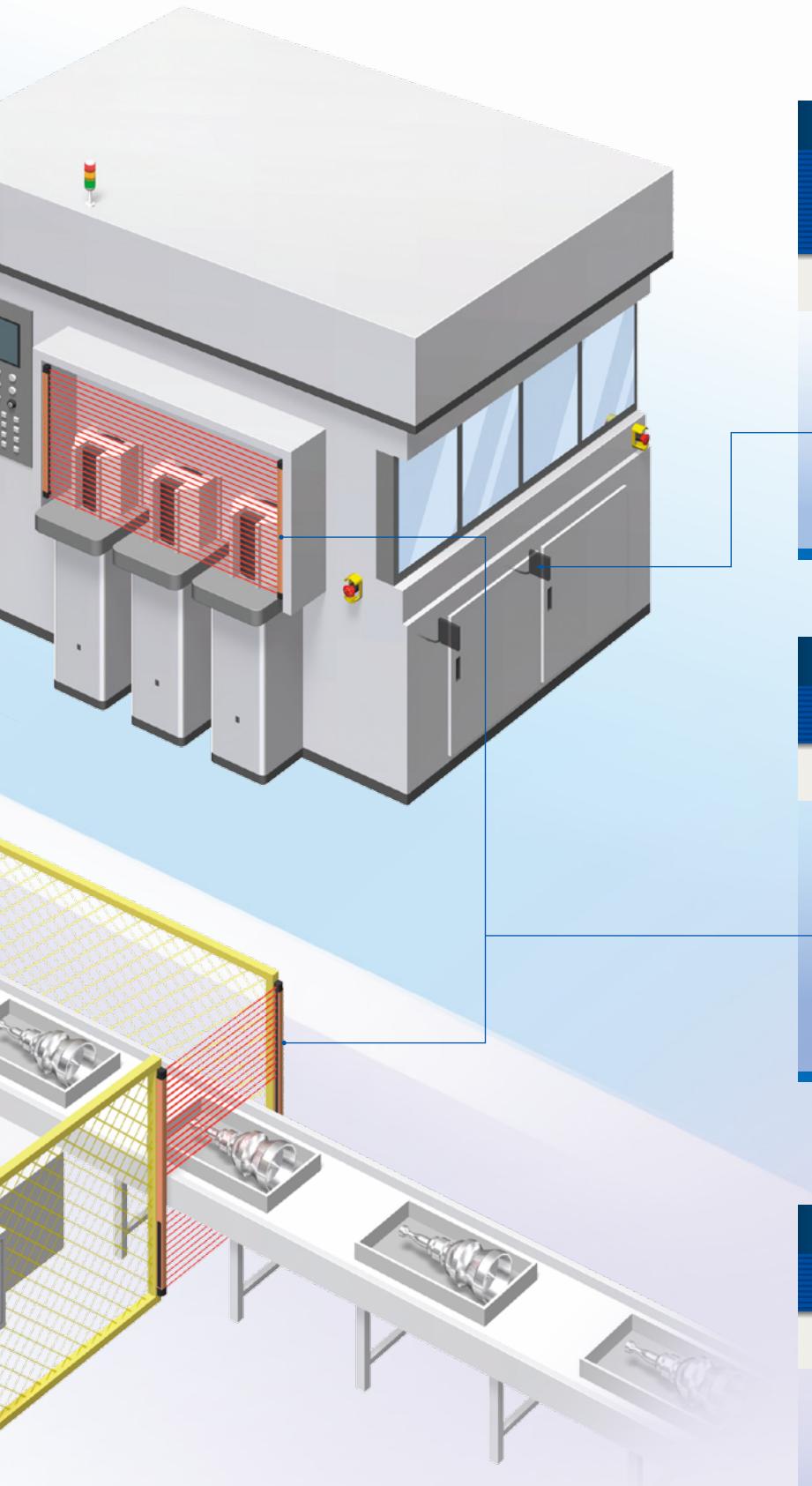
NEW

Safety door switch with key / Key selector switch

SG-B2 / SG-D1

▶ P.8~ / P.12~





NEW Ultra-slim

Safety door switch with solenoid interlock / Safety door switch

SG-B1 / SG-A1

● P.4~



Light curtain

SF4B / SF2B



Safety relay unit

SF-AC



Safety door switch with solenoid interlock

SG-B1 Ultra-slim SERIES



Safety door switch

SG-A1 Ultra-slim SERIES



Connectable safety
relay units



SF-AC Supports up to control category 3
• 2NC inputs, safety output × 3

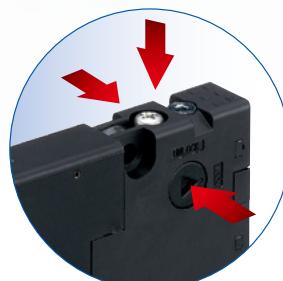
Introducing a safety door switch with solenoid interlock that is among the world's thinnest*!

With 5 built-in contacts

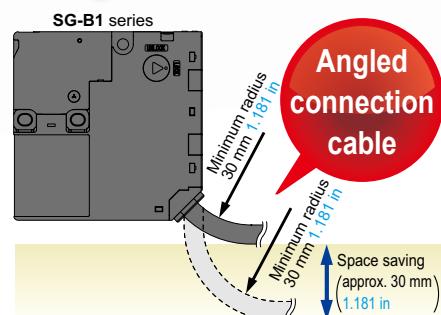
*Based on research conducted by our company as of
March 2013.



Manual lock release can be
operated from three directions.



Space saving design with
angled connection cable



All models come with cables pre-installed.

The **SG-B1** series and **SG-A1** series ship with bundled cables already connected internally. Since there is no need to provide cables separately, and because they are already connected internally, the number of wiring man-hours is cut in half.

- Standard door switch
- Cable



Integrated
design

SG-B1 series / **SG-A1** series



Ships standard
with cables.

Energy-saving design

The **SG-B1** series features an energy-saving design requiring current consumption of just 110 mA at 24 V DC (100 mA for the solenoid and 10 mA for the indicator), even though it also incorporates a solenoid interlock.

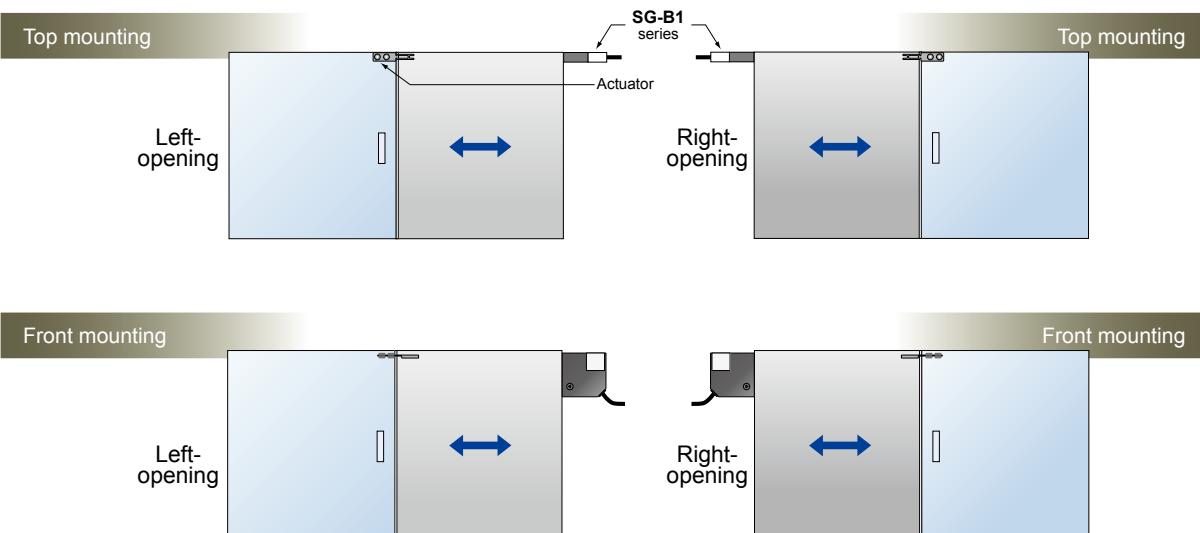


Low power consumption of 110 mA

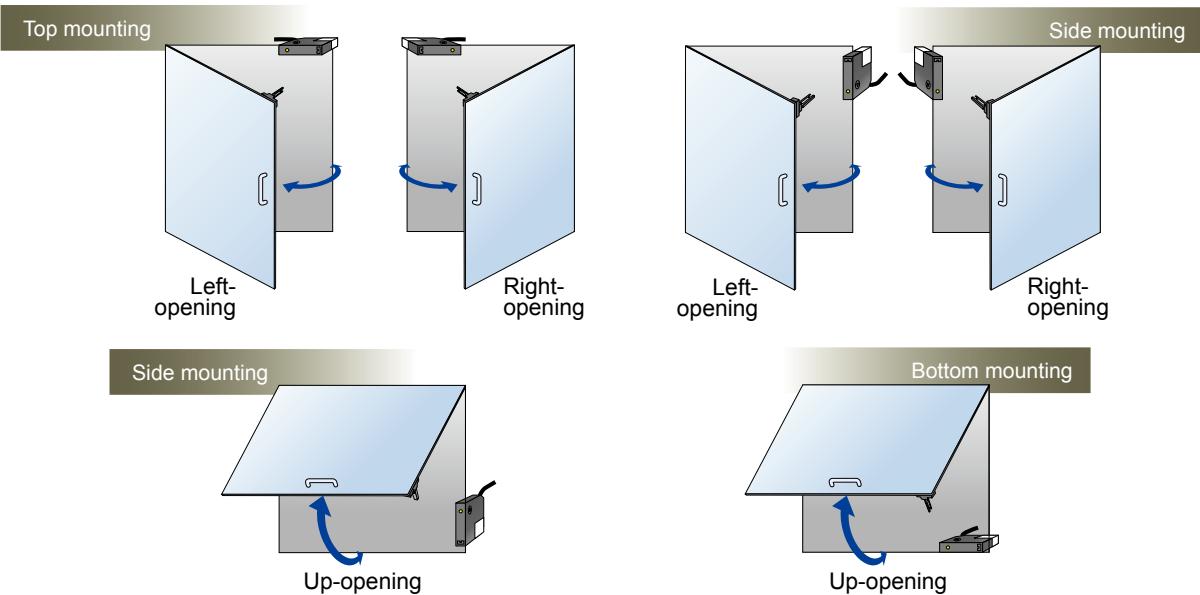
■ Order guide	P.7
■ Contact configuration / Operating patterns	P.18
■ Specifications	P.19
■ Precautions for proper use	P.20~
■ Dimensions	P.22~

Can be installed on any door.

Sliding doors



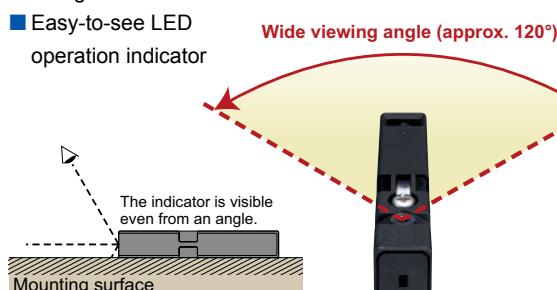
Hinged doors



SG-B1 series

- Choose between two types of locks:
 - Spring lock
 - Magnet lock

- Easy-to-see LED operation indicator



SG-A1 series

- Features three built-in contacts yet is among world's smallest designs.

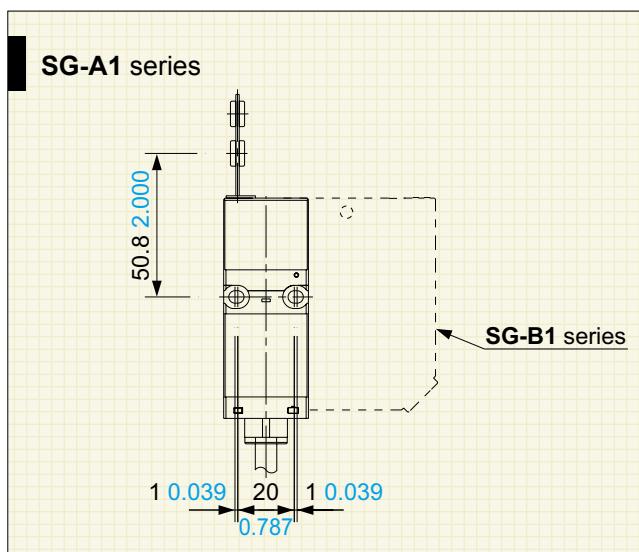
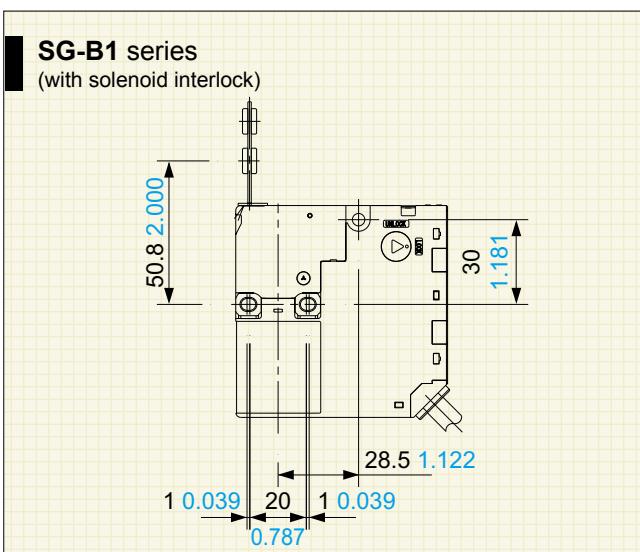
- Choose from two actuator entry slot orientations.



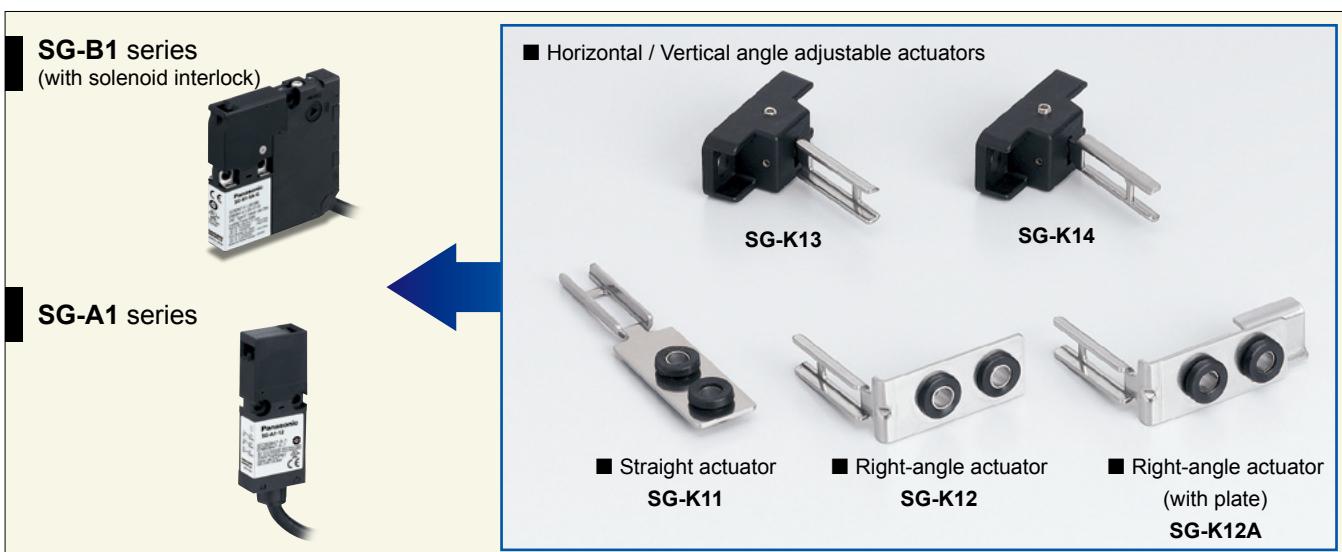
Dimensions (Unit: mm in)



Mounting hole layout (Unit: mm in)



Common actuators



Order guide

Safety door switch with solenoid interlock

Actuators are not included with door switches and must be purchased separately.

Type	Interlock force	Main contacts	Door monitor contacts	Lock monitor contacts	Cable length	Model No.		
Spring lock type	500 N or more	1NC + 1NC	2NC	1NC	1 m 3.281 ft	SG-B1-SA-G1		
					5 m 16.404 ft	SG-B1-SA-G5		
			2NC	1NO	1 m 3.281 ft	SG-B1-SB-G1		
					5 m 16.404 ft	SG-B1-SB-G5		
Magnet lock type			2NC	1NC	1 m 3.281 ft	SG-B1-MA-G1		
					5 m 16.404 ft	SG-B1-MA-G5		
			1NO	1NO	1 m 3.281 ft	SG-B1-MB-G1		
					5 m 16.404 ft	SG-B1-MB-G5		

Safety door switch

Actuators are not included with door switches and must be purchased separately.

Door monitor contacts	Cable length	Model No.
2NC	1 m 3.281 ft	SG-A1-02-1
	5 m 16.404 ft	SG-A1-02-5
2NC + 1NO	1 m 3.281 ft	SG-A1-12-1
	5 m 16.404 ft	SG-A1-12-5
3NC	1 m 3.281 ft	SG-A1-03-1
	5 m 16.404 ft	SG-A1-03-5

Actuators

Actuators are not included with door switches and must be purchased separately.

Type	Model No.
Straight actuator	SG-K11
Right-angle actuator	SG-K12 (Note 1)
Right-angle actuator (with plate)	SG-K12A
Horizontal / vertical angle adjustable actuators (Note 2)	SG-K13
	SG-K14

Notes: 1) The right-angle **SG-K12** actuator's tensile strength is 100 N. Using the device with a load in excess of this value may cause it to fall off the door. If you anticipate that the tensile load during use will exceed 100 N, use the right-angle (with plate) **SG-K12A**.
 2) Choose a model after verifying the required direction of operation based on the relationship between the door and safety switch. (Refer to p.21)

• SG-K11



• SG-K12



• SG-K12A



• SG-K13



• SG-K14



Safety door switch with key

SG-B2 SERIES



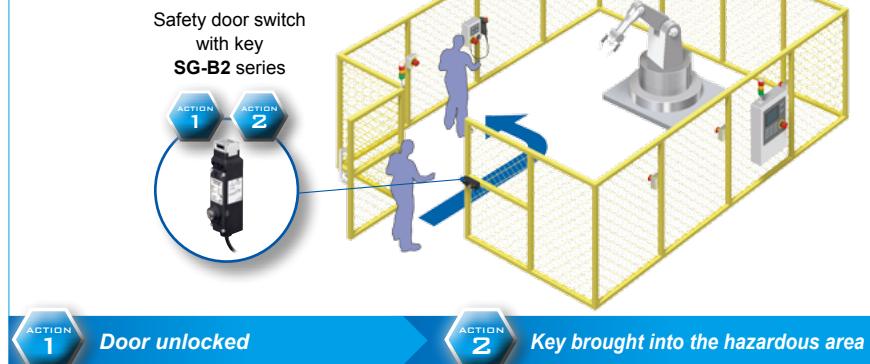
Solve issues related to machine safety and other safety measures with a safety door switch with key!



The safety door switch with key **SG-B2** series locks and unlocks doors with keys.

When an operator takes a key into a hazardous area, the safety door switch will not lock, and the equipment will stop, ensuring operator safety by preventing personnel from being closed inside the hazardous area and preventing equipment from starting to operate.

Safety worker



Hazards of the system and robot are isolated by the safety guard. The worker uses the key to unlock the door and disables the system from starting unexpectedly, then removes the key and brings it into the hazardous area. The system remains off until the worker walks out the door and locks the door with the key. This enables the worker carrying the key to work safely in the hazardous area.

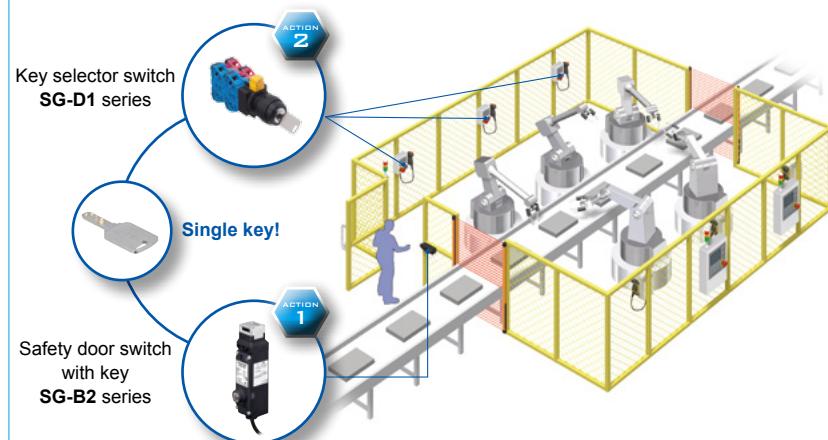
Connectable safety relay units



SF-AC Supports up to control category 3
• 2NC inputs, safety output × 3

Additionally, the key selector switch **SG-D1** series can be used to switch equipment modes and unlock door locks with a single key.

Partial mode change



ACTION 1 Door unlocked (safety output off) **ACTION 2** Equipment mode change

Hazards of the system and robot are isolated by the safety guard. When a worker needs to work inside the hazardous area for maintenance, the worker unlocks the safety guard using a key, disables the system from starting (1), removes the key and brings it into the hazardous area, and then changes the operation mode of each system to maintenance mode (2). While the worker is carrying out maintenance work in the hazardous area, the safety guard cannot be locked and the system cannot be turned on. This enables the worker to work safely in the hazardous area.

■ Order guide	P.10
■ Options	P.11
■ Contact configuration / Operating patterns	P.25
■ Specifications	P.26
■ Precautions for proper use	P.26~
■ Dimensions	P.28~

Energy-saving design, no power supply required

Since doors are locked and unlocked with a key, there is no need to supply power to the safety door switch.

Head removal detection function

Head removal detection function is employed in the **SG-B2**. With this innovative function, the monitor circuit (41-42) turns off when the head is removed from the switch, such as when removing the head to change the head direction.

With the head installed on the switch, monitor circuits 41-42 and 51-52 operate in synchronization while the key locks / unlocks the actuator. When the head is removed, 41-42 turns off and 51-52 turns on.

This disagreement is detected by the head removal detection function.



Monitor circuit	Actuator unlocked	Actuator locked	When the head removed
LOCK ↪ UNLOCK Monitor circuit (NC) Pink ⊖ 41, 42 Pink / White	OFF	ON	OFF
Monitor circuit (NC) Brown ⊖ 51, 52 Brown / White	OFF	ON	ON

Note: Head removal detection function is not direct opening.

Disagreement

High-security pin tumbler key types are used



Available with rear unlocking button

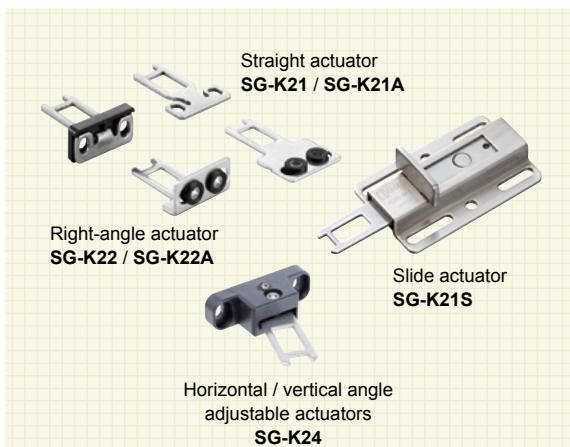


Models with a rear unlocking button allow the door to be unlocked from the inside in the event a worker is left in the hazardous area.

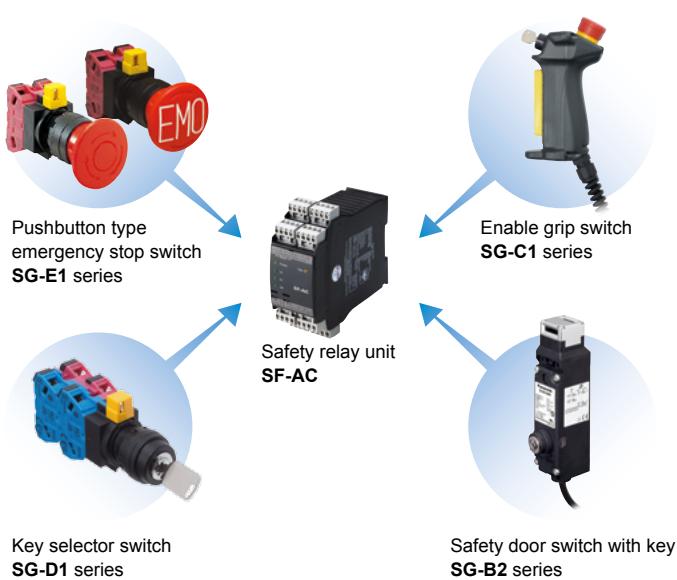
All models come with cables pre-installed.

Double-insulated design eliminates the need for grounding wires.

Choose an actuator based on the door shape and application.



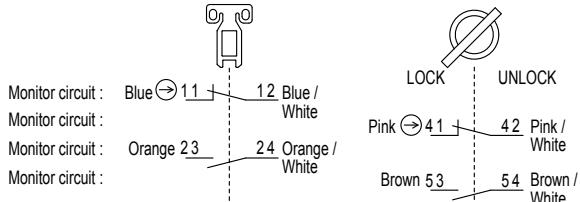
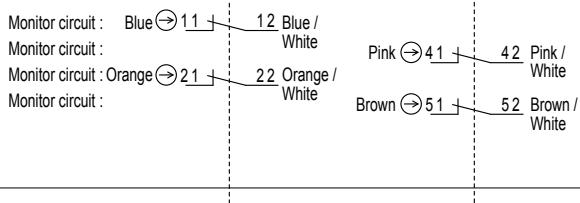
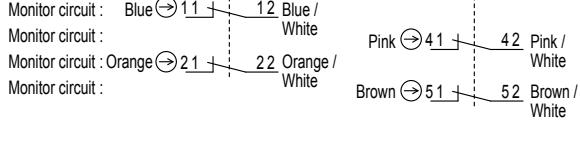
Equipment combination examples related to machine safety



Order guide

Safety door switch with key

Actuators are not included with door switches and must be purchased separately.

Rear unlocking button	Contact arrangement (Note)	Cable length	Key removal position	Model No.
Without	 <p>Monitor circuit : Blue ⊕ 11 12 Blue / White Monitor circuit : Monitor circuit : Orange 23 24 Orange / White Monitor circuit :</p>	5 m 16.404 ft	A (removable in all positions)	SG-B2-K2AC-5
			B (removable in UNLOCK position)	SG-B2-K2BC-5
			C (removable in LOCK position)	SG-B2-K2CC-5
With	 <p>Monitor circuit : Blue ⊕ 11 12 Blue / White Monitor circuit : Monitor circuit : Orange ⊕ 21 22 Orange / White Monitor circuit :</p>		A (removable in all positions)	SG-B2-K2AD-5
			B (removable in UNLOCK position)	SG-B2-K2BD-5
			C (removable in LOCK position)	SG-B2-K2CD-5
With	 <p>Monitor circuit : Blue ⊕ 11 12 Blue / White Monitor circuit : Monitor circuit : Orange ⊕ 21 22 Orange / White Monitor circuit :</p>	5 m 16.404 ft	A (removable in all positions)	SG-B2-K2AD-L5
			B (removable in UNLOCK position)	SG-B2-K2BD-L5
			C (removable in LOCK position)	SG-B2-K2CD-L5

Note: The contact configuration shows the status when the actuator is inserted and the switch is locked.

Key LOCK and UNLOCK positions are as shown on the right.

Switches incorporate two detents so that they stop in each position.



Actuators

Actuators are not included with door switches and must be purchased separately.

Type	Description	Model No.
Straight actuator		SG-K21
Straight actuator with rubber bushings		SG-K21A
Slide actuator	The actuator tensile strength when using this product is 1,400 N.	SG-K21S
Right-angle actuator		SG-K22
Right-angle actuator with rubber bushings		SG-K22A
Horizontal / vertical angle adjustable actuators	The actuator tensile strength when using this product is 500 N.	SG-K24

Note: When using a safety door switch with key on a hinged door, see page 27 for more information about the minimum door radius with which the switch can be used.

• SG-K21



• SG-K21A



• SG-K21S



• SG-K22



• SG-K22A



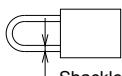
• SG-K24



Options

Type	Model No.
Padlock hasp (Note 1)	SG-PH2
Mounting plate (for mounting on an aluminum frame)	MS-SG-21
	MS-SG-22
Rear unlocking button kit for a frame (Note 2)	MS-SG-23

Notes: 1) The shackle diameter for compliant padlocks ranges from $\varnothing 5.5$ to $\varnothing 7.5$ mm
 $\varnothing 0.217$ to $\varnothing 0.295$ in.



Shackle diameter: $\varnothing 5.5$ to $\varnothing 7.5$ mm $\varnothing 0.217$ to $\varnothing 0.295$ in

2) For more information about selecting a back manual unlock button kit for a frame, see the following table:

Model No.	Mounting part* thickness (X) (mm in)
	Rear unlocking button type When installing an SG-B2-K2-D-L5 with a rear unlocking button directly
MS-SG-22	$33 < X \leq 43$ $1.299 < X \leq 1.693$
MS-SG-23	$23 < X \leq 33$ $0.906 < X \leq 1.299$

* The mounting part is a frame or a panel that the product is mounted on.

Padlock hasp

- **SG-PH2**



Mounting plate (for mounting on an aluminum frame)

- **MS-SG-21**



Rear unlocking button kit for a frame

- **MS-SG-22**
- **MS-SG-23**



Key selector switch

SG-D1

SERIES

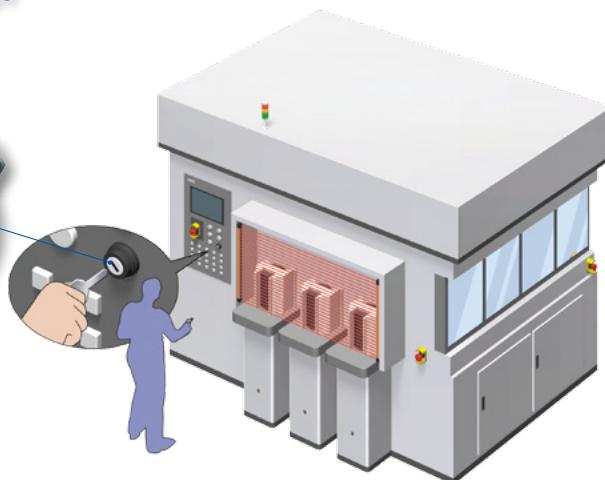


Key selector switch with direct open operation function

Pin tumbler design for high security

Mode change

Key selector switch
SG-D1 series



ACTION 1 Mode change

Workers can be limited by using a key selector switch to switch modes when performing maintenance and program overwrites. Additionally, since the NC contact (b-contact) use direct open operation, the circuit will be reliably shut off by forcibly separating the NC contact, even if they have melted together.

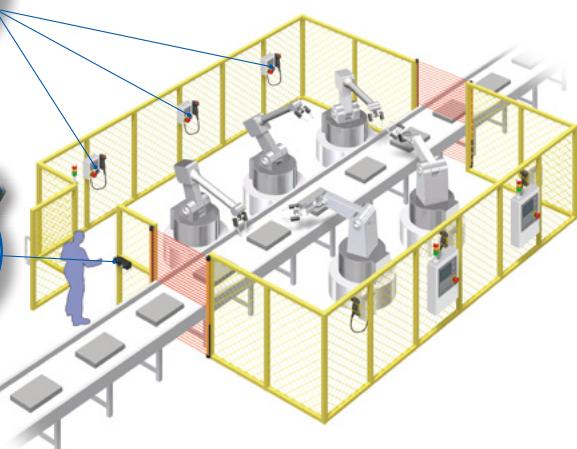
Use in combination with the safety door switch with key SG-B2 series to enable hostage control.

Partial mode change

Key selector switch
SG-D1 series



Safety door switch
with key
SG-B2 series



ACTION 1 Door unlocked (safety output off)

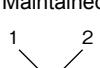
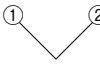
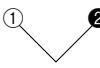
ACTION 2 Mode change

Hazards of the system and robot are isolated by the safety guard. When a worker needs to work inside the hazardous area for maintenance, the worker unlocks the safety guard using a key, disables the system from starting (1), removes the key and brings it into the hazardous area, and then changes the operation mode of each system to maintenance mode (2). While the worker is carrying out maintenance work in the hazardous area, the safety guard cannot be locked and the system cannot be turned on. This enables the worker to work safely in the hazardous area.

■ Order guide	P.13
■ Options	P.13
■ Specifications	P.35
■ Precautions for proper use	P.35
■ Dimensions	P.36

Order guide

Key selector switch

Position	Contact configuration	Contact block		Operator position		Model No.	Key removal position	
		Mounting position (Note)	Contact	1	2			
 1 2	1NO / 1NC (11)	①	NO		●	SG-D1-2A11	A: All positions 	
		②	NC	●				
	2NO / 2NC (22)	①	NO		●	SG-D1-2A22		
		②	NC	●				
		③	NO		●			
		④	NC	●				
	1NO / 1NC (11)	①	NO		●	SG-D1-2B11	B: Left position (Not removable in right position) 	
		②	NC	●				
	2NO / 2NC (22)	①	NO		●	SG-D1-2B22		
		②	NC	●				
		③	NO		●			
		④	NC	●				
	1NO / 1NC (11)	①	NO		●	SG-D1-2C11	C: Right position (Not removable in left position) 	
		②	NC	●				
	2NO / 2NC (22)	①	NO		●	SG-D1-2C22		
		②	NC	●				
		③	NO		●			
		④	NC	●				

Note: Contact blocks are attached as shown below:



Options

Type	Model No.	Description
Locking ring wrench	SG-ET1	Used to tighten the locking ring when installing the unit onto a panel. Material: Brass Weight: approx. 150 g * Tighten the locking ring to a torque of 2.0 N·m.

Locking ring wrench

- SG-ET1



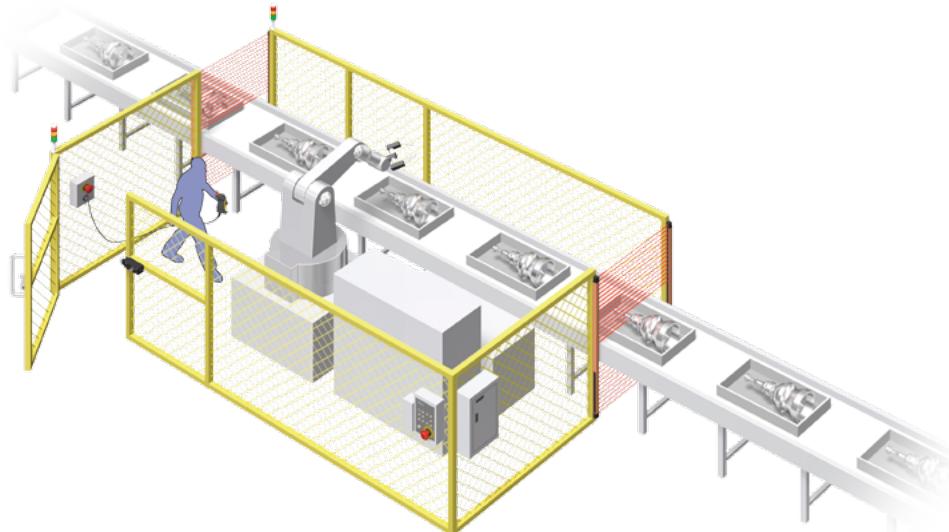
Enable grip switch

SG-C1
SERIES

CE cUL us (Push monitor switch)



Compact, light weight grip switches designed to fit comfortably in the hand



This product line includes models with control units suited to a variety of applications.

The compact, light weight grip profile was designed based on human engineering considerations.

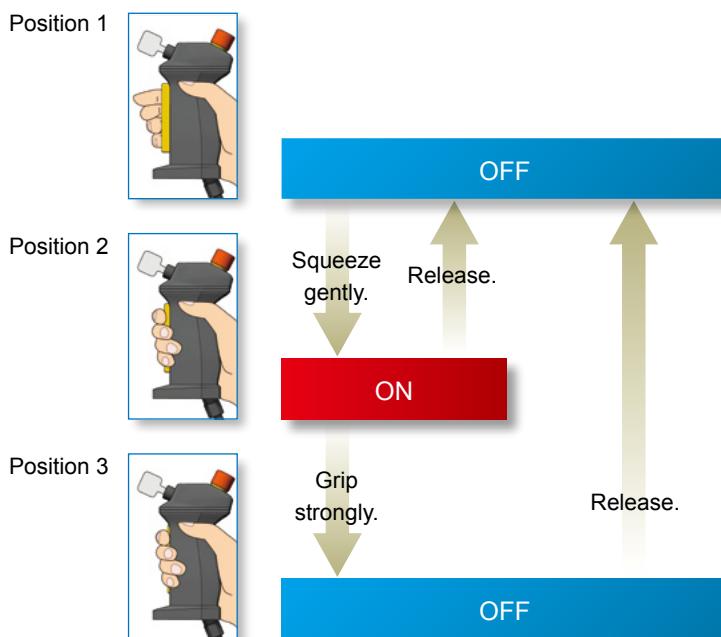
The compact profile fits the hand perfectly, ensuring comfortable operation. Thanks to its light weight design (SG-C1-21: approx. 140 g) and compact size, it is easy to hold even for individuals with small hands, and it can also be used in confined work locations.

Reduced impact during extended operation

We reduced the impact during extended operation by lowering the holding load in position 2 (ON).

Pleasant, clear button operation

Tactile clicking feedback allows easy recognition of switch operation when shifting from position 1 (contact OFF) to position 2 (contact ON).



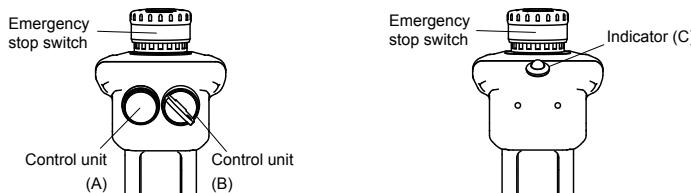
■ Order guide	P.15
■ Contact configuration / Operating patterns	P.15
■ Specifications	P.31
■ Precautions for proper use	P.31~
■ Dimensions	P.32

Order guide

Enable grip switch

Contact configuration					Rubber boot material / Color	Wiring style	Model No.		
3 position enabling switch	Push monitor switch	Additional control units							
		Emergency stop switch	Control unit (A)	Control unit (B)	Indicator (green) (C)				
2 contacts	With (1NC)	Without					SG-C1-21		
		With (2NC)	Without		Without	Silicone rubber / (Yellow) (Note)	SG-C1-21-E		
			Without	Momentary pushbutton switch (2c)	Momentary pushbutton switch (2c)		SG-C1-21-EG		
		With (2NC)		Key selector switch (2c)	Without		SG-C1-21-MM		
							SG-C1-21-EMM		
							SG-C1-21-EMK		

Additional control unit layout



Note: Silicone rubber: Can be used in general factories. Remains flexible in cold temperatures. Suitable in applications with a wide operating temperature range.

Contact configuration / Operating patterns

Grip switch (during operation of center of the rubber boot)

		Terminal No. Solder terminal	Position 1	Position 2	Position 3
Push (Position 1→2→3)	NO1-C1				
	31-32				
	NO2-C2				
Release (Position 2→1)	NO1-C1				
	31-32				
	NO2-C2				
Release (Position 3→1)	NO1-C1				
	31-32				
	NO2-C2				

Legend: : Contact ON (closed) : Contact OFF (opened)

3 position enabling switch: 2 contacts; pin No.: NO1-C1, NO2-C2
Push monitor switch: 0, 1 contacts: pin No.: 31-32 (**SG-C1-21**)

Note: Push monitor switch (terminal No.31-32) will be positive opening circuit (⊖) when the switch operates from position 2 to 3. Use contacts of terminal No. NO1-C1 and NO2-C2 for the output of enabling system.

The above operating characteristics illustrate the performance when the center of the rubber boot is pressed. Pressing the edge activates one of the two 3 position enabling switches inside earlier than the other, and may cause a delay in the operation.

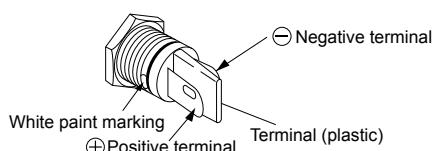
Key selector switch

Operator position & contact operation (top view)					
Position	Key removal position	↖ (Left)		↗ (Right)	
Maintained 1 2	Removable in all positions	Left contact NO1 C1	Right contact NO2 C2	Left contact NO1 C1	Right contact NO2 C2

Indicator

Pay attention to the polarity of the power supply as **SG-C1-21-EG** do not contain a diode for protection against reverse polarity.

On solder terminal units, the terminal with a white paint marking is positive.



Emergency stop switch

SG-E1

Pushbutton type

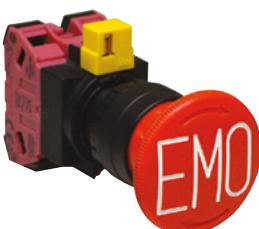
UL LISTED CSA CE



SEMI emergency off (EMO) switch

Pushbutton type

UL LISTED CSA CE



Push to lock, turn to reset

Switches feature simple operation: Push the pushbutton to lock the switch, and turn the switch in the direction shown by the arrow to reset it.



Push to lock



Turn to reset

The product line includes a SEMI emergency off (EMO) switch.



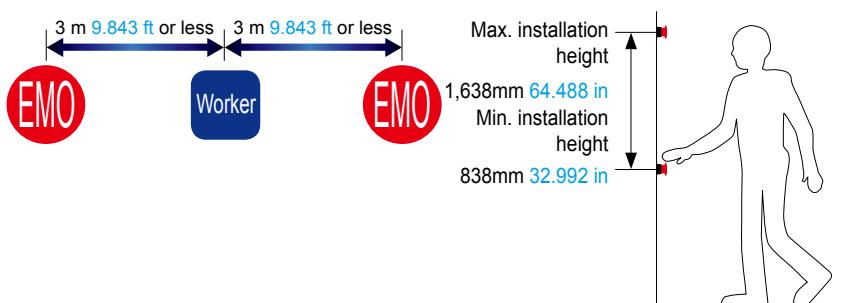
SEMI semiconductor industry safety standards

SEMI standards comprise a series of guidelines put together by an industry group consisting of manufacturers of semiconductor manufacturing equipment, flat-panel displays, and associated materials. In the semiconductor industry, these guidelines have achieved the status of de facto international standards.

Section 12.1 of the SEMI standards (S2-0706) states, "Equipment should incorporate an emergency off (EMO) circuit. When the EMO actuator (button) is triggered, the equipment should transition to a safe state in which no new hazard is posed to workers or equipment." This provision likely stems from the need to address the possibility of secondary hazards that could occur when processing power and other inputs are stopped, reflecting the industry's extensive use of materials such as solvents and chemicals, many of which contain hazardous or toxic substances. Consequently, SEMI standards require that normal emergency stop switches, which shut off the supply of energy, including power, be augmented with separate emergency off switches that shut off only the portion of the load that created the hazardous state while maintaining operation of other safety-related equipment (smoke detectors, gas / water leak detectors, pressure measurement equipment, etc.).

When there is the possibility that the emergency off switch could be operated mistakenly, a guard must be installed and the switch must use direct opening operation. The button must be red with a yellow background, and the switch itself must include the letters "EMO".

- When installing a SEMI emergency off (EMO) switch on semiconductor manufacturing equipment, it should be installed at a height of 838 to 1,638 mm [32.992 to 64.488 in.](#) (SEMI S8-0705)
- According to SEMI standards, the EMO emergency stop switch must be installed within 3 m [9.843 ft](#) of the work location. (SEMI S2-0706 12.5.2)



■ Order guide	P.17
■ Options	P.17
■ Specifications	P.33
■ Precautions for proper use	P.33
■ Dimensions	P.34

Order guide

Emergency stop switch

Type	Contact configuration	Button color	Model No.
Pushlock Turn reset	2NC	Red	SG-E1-02
	1NO / 2NC		SG-E1-12

SEMI emergency off (EMO) switch

Type	Main contacts (NC contacts)	Monitor contacts (NO contacts)	Button color / text color	Model No.
Pushlock Turn reset	2NC	—	Red / White	SG-E1-02-E
	2NC	1NO		SG-E1-12-E

Options

Type	Model No.	Description		
Emergency stop nameplate	SG-EP1	Legend (Blank) EMERGENCY STOP 非常停止 (Japanese)	Background: Yellow	Material: Polyamide
	SG-EP2		Legend: Black	
	SG-EP3		Applicable panel thickness: 0.8 to 4.5 mm 0.031 to 0.177 in	
Locking ring wrench	SG-ET1	Used to tighten the locking ring when installing the unit onto a panel. Material: Brass, Weight: approx. 150 g * Tighten the locking ring to a torque of 2.0 N·m.		
SEMI guard ring	MS-SG-GR1	For SEMI emergency off (EMO) switches. Specifically designed for use with semiconductor manufacturing equipment.		

●Caution

SEMI guard rings are designed specifically for use with semiconductor manufacturing equipment and should not be used as emergency stop switches for machine tools, food processing machinery, or other equipment.

(The European Machinery Directive, IEC 60204-1, JIS B9960-1, and other standards require that emergency stop switches be easy to approach and operate, and use of SEMI standard-compliant switch guards is not currently approved.)

Emergency stop nameplate



Locking ring wrench

• **SG-ET1**



SEMI guard ring

• **MS-SG-GR1**



SG-B1 Ultra-slim SERIES



Safety door switch with solenoid interlock

SG-A1 Ultra-slim SERIES



Safety door switch

Contact configuration / Operating patterns

Safety door switch with solenoid interlock

: Closed : Open

Model No. and contact configuration	Safety switch status	Status 1	Status 2	Status 3	Status 4	Unlocking using manual unlocking key
		•Door closed •Machine ready to operate •Solenoid de-energized	•Door closed •Machine cannot be operated •Solenoid energized	•Door open •Machine cannot be operated •Solenoid energized	•Door open •Machine cannot be operated •Solenoid de-energized	•Door closed •Machine cannot be operated •Solenoid de-energized
	Door status					
	Door	•Closed (locked)	•Closed (unlocked)	•Open	•Open	•Closed (unlocked)
SG-B1-SA-□ SG-B1-MA-□	Spring lock type	Main circuit 11-42				
	Magnet lock type	Door monitor circuit (door closed) 21-22				
		Door monitor circuit (door closed) 31-32				
		Lock monitor circuit (locked) 51-52				
	Spring lock type	Main circuit 11-42				
	Magnet lock type	Door monitor circuit (door closed) 21-22				
		Door monitor circuit (door closed) 31-32				
		Lock monitor circuit (unlocked) 53-54				
	Spring lock type Solenoid power A1-A2 (same for all models)	•OFF (de-energized)	•ON (energized)	•ON (energized)	•OFF (de-energized)	•OFF (de-energized)
	Magnet lock type Solenoid power A1-A2 (same for all models)	•ON (energized)	•OFF (de-energized)	•OFF (de-energized)	•ON (energized) (Note 2)	•OFF (de-energized) to ON (re-energized) (Note 2)

Main circuit: Connected to the machine drive control circuit, sending the interlock signals of the protective door.

Monitor circuit: Sends the monitoring signals of open / closed and lock / unlocked statuses of the protective door.

Notes: 1) Do not attempt manual unlocking while the solenoid is energized.

2) Do not energize the solenoid for a long period of time while the door is open or while the door is unlocked manually.

Operation characteristics : Contact ON (closed) : Contact OFF (opened)

(reference)		0 (Actuator mounting reference position)
SG-B1-SA-□		Approx. 1.1 0.043 (Lock)
SG-B1-MA-□		Approx. 4.7 0.185 Approx. 5.0 0.197 (Travel: mm in)
Main circuit (11-42)		
Door monitor circuit (21-22)		
Door monitor circuit (31-32)		
Lock monitor circuit (51-52)		
	(Actuator completely inserted)	(Actuator pulled out)

SG-B1-SB-□ SG-B1-MB-□ 0 (Actuator mounting reference position)

(reference)		0 (Actuator mounting reference position)
SG-B1-SB-□		Approx. 1.1 0.043 (Lock)
SG-B1-MB-□		Approx. 4.7 0.185 Approx. 5.0 0.197 (Travel: mm in)
Main circuit (11-42)		
Door monitor circuit (21-22)		
Door monitor circuit (31-32)		
Lock monitor circuit (53-54)		
	(Actuator completely inserted)	(Actuator pulled out)

• The operation characteristics show the contact status when the actuator enters an entry slot of an safety switch.

• The operation characteristics shown in the chart above are of the SG-K11 / SG-K12 / SG-K13 and SG-K14 actuators. For the SG-K12A actuator, subtract 0.6 mm **0.024** in.

Safety door switch

Model No.	Contact configuration	Operation characteristics	
SG-A1-02-□	2NC	0.8 0.031 (Actuator mounting reference position) 11-12 31-32	0 Approx. 0.217 Approx. 0.228 Approx. 28.2 1.110 (Travel: mm in) 5.5 5.8
SG-A1-12-□	2NC + 1NO	11-12 21-22 33-34	
SG-A1-03-□	3NC	11-12 21-22 31-32	

: Contact ON (closed)

: Contact OFF (opened)



SG-B1 SERIES / SG-A1 SERIES

Specifications

Designation Item	Safety door switch with solenoid interlock				
Series	SG-B1 series				
Applicable standards	EN 1088, IEC 60947-5-1, EN 60947-5-1, GS-ET-19, UL 508, CSA C22.2 No.14				
Standards for use	IEC 60204-1, EN 60204-1				
Applicable directives	Machinery directive (2006/42/EC) Low voltage directive (2006/95/EC)				
Operating condition	Ambient temperature: -25 to +50 °C -13 to +122 °F (No dew condensation or icing allowed) Storage: -40 to +80 °C -40 to +176 °F				
Ambient temperature	-25 to +50 °C -13 to +122 °F (No dew condensation or icing allowed)				
Ambient humidity	45 to 85 % RH				
Pollution degree	3 (Inside 2)				
Altitude	2,000 m 6,561.68 ft max.				
Rated insulation voltage (Ui)	300 V (Door monitor circuit) 150 V (Main, Lock monitor circuit) 30 V (Between ground and LED, solenoid circuit)				
Impulse withstand voltage (Uiimp)	2.5 kV (Door monitor circuit) 1.5 kV (Main, Lock monitor circuit) 0.5 kV (Between ground and LED, solenoid circuit)				
Thermal current (Ith)	Ambient temperature: -25 to +35 °C -13 to +95 °F 2.5 A (up to 2 circuits) 1.0 A (3 or more circuits)				
	Ambient temperature: 35 to +50 °C 95 to +122 °F 1.0 A (1 circuit) 0.5 A (2 or more circuits)				
Rated operational voltage (Ue) / Rated operational current (Ie)	Ie Ue 30 V 125 V 250 V				
	Main circuit, lock monitor circuit				
	AC	Resistive load (AC-12)	-	2 A	-
		Inductive load (AC-15)	-	1 A	-
	DC	Resistive load (DC-12)	2 A	0.4 A	-
		Inductive load (DC-13)	1 A	0.22 A	-
	Door monitor circuit				
	AC	Resistive load (AC-12)	-	2.5 A	1.5 A
		Inductive load (AC-15)	-	1.5 A	0.75 A
	DC	Resistive load (DC-12)	2.5 A	1.1 A	0.55 A
		Inductive load (DC-13)	2.3 A	0.55 A	0.27 A
Electric shock protection class	Class II (IEC 61140) (Note 1), □ (double insulated)				
Operating frequency	900 operations/hour				
Actuator operating speed	0.05 to 1.0 m/sec.				
B _{10d}	2,000,000 (ISO 13849-1 Annex C Table C.1)				
Mechanical durability	1,000,000 operations min. (GS-ET-19) 100,000 operations min. (900 operations/hour, (AC-12 125 V 2A, DC-12 125 V 0.4 A)				
Electrical durability	1,000,000 operations min. (900 operations/hour, (24 V AC/DC 0.1 A resistive load)				
Interlock force	500 N min. (GS-ET-19) (Note 2)				
Direct opening travel	8 mm 0.315 in min.				
Direct opening force	60 N min.				
Contact resistance	300 mΩ max. (initial value, 1 m 3.281 ft cable) 700 mΩ max. (initial value, 5 m 16.404 ft cable)				
Protection	IP 67 (IEC 60529)				
Shock resistance	Malfunction: 100 m/s ² , Destruction: 1,000 m/s ²				
Vibration resistance	Malfunction: 10 to 55 Hz, half amplitude 0.35 mm 0.014 in Destruction: 30 Hz, half amplitude 1.5 mm 0.059 in				
Short-circuit protective device	Use 250 V / 10 A fast acting type fuse				
Material	Enclosure: PA66				
Cable	UL style 2464, No.22 AWG 12-core				
	Rated operating voltage DC 24 V 100% duty cycle				
	Rated current 110 mA (solenoid 100 mA, LED 10 mA : initial value)				
	Turn on voltage Rated voltage × 85 % max. (at 20 °C 68 °F)				
	Turn off voltage Rated voltage × 10 % min. (at 20 °C 68 °F)				
Indicator	Green LED				
Weight	SG-B1-□-G1: Approx. 220 g, SG-B1-□-G5: Approx. 600 g				

Notes: 1) Basic insulation of 2.5 kV, 1.5 kV 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 230 V 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.

2) The actuator locking strength is rated at 500 N of static load. Do not apply a load higher than the rated value.
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 (such as the **SG-A1** safety switch) or a sensor to detect door opening and stop the machine.

Designation Item	Safety door switch				
Series	SG-A1 series				
Applicable standards	EN 1088, IEC 60947-5-1, EN 60947-5-1, GS-ET-15, UL 508, CSA C22.2 No.14				
Standards for use	IEC 60204-1, EN 60204-1				
Applicable directives	Machinery directive (2006/42/EC) Low voltage directive (2006/95/EC)				
Operating condition	Ambient temperature: -25 to +70 °C -13 to +158 °F (No dew condensation or icing allowed) Storage: -40 to +80 °C -40 to +176 °F				
Ambient temperature	-25 to +70 °C -13 to +158 °F (No dew condensation or icing allowed)				
Ambient humidity	45 to 85 % RH				
Pollution degree	3 (Inside 2)				
Altitude	2,000 m 6,561.68 ft max.				
Impulse withstand voltage (Uiimp)	4 kV				
Rated insulation voltage (Ui)	300 V				
Thermal current (Ith)	2.5 A				
	Ie	Ue	30 V	125 V	250 V
	AC	Resistive load (AC-12)	-	2.5 A	1.5 A
		Inductive load (AC-15)	-	1.5 A	0.75 A
	DC	Resistive load (DC-12)	2.5 A	1.1 A	0.55 A
		Inductive load (DC-13)	2.3 A	0.55 A	0.27 A
Rated operational voltage (Ue) / Rated operational current (Ie)	Class II (IEC 61140), □ (double insulated)				
Protection	IP 67 (IEC 60529)				
Shock resistance	Malfunction: 300 m/s ² Destruction: 1,000 m/s ²				
Vibration resistance	Malfunction: 5 to 55 Hz, half amplitude 0.5 mm 0.020 in Destruction: 30 Hz, half amplitude 1.5 mm 0.059 in				
Operating frequency	1,200 operations/hour				
Actuator operating speed	0.05 to 1.0 m/sec.				
B _{10d}	2,000,000 (ISO 13849-1 Annex C Table C.1)				
Mechanical durability	1,000,000 operations min. (GS-ET-15)				
Electrical durability	100,000 operations min. (AC-12 250 V 1.5 A) 1,000,000 operations min. (AC/DC 24 V 100 mA) (1,200 operations/hour)				
Direct opening travel	8 mm 0.315 in min.				
Direct opening force	60 N min.				
Contact resistance	300 mΩ max. (initial value, 1 m 3.281 ft cable) 700 mΩ max. (initial value, 5 m 16.404 ft cable)				
Short-circuit protective device	Use 250 V / 10 A fast acting type fuse				
Conditional short-circuit current	50 A (250 V)				
Material	Enclosure: PA66				
Cable	UL style 2464, No.20 AWG 6-core				
Weight	SG-A1-□-1: Approx. 120 g, SG-A1-□-5: Approx. 420 g				

Safety door switch
SG-B1
SG-A1

Safety door switch with key
SG-B2

Enable grip switch
SG-C1

Emergency stop switch
SG-E1

Key selector switch
SG-D1



SG-B1 SERIES / SG-A1 SERIES

Precautions for proper use

- This catalog is a guide to select a suitable product. Be sure to read the instruction manual attached to the product prior to its use.

- In order to avoid electric shock or fire, turn the power off before installation, removal, wire connection, maintenance, or inspection of the safety switch.
- If relays are used in the circuit between the safety switch and the load, consider the danger and use safety relays, since welding or sticking contacts of standard relays may invalidate the functions of the safety switch.
- Do not place a PLC in the circuit between the safety switch and the load. Safety and security can be endangered in the event of a malfunction of the PLC.
- Do not disassemble or modify the safety switch, otherwise a breakdown or an accident may occur.
- Do not install the actuator in a location where the human body may come in contact. Otherwise injury may occur.
- Magnet lock type is locked when energized, and unlocked when de-energized. When energization is interrupted due to wire disconnection or other failures, the safety switch may be unlocked causing possible danger to the operators. Magnet lock type must not be used in applications where locking is strictly required for safety. Perform a risk assessment and determine whether solenoid lock type is appropriate.



Both series

- Regardless of door types, do not use the safety switch as a door stop. Install a mechanical door stop at the end of the door to protect the safety switch against excessive force.
- Do not apply external force on the actuator while unlocking, otherwise the actuator may not be unlocked.
- Do not apply excessive shock to the safety switch when opening or closing the door. A shock to the safety switch exceeding 1,000 m/s² may cause damage to the safety switch.
- If the operating atmosphere is contaminated, use a protective cover to prevent the entry of foreign objects into the safety switch through the actuator entry slots. Entry of a considerable amount of foreign objects into the safety switch may affect the mechanism of the safety switch and cause a malfunction.
- Do not store the safety switches in a dusty, humid, or organic-gas atmosphere, or in an area subjected to direct sunlight.
- Use proprietary actuators only. When other actuators are used, the safety switch may be damaged.

SG-B1 series

- The locking strength is rated at 500 N. Do not apply a load higher than the rated value. When a higher load is expected, provide an additional system consisting of another safety switch without lock (such as the SG-A1 safety switch) or a sensor to detect door opening and stop the machine.
- Regardless of door types, do not use the safety switch as a door lock. Install a separate lock using a latch or other measures.
- While the solenoid is energized, the switch temperature rises approximately 35 °C 95 °F above the ambient temperature (to approximately 85 °C 185 °F while the ambient temperature is 50 °C 122 °F). Do not touch to prevent burns. If cables come into contact with the switch, use heat-resistant cables.
- Bouncing will occur on the lock monitor contact during locking and unlocking (reference value: 20 ms).

Safety door switch
Safety door switch with solenoid interlockSG-B1
SG-A1

Safety door switch with key

SG-B2

Enable grip switch

SG-C1

Emergency stop switch

SG-E1

Key selector switch

SG-D1

- Although the SG-K11 / SG-K12 / SG-K12A actuators alleviate shock when the actuator enters a slot in the safety switch, make sure that excessive shock is not applied. If the rubber bushings become deformed or cracked, replace with new ones.

SG-A1 series

- Cover the unused actuator entry slot using the slot plug supplied with the safety switch.

Minimum radius of hinged door

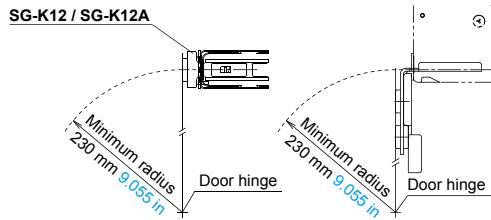
- When using the safety switch on hinged doors, refer to the minimum radius of doors shown below. When using on doors with small minimum radius, use the angle adjustable actuator (SG-K13 / SG-K14).

Note: The values indicated in the figures below assume that there is no mechanical interference between the actuator and the safety switch when the door is opened or closed. Because deviation or dislocation of hinged doors may occur in actual applications, make sure of the correct operation before installation.

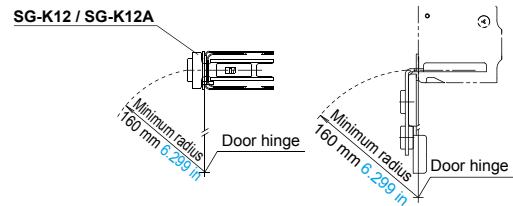
When using the right-angle actuator (SG-K12 / SG-K12A)

SG-B1 series

<When the door hinge is on the extension line of the actuator mounting surface>

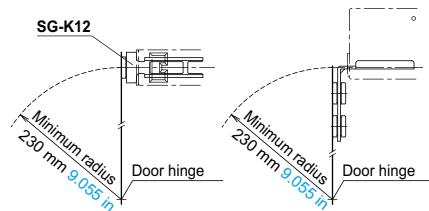


<When the door hinge is on the extension line of the safety switch surface>

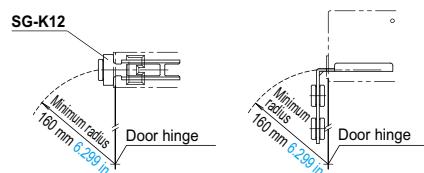


SG-A1 series

<When the door hinge is on the extension line of the actuator mounting surface>



<When the door hinge is on the extension line of the safety switch surface>





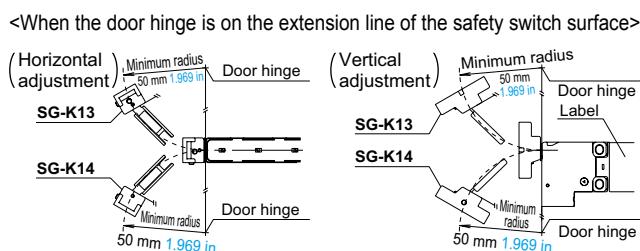
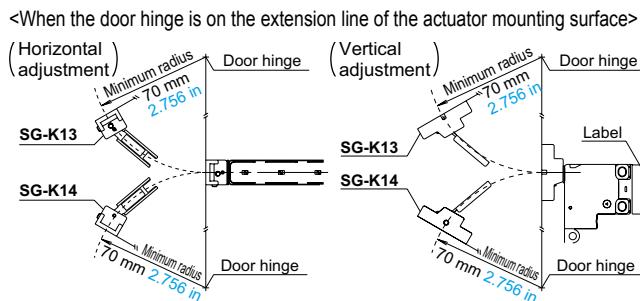
SG-B1 SERIES / SG-A1 SERIES

Precautions for proper use

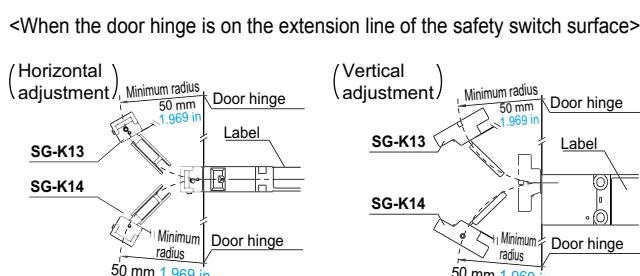
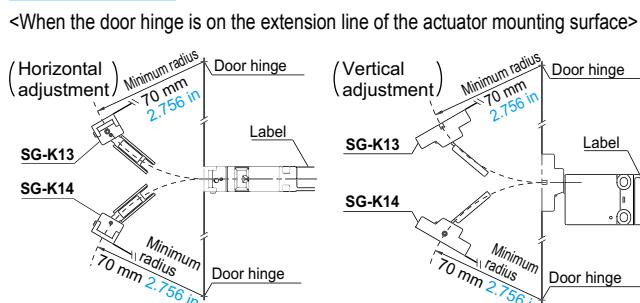
When using the (SG-K13 / SG-K14) angle adjustable (vertical / horizontal) actuator

- When the door hinge is on the extension line of the actuator mounting surface: 70 mm 2.756 in
- When the door hinge is on the extension line of the safety switch surface: 50 mm 1.969 in

SG-B1 series



SG-A1 series

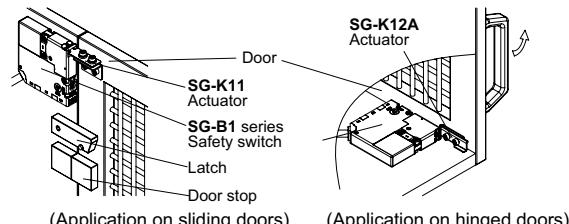


Actuator angle adjustment (vertical / horizontal)

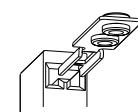
- Using the angle adjustment screw (M3 hexagon-socket-head screw), the actuator angle can be adjusted. (refer to the dimensions on page 24)
Adjustable angle: 0 to 20°
- The larger the adjusted angle of the actuator, the smaller the applicable radius of the door opening. After installing the actuator, open the door. Then adjust the actuator so that its edge can be inserted properly into the actuator entry slot of the safety switch.
- After adjusting the actuator angle, apply Loctite to the adjustment screw so that the screw will not move.

Mounting

- Mount the safety switch on a fixed piece of machinery or guard and the actuator on a hinged door. Avoid mounting both the safety switch and actuator on a hinged door. Doing so may cause equipment failure. For more information about how to mount the devices, see the following diagram:



Note: When mounting the actuator, make sure that the actuator enters the slot in the correct direction, as shown on the right figure.



Recommended tightening torque for mounting screws

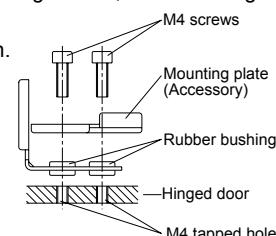
Safety switch: 1.0 to 1.5 N·m (Three M4 screws)*

Actuator: 1.0 to 1.5 N·m (Two M4 screws)*

*The above recommended tightening torques of the mounting screws are the values confirmed with hexagon-socket-head bolts. When other screws are used and tightened to a smaller torque, make sure that the screws do not become loose after mounting.

- Mounting bolts must be provided by the users.
- To avoid unauthorized or unintended removal of the safety switch and the actuator, it is recommended that the safety switch and actuator are installed in a secure manner, for example using special screws or welding the screws.
- When installing the SG-K12A actuator, use the mounting plate (supplied with the actuator) on the hinged door, and mount tightly using two M4 screws.

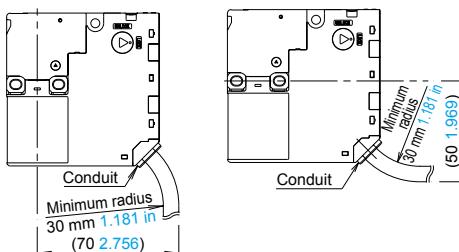
The mounting plate has orientation. Do not lose the mounting plate. Adequate performance cannot be obtained without the plate as the actuator may fall off the door.



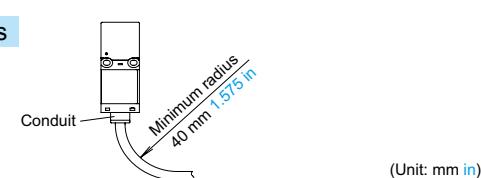
Cables

- Do not fasten or loosen the gland at the bottom of the safety switch.
- When bending the cable during wiring, make sure that the cable radius is kept at 30 mm 1.181 in minimum.
- When wiring, make sure that water or oil does not enter the cable.
- The solenoid has polarity. Make sure of the correct polarity when wiring.

SG-B1 series



SG-A1 series



(Unit: mm in)

Safety door switch with solenoid interlock
SG-B1 SG-A1

Safety door switch with key
SG-B2

Enable grip switch
SG-C1

Emergency stop switch
SG-E1

Key selector switch
SG-D1

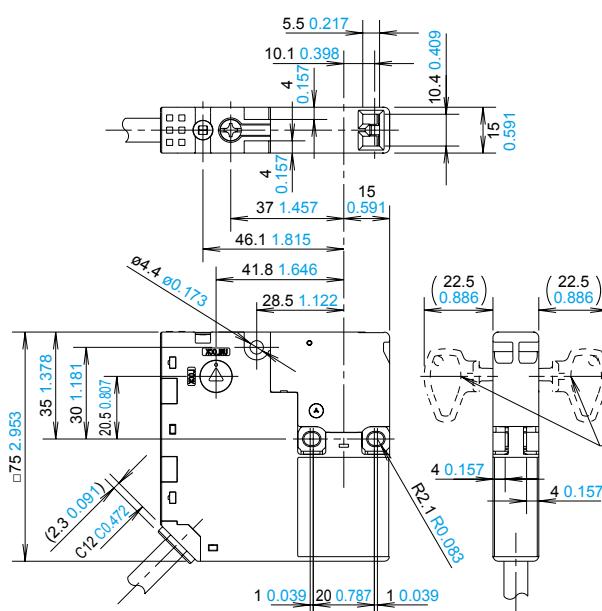
SG-D1



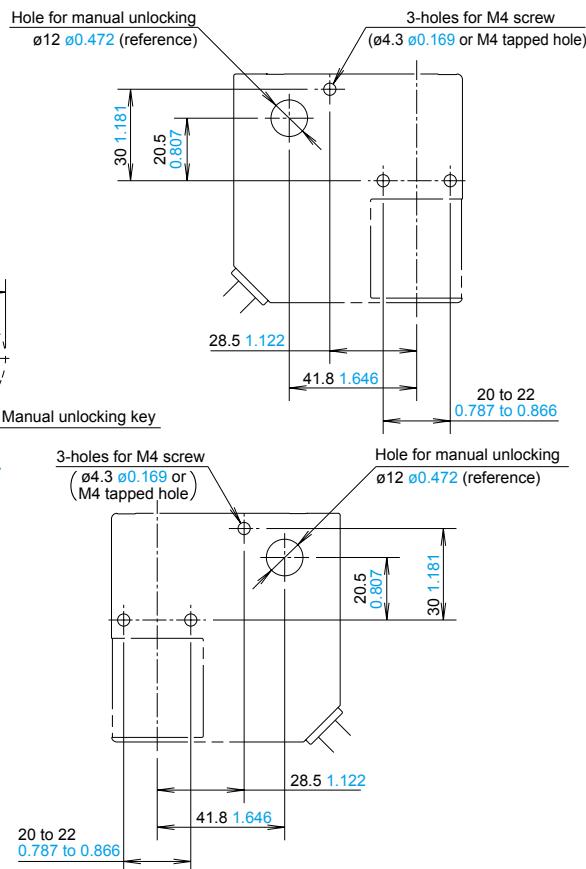
SG-B1 SERIES / SG-A1 SERIES

Dimensions (Unit: mm in)

SG-B1 □ Safety door switch with solenoid interlock

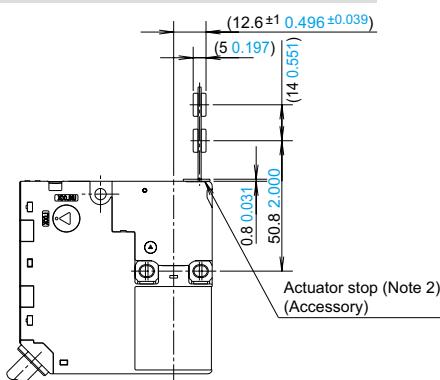


Mounting hole layout

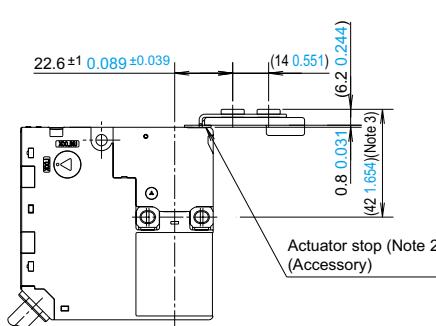


Note 1: Drill mounting holes so that they are properly aligned for the orientation in which the safety switch will be used.

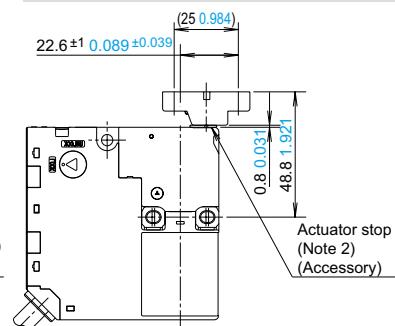
When using straight actuator (SG-K11)



When using the right-angle actuator (SG-K12 / SG-K12A)



When using the angle adjustable actuator (horizontal / vertical) (SG-K13 / SG-K14)



Notes: 2) The actuator stop is used to adjust the actuator position. Remove the actuator stop after the actuator position is mounted.

3) 41.4 1.63 when using SG-K12

* The tensile strength of the SG-K12 actuator is 100N. If an excessive tensile force is applied, the actuator may fall off the door.

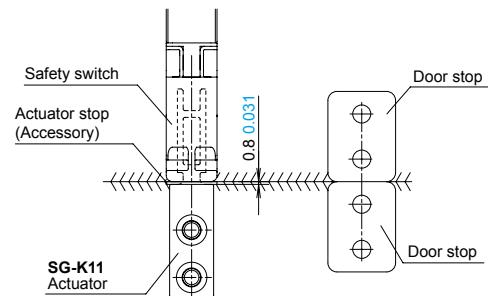
When a tensile force exceeding 100N is expected, use the SG-K12A actuator with a plate.

Actuator mounting reference position

As shown in the figure on the right, the mounting reference position of the actuator when inserted in the safety switch is:

The actuator stop on the actuator lightly touches the safety switch.

* The actuator stop is used to adjust the actuator position. Remove the actuator stop after the actuator position is mounted.

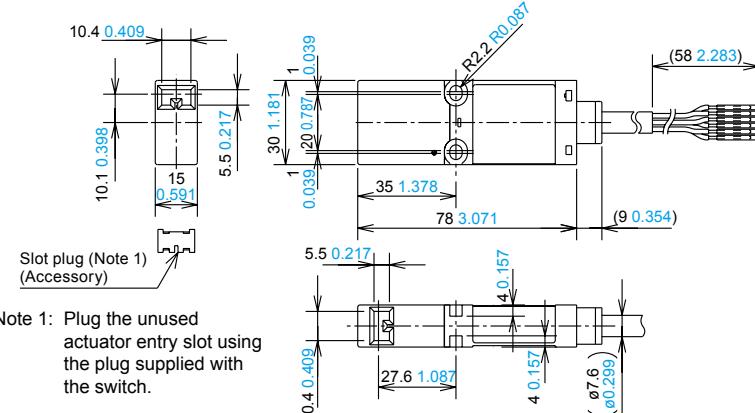




SG-B1SERIES / SG-A1SERIES

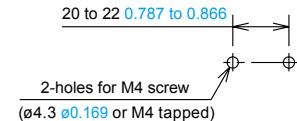
Dimensions (Unit: mm in)

SG-A1 □ Safety door switch



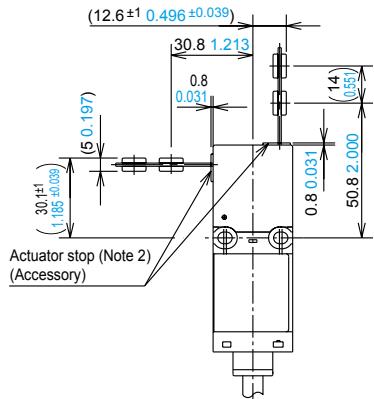
Note 1: Plug the unused actuator entry slot using the plug supplied with the switch.

Mounting hole layout



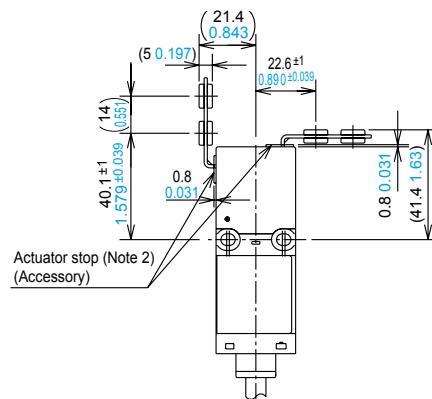
*The safety switch can be mounted in two directions.

When using straight actuator (SG-K11)

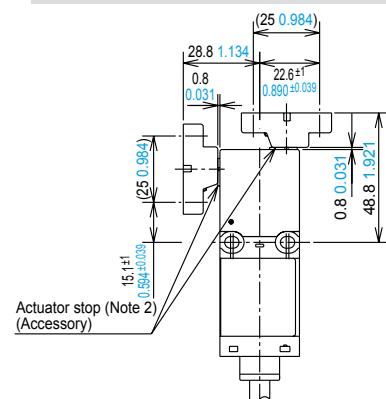


Note 2: The actuator stop is used to adjust the actuator position. Remove the actuator stop after the actuator position is mounted.

When using the right-angle actuator (SG-K12)

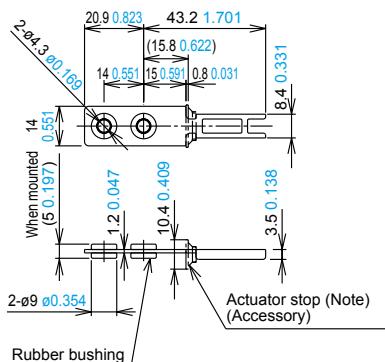


When using the angle adjustable actuator (horizontal / vertical) (SG-K13 / SG-K14)



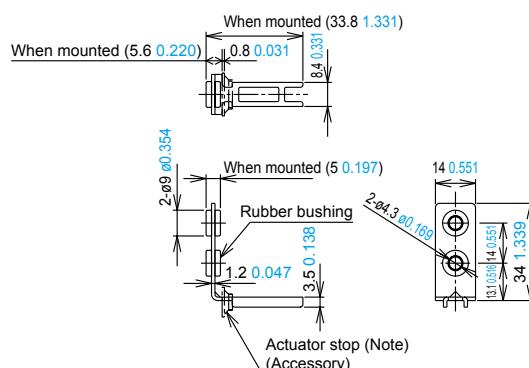
SG-K11 / SG-K12 Actuator

Straight actuator (SG-K11)



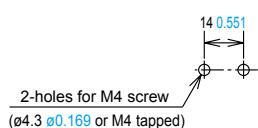
Right-angle actuator (SG-K12)

* The tensile strength of the SG-K12 actuator is 100N. If an excessive tensile force is applied, the actuator may fall off the door.
When a tensile force exceeding 100N is expected, use the SG-K12A actuator with a plate.



Note: The actuator stop is used to adjust the actuator position. Remove the actuator stop after the actuator position is mounted.

Actuator mounting hole layout (Straight actuator, right-angle actuator)



Safety door switch
Safety door switch with solenoid interlock

SG-B1
SG-A1

Safety door switch with key
SG-B2

Enable grip switch
SG-C1

Emergency stop switch
SG-E1

Key selector switch
SG-D1

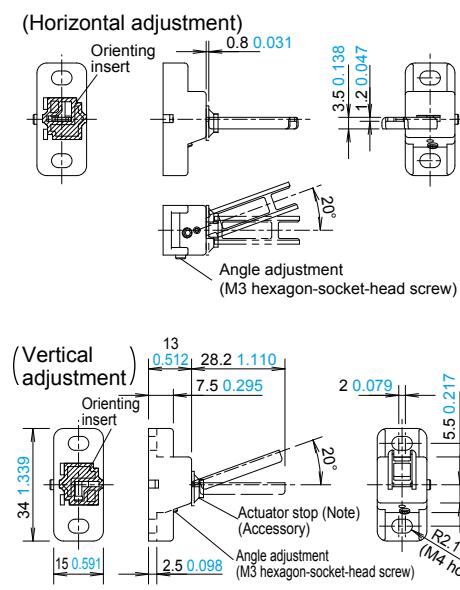


SG-B1 SERIES / SG-A1 SERIES

Dimensions (Unit: mm in)

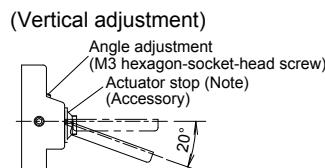
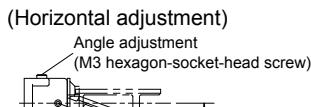
SG-K13 / SG-K14 Actuator

Horizontal / vertical angle adjustable actuators (SG-K13)



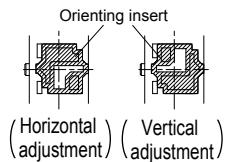
Horizontal / vertical angle adjustable actuators (SG-K14)

* The SG-K14 differs from the SG-K13 in that the direction in which the metal parts on the tip of the actuator are embedded is reversed by 180°.



Changes in the orientation of adjustment for angle adjustable (horizontal / vertical) actuators

The orientation of actuator adjustment (horizontal / vertical) can be changed using the orienting insert (white plastic) installed on the back of the actuator. Do not lose the mounting plate.

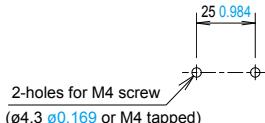


* The base is made of glass-reinforced PA66 (66 nylon). Angle adjustment screws are stainless steel (SUS).

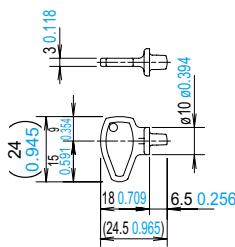
When using adhesive on screws, take material compatibility into consideration.

Note: The actuator stop is used to adjust the actuator position. Remove the actuator stop after the actuator position is mounted.

Actuator mounting hole layout (horizontal / vertical angle adjustable actuators)



• Manual unlocking key (Accessory: plastic)





Contact configuration / Operating patterns

: Closed : Open

Safety switch status	Status 1	Status 2	Status 3	Rear manual unlock																																																												
	<ul style="list-style-type: none"> Door closed Machine ready to operate 	<ul style="list-style-type: none"> Door closed Machine cannot be operated 	<ul style="list-style-type: none"> Door open Machine cannot be operated 	<ul style="list-style-type: none"> Door closed Machine cannot be operated 																																																												
Door status																																																																
Circuit diagram (Example: SG-B2-K2□D-L5)																																																																
Door	<ul style="list-style-type: none"> Closed (locked) 	<ul style="list-style-type: none"> Closed (unlocked) 	<ul style="list-style-type: none"> Open 	<ul style="list-style-type: none"> Closed (unlocked) 																																																												
Model No. and contact configuration	<table border="1"> <tr> <td>SG-B2-K2□C-5</td> <td>Monitor circuit (door closed) 11-12</td> <td>Monitor circuit (door open) 23-24</td> <td>Monitor circuit (locked) 41-42</td> </tr> <tr> <td>Monitor circuit: $\ominus 11 +$ 12</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Monitor circuit: $\ominus 41 +$ 42</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Monitor circuit: 23 + 24</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Monitor circuit: 53 + 54</td> <td></td> <td></td> <td></td> </tr> </table> <table border="1"> <tr> <td>SG-B2-K2□D-5</td> <td>Monitor circuit (door closed) 11-12</td> <td>Monitor circuit (door closed) 21-22</td> <td>Monitor circuit (locked) 41-42</td> </tr> <tr> <td>Monitor circuit: $\ominus 11 +$ 12</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Monitor circuit: $\ominus 41 +$ 42</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Monitor circuit: $\ominus 21 +$ 22</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Monitor circuit: $\ominus 51 +$ 52</td> <td></td> <td></td> <td></td> </tr> </table> <table border="1"> <tr> <td>SG-B2-K2□D-L5</td> <td>Monitor circuit (door closed) 11-12</td> <td>Monitor circuit (door closed) 21-22</td> <td>Monitor circuit (locked) 41-42</td> </tr> <tr> <td>Monitor circuit: $\ominus 11 +$ 12</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Monitor circuit: $\ominus 41 +$ 42</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Monitor circuit: $\ominus 21 +$ 22</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Monitor circuit: $\ominus 51 +$ 52</td> <td></td> <td></td> <td></td> </tr> </table>				SG-B2-K2□C-5	Monitor circuit (door closed) 11-12	Monitor circuit (door open) 23-24	Monitor circuit (locked) 41-42	Monitor circuit: $\ominus 11 +$ 12				Monitor circuit: $\ominus 41 +$ 42				Monitor circuit: 23 + 24				Monitor circuit: 53 + 54				SG-B2-K2□D-5	Monitor circuit (door closed) 11-12	Monitor circuit (door closed) 21-22	Monitor circuit (locked) 41-42	Monitor circuit: $\ominus 11 +$ 12				Monitor circuit: $\ominus 41 +$ 42				Monitor circuit: $\ominus 21 +$ 22				Monitor circuit: $\ominus 51 +$ 52				SG-B2-K2□D-L5	Monitor circuit (door closed) 11-12	Monitor circuit (door closed) 21-22	Monitor circuit (locked) 41-42	Monitor circuit: $\ominus 11 +$ 12				Monitor circuit: $\ominus 41 +$ 42				Monitor circuit: $\ominus 21 +$ 22				Monitor circuit: $\ominus 51 +$ 52			
SG-B2-K2□C-5	Monitor circuit (door closed) 11-12	Monitor circuit (door open) 23-24	Monitor circuit (locked) 41-42																																																													
Monitor circuit: $\ominus 11 +$ 12																																																																
Monitor circuit: $\ominus 41 +$ 42																																																																
Monitor circuit: 23 + 24																																																																
Monitor circuit: 53 + 54																																																																
SG-B2-K2□D-5	Monitor circuit (door closed) 11-12	Monitor circuit (door closed) 21-22	Monitor circuit (locked) 41-42																																																													
Monitor circuit: $\ominus 11 +$ 12																																																																
Monitor circuit: $\ominus 41 +$ 42																																																																
Monitor circuit: $\ominus 21 +$ 22																																																																
Monitor circuit: $\ominus 51 +$ 52																																																																
SG-B2-K2□D-L5	Monitor circuit (door closed) 11-12	Monitor circuit (door closed) 21-22	Monitor circuit (locked) 41-42																																																													
Monitor circuit: $\ominus 11 +$ 12																																																																
Monitor circuit: $\ominus 41 +$ 42																																																																
Monitor circuit: $\ominus 21 +$ 22																																																																
Monitor circuit: $\ominus 51 +$ 52																																																																

Notes: 1) When the operator is confined in a hazardous area, the actuator can be unlocked manually by pressing the rear unlocking button, which should be accessed easily by the operator.

2) The above contact configuration shows the status when the actuator is inserted and the switch is locked.

3) Monitor circuit: Sends monitoring signals of protective door open / closed status or protective door lock / unlock status.

• Operation characteristics : Contact ON (closed) : Contact OFF (opened)

(reference) 0 (Actuator mounting reference position)

SG-B2-K2□C-5 Approx. 3.3 **0.130** (Lock)
Approx. 5.3 **0.209** Approx. 6.9 **0.272** Approx. 26.4 **1.039**
(Travel: mm in)

Monitor circuit (11-12)		
Monitor circuit (23-24)		
Monitor circuit (41-42)		
Monitor circuit (51-52)		

(Actuator completely inserted) (Actuator pulled out)

SG-B2-K2□D-5 0 (Actuator mounting reference position)

SG-B2-K2□D-L5 Approx. 3.3 **0.130** (Lock)
Approx. 5.3 **0.209** Approx. 6.9 **0.272** Approx. 26.4 **1.039**
(Travel: mm in)

Monitor circuit (11-12)		
Monitor circuit (21-22)		
Monitor circuit (41-42)		
Monitor circuit (51-52)		

(Actuator completely inserted) (Actuator pulled out)

• The characteristics show the contact status when the actuator enters an entry slot of an safety switch.

• The characteristics shown in the chart above are of the **SG-K21** actuator. For the others actuator, add 1.3 mm **0.051** in.



When connecting the **SG-B2** series to a safety circuit, connect the door monitor circuits (11-12) \ominus and the lock monitor circuits (41-42, 51-52) in series. (GS-ET-19)

Safety door switch
Safety door switch with solenoid interlock

SG-B1
SG-A1

Safety door switch with key

SG-B2
Enable grip switch

SG-C1
Emergency stop switch

SG-E1
Key selector switch

SG-D1



SG-B2 SERIES

Specifications

Designation	Safety door switch with key				
Item	Series	SG-B2 series			
Applicable standards	EN 1088, IEC 60947-5-1, EN 60947-5-1, GS-ET-19, UL 508, CSA C22.2 No.14				
Standards for use	IEC 60204-1, EN 60204-1				
Applicable directives	Machinery directive (2006/42/EC) Low voltage directive (2006/95/EC)				
Operating condition	Ambient temperature	-25 to +70 °C -13 to +158 °F (No dew condensation or icing allowed) Storage: -40 to +80 °C -40 to +176 °F			
	Ambient humidity	45 to 85 % RH			
	Pollution degree	3 (Inside 2)			
	Altitude	2,000 m 6,561.68 ft max.			
Impulse withstand voltage (Uimp)		2.5 kV			
Rated insulation voltage (Ui)		250 V (Note 1)			
		2.5 A			
Thermal current (Ith)		Ambient temperature: -25 to +60 °C -13 to +140 °F : 2.5 A max. +60 to +65 °C +140 to +149 °F : 1.5 A max. +65 to +70 °C +149 to +158 °F : 1.0 A max.			
Rated operational voltage (Ue) / Rated operational current (Ie)	Ie	Ue	30 V	125 V	250 V
	AC	Resistive load (AC-12)	-	2.5 A	1.5 A
	AC	Inductive load (AC-15)	-	1.5 A	0.75 A
	DC	Resistive load (DC-12)	2.5 A	1.1 A	0.55 A
	DC	Inductive load (DC-13)	2.3 A	0.55 A	0.27 A
Operating frequency	900 operations/hour				
Actuator operating speed	0.05 to 1.0 m/sec.				
B _{10d}	2,000,000 (ISO 13849-1 Annex C Table C.1)				
Mechanical durability	1,000,000 operations min. (GS-ET-19) Rear unlocking button: 3,000 operations min. (Type SG-B2-□-L5)				
Electrical durability	100,000 operations min. (AC-12, 250 V 1 A) 1,000,000 operations min. (AC/DC 24 V 100 mA) (900 operations/hour)				
Electric shock protection class	Class II (IEC 61140) (Note 2),  (double-insulated)				
Interlock force	1,400 N min. (GS-ET-19) (Note 3) (500 N min. : SG-K24 actuator)				
Direct opening travel	11 mm 0.433 in min. (actuator: SG-K21) 12 mm 0.472 in min. (for other actuators)				
Direct opening force	80 N min.				
Contact resistance	700 mΩ max. (initial value, 5 m 16.404 ft cable)				
Protection	IP 65 (IEC 60529)				
Shock resistance	Malfunction: 100 m/s ² , Destruction: 1,000 m/s ²				
Vibration resistance	Malfunction: 10 to 55 Hz, half amplitude 0.35 mm 0.014 in Destruction: 30 Hz, half amplitude 1.5 mm 0.059 in				
Conditional short-circuit current	50 A (250 V)				
Short-circuit protective device	Use 250 V / 10 A fast acting type fuse				
Material	Enclosure: PA66				
Cable	UL style 2464, No.22 AWG 12-core				
Key	Operating specifications	2 positions			
	Mechanical durability	100,000 operations min.			
	Key operating durability	10,000 operations min.			
	Key tensile strength	1.0 N·m min.			
	Direct opening force	0.6 N·m min.			
	Direct opening degree	60° min.			
Weight	SG-B2-□-5: Approx. 680 g, SG-B2-□-L5: Approx. 700 g				

Notes: 1) Ratings approved by UL, c-UL: 125 V

- 2) Basic insulation of 2.5 kV impulse withstand voltage is ensured between different contact circuits.
When both SELV (safety extra low voltage) or PELV (protective extra low voltage) circuits and other circuits (such as 230 V 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 1,400 N 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 (such as the **SG-A1** safety switch) or a sensor to detect door opening and stop the machine.

Precautions for proper use

- This catalog is a guide to select a suitable product. Be sure to read the instruction manual attached to the product prior to its use.



- In order to avoid electric shock or fire, turn the power off before installation, removal, wire connection, maintenance, or inspection of the safety switch.
- If relays are used in the circuit between the safety switch and the load, consider the danger and use safety relays, since welding or sticking contacts of standard relays may invalidate the functions of the safety switch.
- Do not place a PLC in the circuit between the safety switch and the load. Safety and security can be endangered in the event of a malfunction of the PLC.
- Do not disassemble or modify the safety switch, otherwise a breakdown or an accident may occur.
- Do not install the actuator in a location where the human body may come in contact. Otherwise injury may occur.

- Regardless of door types, do not use the safety switch as a door stop. Install a mechanical door stop at the end of the door to protect the safety switch against excessive force.
- Do not apply excessive shock to the safety switch when opening or closing the door. A shock to the safety switch exceeding 1,000 m/s² may cause damage to the safety switch.
- If the operating atmosphere is contaminated, use a protective cover to prevent the entry of foreign objects into the safety switch through the actuator entry slots. Entry of a considerable amount of foreign objects into the safety switch may affect the mechanism of the safety switch and cause a malfunction.
- Cover the unused actuator entry slot using the slot plug supplied with the safety switch.
- Do not store the safety switches in a dusty, humid, or organic-gas atmosphere, or in an area subjected to direct sunlight.
- Use proprietary actuators only. When other actuators are used, the safety switch may be damaged.
Do not cut, machine, or otherwise modify actuators. Doing so may cause equipment failure.
- Do not open the lid of the safety switch. Loosening the screws may damage the safety switch.
- The locking strength is rated at 1,400 N. Do not apply a load higher than the rated value. When a higher load is expected, provide an additional system consisting of another safety switch without lock or a sensor to detect door opening and stop the machine.
- Regardless of door types, do not use the safety switch as a door lock. Install a separate lock using a latch or other measures.
- Although the **SG-K21A** / **SG-K22A** actuators alleviate the shock when the actuator enters the slot on the safety switch, make sure that excessive shock is not applied. If the rubber bushings become deformed or cracked, replace with new ones.

Safety door switch with solenoid interlock

SG-B1
SG-A1

Safety door switch with key

SG-B2

Engraving grip switch

SG-C1

Emergency stop switch

SG-E1

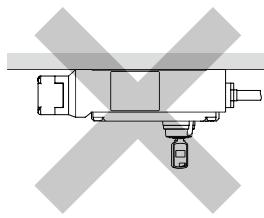
Key selector switch

SG-D1



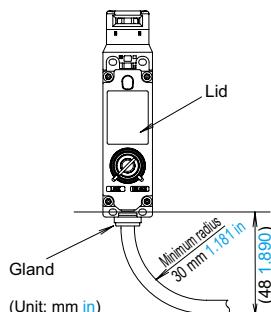
Precautions for proper use

- Do not mount the safety switch facing down as shown in the figure below. Otherwise, the key may fall off due to shock.



Cables

- Do not fasten or loosen the gland at the bottom of the safety switch.
- When bending the cable during wiring, make sure that the cable radius is kept at 30 mm 1.181 in minimum.
- When wiring, make sure that water or oil does not enter the cable.
- Do not open the lid of the safety switch. Otherwise the safety switch will be damaged.

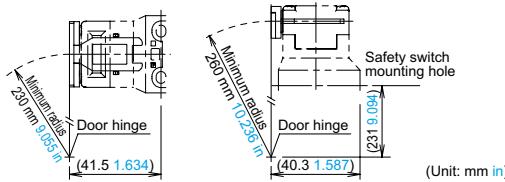


Minimum radius of hinged door

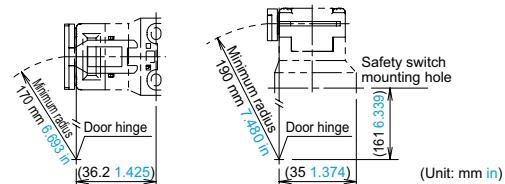
When using the safety switch on hinged doors, refer to the minimum radius of doors shown below. When using on doors with small minimum radius, use the angle adjustable actuator (SG-K24). Note: Because deviation or dislocation of hinged doors may occur in actual applications, make sure of the correct operation before installation.

When using the right-angle actuator (SG-K22)

<When the door hinge is on the extension line of the actuator mounting surface>

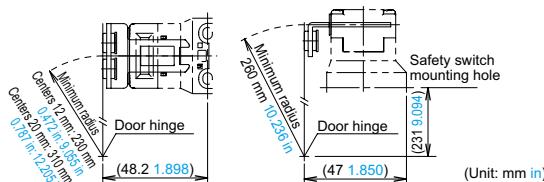


<When the door hinge is on the extension line of the safety switch surface>

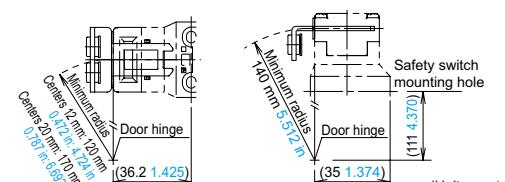


When using the right-angle actuator (with rubber bushings) (SG-K22A)

<When the door hinge is on the extension line of the actuator mounting surface>



<When the door hinge is on the extension line of the safety switch surface>



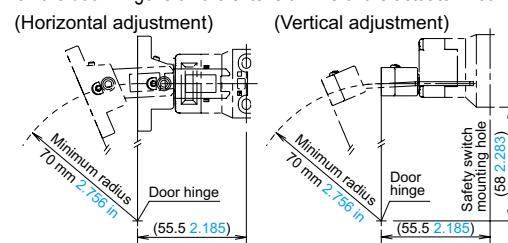
Actuator angle adjustment (vertical / horizontal)

- Using the angle adjustment screw (M3 hexagon-socket-head screw), the actuator angle can be adjusted. (refer to the dimensions on page 29)
- Adjustable angle: 0 to 20°
- The larger the adjusted angle of the actuator, the smaller the applicable radius of the door opening. After installing the actuator, open the door. Then adjust the actuator so that its edge can be inserted properly into the actuator entry slot of the safety switch.
- After adjusting the actuator angle, apply Loctite to the adjustment screw so that the screw will not move.

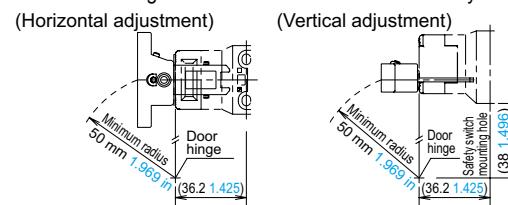
When using the angle adjustable actuator (SG-K24)

- When the door hinge is on the extension line of the actuator mounting surface: 70 mm 2.756 in
- When the door hinge is on the extension line of the safety switch surface: 50 mm 1.969 in

<When the door hinge is on the extension line of the actuator mounting surface>

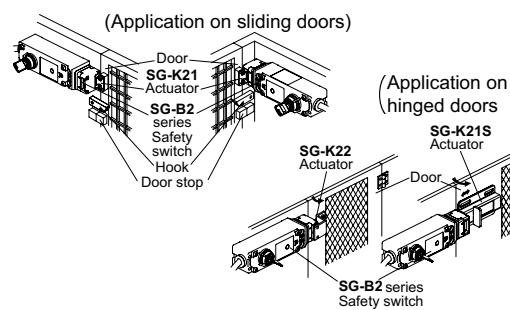


<When the door hinge is on the extension line of the safety switch surface>



Mounting

- Mount the safety switch on a fixed piece of machinery or guard and the actuator on a hinged door.
- Avoid mounting both the safety switch and actuator on a hinged door. Doing so may cause equipment failure. For more information about how to mount the devices, see the following diagram:



Recommended tightening torque for mounting screws

• Recommended screw tightening torque

	Screw tightening torque
For mounting the safety switch (M4 screw) (Note 1)	1.8 to 2.2 N·m
For mounting the actuator (SG-K21 : Two M4 screws) (Note 1) (SG-K21A / SG-K22A : Two M4 screws) (Note 1, 2) (SG-K21S : M5 screw) (Note 1) (SG-K22 : Two M4 phillips screws) (SG-K24 : Two M4 screws) (Note 1)	1.8 to 2.2 N·m 1.0 to 1.5 N·m 4.5 to 5.5 N·m 0.8 to 1.2 N·m 1.0 to 1.5 N·m
For mounting the SG-B2 head (M3)	0.9 to 1.1 N·m
For mounting the manual rear unlocking button (M3 screw with washers)	0.5 to 0.7 N·m

Notes: 1) The above recommended tightening torques of the mounting screws are the values confirmed with hexagon-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.

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.



Safety door switch
Safety door switch with solenoid interlock
SG-B1
SG-A1

Safety door switch with key
SG-B2
SG-B2

Enable grip switch
SG-C1
SG-C1

Emergency stop switch
SG-E1
SG-E1

Key selector switch
SG-D1
SG-D1

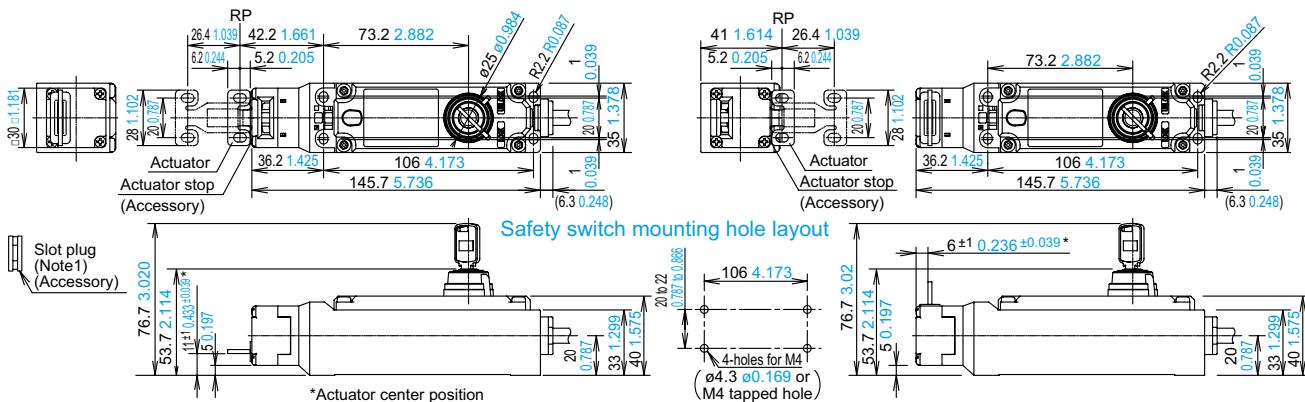


SG-B2 SERIES

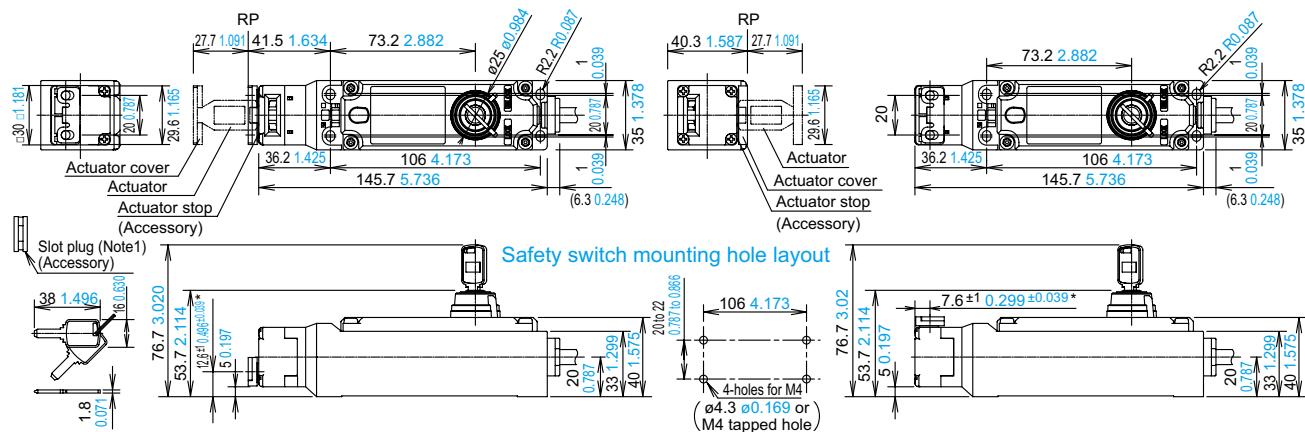
Dimensions (Unit: mm in)

SG-B2-K2□-5 Door switch

When using horizontal mounting / straight actuator (SG-K21)



When using vertical mounting / straight actuator (SG-K22)

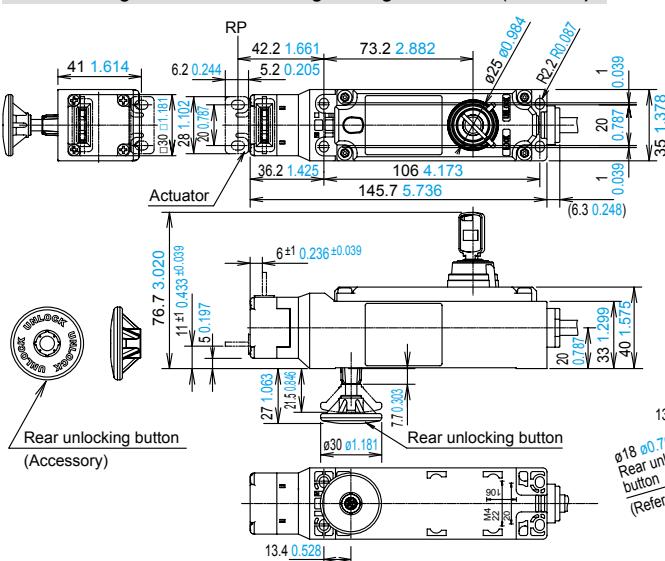


Notes: 1) Plug the unused actuator entry slot using the plug supplied with the switch.

2) When mounting the safety switch, be sure to conform to the mounting hole dimensions and secure in place with four screws.

SG-B2-K□-L5 Door switch (rear unlocking button type)

When using horizontal mounting / straight actuator (SG-K21)



● Mounting part* thickness (X): 1 to 6 mm 0.039 to 0.236 in

6 < X < 23 mm 0.236 < X < 0.906 in : Not mountable

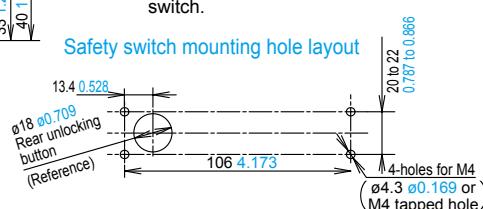
23 ≤ X ≤ 53 mm 0.906 ≤ X ≤ 2.087 in : Use a rear unlocking button kit. (refer to page 11, 30)

* The mounting part is a frame or a panel that the product is mounted on.

● With the mounting hole dimension, the rear unlocking button rod does not touch the hole even when the safety switch moves sideways.

Note: Plug the unused actuator entry slot using the plug supplied with the switch.

Safety switch mounting hole layout

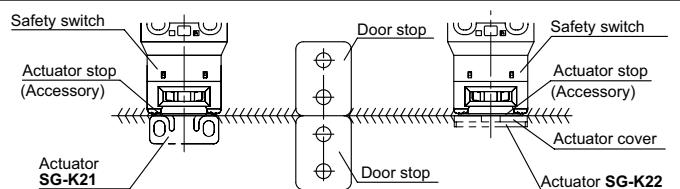


Actuator mounting reference position

As shown in the figure on the right, the mounting reference position of the actuator when inserted in the safety switch is:

The actuator stop on the actuator lightly touches the safety switch.

* The actuator stop is used to adjust the actuator position. Remove the actuator stop after the actuator position is mounted.

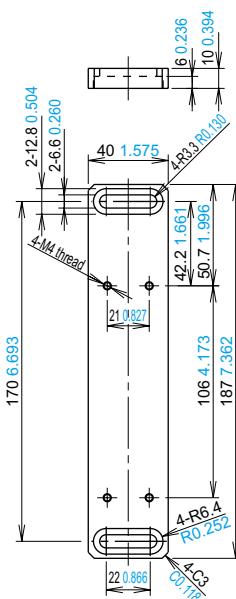




SG-B2 SERIES

Dimensions (Unit: mm in)

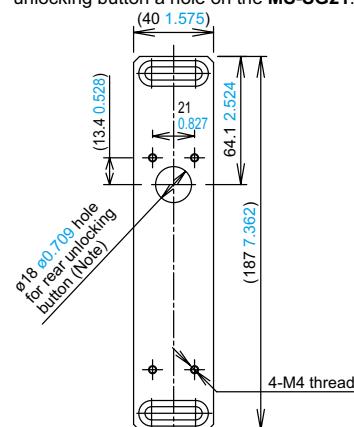
MS-SG21 Mounting plate (Optional)



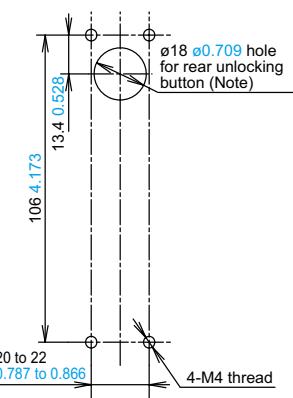
Material: Anodized aluminum A6063
Weight: Approx. 180 g

Mounting plate hole layout

When installing the **SG-B2-K2□-L5** (rear unlocking button type), provide a rear unlocking button a hole on the **MS-SG21**.

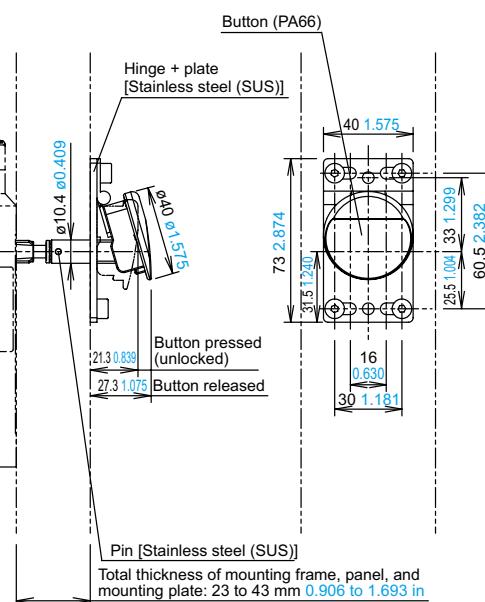
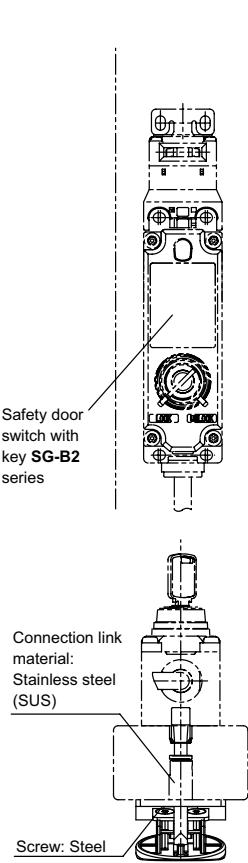


Safety switch mounting hole layout

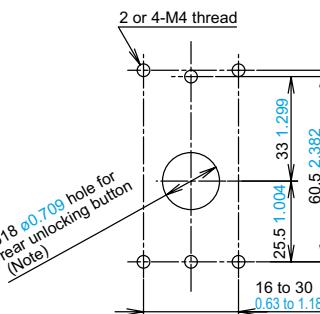


Note: With the mounting hole dimension, the rear unlocking button rod does not touch the hole even when the safety switch moves sideways.

MS-SG-22 / MS-SG-23 Rear unlocking button kit for a frame (Optional)



Rear unlocking button mounting dimensions



Example: When mounted on a □30 mm □1.181 in frame using the mounting plate above **MS-SG-21**, select **MS-SG-22** since the mounting part thickness (X) is 40 (X = 10 + 30 = 40) 1.575 (X = 0.394 + 1.181 = 1.575).

For more information about selecting a back manual unlocking button kit for a frame, see the following table:

Model No.	Mounting part* thickness (X) (mm in)
	Rear unlocking button type When installing an SG-B2-K2□-L5 with a rear unlocking button directly
MS-SG-22	33 < X ≤ 43 1.299 < X ≤ 1.693
MS-SG-23	23 < X ≤ 33 0.906 < X ≤ 1.299

* The mounting part is a frame or a panel that the product is mounted on.

Note: With the mounting hole dimension, the rear unlocking button rod does not touch the hole even when the safety switch moves sideways.

Safety door switch

Safety door switch with solenoid interlock

SG-B1

SG-A1

Safety door switch with key

SG-B2

Enable grip switch

SG-C1

Emergency stop switch

SG-E1

Key selector switch

SG-D1



Specifications

Designation	Enable grip switch																																																																																																																																																	
Item	Series	SG-C1 series																																																																																																																																																
Applicable standards	IEC 60947-5-1, EN 60947-5-1, JIS C 8201-5-1, GS-ET-22, UL 508, CSA C22.2 No.14																																																																																																																																																	
Standards for use	ISO 12100 / EN ISO 12100, IEC 60204-1 / EN 60204-1, ISO 11161 / EN ISO 11161, ISO 10218-1 / EN ISO 10218-1, ANSI/RIA/ISO 10218-1, ANSI/RIA R15.06, ANSI B11.19, ISO 13849-1 / EN ISO 13849-1																																																																																																																																																	
Applicable directives	Machinery directive (2006/42/EC) Low voltage directive (2006/95/EC)																																																																																																																																																	
Operating condition	<table border="1"> <tr> <td>Ambient temperature</td> <td colspan="7">-25 to +60 °C -13 to +140 °F (No dew condensation or icing allowed) Storage: -40 to +80 °C 40 to +176 °F</td></tr> <tr> <td>Ambient humidity</td><td colspan="7">45 to 85 % RH</td></tr> <tr> <td>Pollution degree</td><td colspan="7">3 (Inside 2)</td></tr> <tr> <td>Altitude</td><td colspan="7">2,000 m 6,561.68 ft max.</td></tr> </table>							Ambient temperature	-25 to +60 °C -13 to +140 °F (No dew condensation or icing allowed) Storage: -40 to +80 °C 40 to +176 °F							Ambient humidity	45 to 85 % RH							Pollution degree	3 (Inside 2)							Altitude	2,000 m 6,561.68 ft max.																																																																																																																	
Ambient temperature	-25 to +60 °C -13 to +140 °F (No dew condensation or icing allowed) Storage: -40 to +80 °C 40 to +176 °F																																																																																																																																																	
Ambient humidity	45 to 85 % RH																																																																																																																																																	
Pollution degree	3 (Inside 2)																																																																																																																																																	
Altitude	2,000 m 6,561.68 ft max.																																																																																																																																																	
Impulse withstand voltage (Uimp)	2.5 kV (Momentary pushbutton switch and key selector switch: 1.5 kV)																																																																																																																																																	
Rated insulation voltage (Ui)	250 V (Momentary pushbutton switch and key selector switch: 125 V) / Models with indicator: 30 V																																																																																																																																																	
Thermal current (Ith)	3 A (Emergency stop switch: 5 A)																																																																																																																																																	
Rated operational voltage (Ue) / Rated operational current (Ie) (Note)	<table border="1"> <tr> <td>le</td> <td>Ue</td> <td>30 V</td> <td>125 V</td> <td>250 V</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td rowspan="4">Grip switch</td> <td>3 position enabling switch (Terminal No.: NO1-C1, NO2-C2)</td> <td>AC</td> <td>Resistive load (AC-12) -</td> <td>1 A</td> <td>0.5 A</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>AC</td> <td>Inductive load (AC-15) -</td> <td>0.7 A</td> <td>0.5 A</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>DC</td> <td>Resistive load (DC-12) 1 A</td> <td>0.2 A</td> <td>-</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>DC</td> <td>Inductive load (DC-13) 0.7 A</td> <td>0.1 A</td> <td>-</td> <td></td> <td></td> <td></td> </tr> <tr> <td rowspan="4">Push monitor switch (Terminal No. 31-32)</td> <td>AC</td> <td>Resistive load (AC-12) -</td> <td>2.5 A</td> <td>1.5 A</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>AC</td> <td>Inductive load (AC-15) -</td> <td>1.5 A</td> <td>0.75 A</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>DC</td> <td>Resistive load (DC-12) 2.5 A</td> <td>1.1 A</td> <td>0.55 A</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>DC</td> <td>Inductive load (DC-13) 2.3 A</td> <td>0.55 A</td> <td>0.27 A</td> <td></td> <td></td> <td></td> </tr> <tr> <td rowspan="4">Emergency stop switch (Terminal No. 1-2, 1-2)</td> <td>AC</td> <td>Resistive load (AC-12) -</td> <td>5 A</td> <td>3 A</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>AC</td> <td>Inductive load (AC-15) -</td> <td>3 A</td> <td>1.5 A</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>DC</td> <td>Resistive load (DC-12) 2 A</td> <td>0.4 A</td> <td>0.2 A</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>DC</td> <td>Inductive load (DC-13) 1 A</td> <td>0.22 A</td> <td>0.1 A</td> <td></td> <td></td> <td></td> </tr> <tr> <td rowspan="4">Momentary pushbutton switch / Key selector switch (Terminal No. C1-NO1, NC1, C2-NO2, NC2)</td> <td>AC</td> <td>Resistive load (AC-12) -</td> <td>0.5 A</td> <td>-</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>AC</td> <td>Inductive load (AC-15) -</td> <td>0.3 A</td> <td>-</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>DC</td> <td>Resistive load (DC-12) 1 A</td> <td>0.2 A</td> <td>-</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>DC</td> <td>Inductive load (DC-13) 0.7 A</td> <td>0.1 A</td> <td>-</td> <td></td> <td></td> <td></td> </tr> </table>								le	Ue	30 V	125 V	250 V					Grip switch	3 position enabling switch (Terminal No.: NO1-C1, NO2-C2)	AC	Resistive load (AC-12) -	1 A	0.5 A					AC	Inductive load (AC-15) -	0.7 A	0.5 A					DC	Resistive load (DC-12) 1 A	0.2 A	-					DC	Inductive load (DC-13) 0.7 A	0.1 A	-				Push monitor switch (Terminal No. 31-32)	AC	Resistive load (AC-12) -	2.5 A	1.5 A					AC	Inductive load (AC-15) -	1.5 A	0.75 A					DC	Resistive load (DC-12) 2.5 A	1.1 A	0.55 A					DC	Inductive load (DC-13) 2.3 A	0.55 A	0.27 A				Emergency stop switch (Terminal No. 1-2, 1-2)	AC	Resistive load (AC-12) -	5 A	3 A					AC	Inductive load (AC-15) -	3 A	1.5 A					DC	Resistive load (DC-12) 2 A	0.4 A	0.2 A					DC	Inductive load (DC-13) 1 A	0.22 A	0.1 A				Momentary pushbutton switch / Key selector switch (Terminal No. C1-NO1, NC1, C2-NO2, NC2)	AC	Resistive load (AC-12) -	0.5 A	-					AC	Inductive load (AC-15) -	0.3 A	-					DC	Resistive load (DC-12) 1 A	0.2 A	-					DC	Inductive load (DC-13) 0.7 A	0.1 A	-			
le	Ue	30 V	125 V	250 V																																																																																																																																														
Grip switch	3 position enabling switch (Terminal No.: NO1-C1, NO2-C2)	AC	Resistive load (AC-12) -	1 A	0.5 A																																																																																																																																													
		AC	Inductive load (AC-15) -	0.7 A	0.5 A																																																																																																																																													
		DC	Resistive load (DC-12) 1 A	0.2 A	-																																																																																																																																													
		DC	Inductive load (DC-13) 0.7 A	0.1 A	-																																																																																																																																													
Push monitor switch (Terminal No. 31-32)	AC	Resistive load (AC-12) -	2.5 A	1.5 A																																																																																																																																														
		AC	Inductive load (AC-15) -	1.5 A	0.75 A																																																																																																																																													
		DC	Resistive load (DC-12) 2.5 A	1.1 A	0.55 A																																																																																																																																													
		DC	Inductive load (DC-13) 2.3 A	0.55 A	0.27 A																																																																																																																																													
Emergency stop switch (Terminal No. 1-2, 1-2)	AC	Resistive load (AC-12) -	5 A	3 A																																																																																																																																														
		AC	Inductive load (AC-15) -	3 A	1.5 A																																																																																																																																													
		DC	Resistive load (DC-12) 2 A	0.4 A	0.2 A																																																																																																																																													
		DC	Inductive load (DC-13) 1 A	0.22 A	0.1 A																																																																																																																																													
Momentary pushbutton switch / Key selector switch (Terminal No. C1-NO1, NC1, C2-NO2, NC2)	AC	Resistive load (AC-12) -	0.5 A	-																																																																																																																																														
		AC	Inductive load (AC-15) -	0.3 A	-																																																																																																																																													
		DC	Resistive load (DC-12) 1 A	0.2 A	-																																																																																																																																													
		DC	Inductive load (DC-13) 0.7 A	0.1 A	-																																																																																																																																													
Electric shock protection class	Class II (IEC 61140), (double insulated) (Models with indicator: Class III)																																																																																																																																																	
Operating frequency	1,200 operations/hour																																																																																																																																																	
B _{10d}	2,000,000 (ISO 13849-1 Annex C Table C.1)																																																																																																																																																	
Mechanical durability	Position 1→2→1: 1,000,000 operations min. Position 1→2→3→1: 100,000 operations min.																																																																																																																																																	
Electrical durability	100,000 operations min. (Rated operating load) 1,000,000 operations min. (AC / DC 24 V 100 mA)																																																																																																																																																	
Shock resistance	Malfunction: 150 m/s ² , Destruction: 1,000 m/s ²																																																																																																																																																	
Free fall	1.0 m 3.281 ft 1 time (Based on IEC60068-2-32)																																																																																																																																																	
Vibration resistance	Malfunction: 5 to 55 Hz, half amplitude 0.5 mm 0.020 in Destruction: 16.7 Hz, half amplitude 1.5 mm 0.059 in																																																																																																																																																	
Protection	IP66 / IP67	Without additional switch and pilot light																																																																																																																																																
	IP65	With additional switch and/or pilot light																																																																																																																																																
Conditional short-circuit current	50 A (250 V)																																																																																																																																																	
Short-circuit protective device	250 V AC, 10 A Fuse (IEC60127-1)																																																																																																																																																	
Direct opening force	60 N min. (Push monitor switch)																																																																																																																																																	
Direct opening travel	4.7 mm 0.185 in min. (Push monitor switch)																																																																																																																																																	
Actuator Strength (Entire button is pushed)	500 N min. (Grip switch)																																																																																																																																																	
Indicator (Note)	Green LED Rated Operating Voltage: DC 24 V ±10 % Rated current: 15 mA																																																																																																																																																	
Weight	SG-C1-21: Approx. 140 g SG-C1-21-E: Approx. 150 g SG-C1-21-EG: Approx. 155 g SG-C1-21-MM: Approx. 155 g SG-C1-21-EMM: Approx. 165 g SG-C1-21-EMK: Approx. 170 g																																																																																																																																																	

Note: As for the type with pilot light, Ue (contact ratings) of all switches is only less than 30 V DC, and connect all switches to SELV (safety extra low voltage) or PELV (protective extra low voltage) circuit.

Precautions for proper use

- This catalog is a guide to select a suitable product. Be sure to read the instruction manual attached to the product prior to its use.

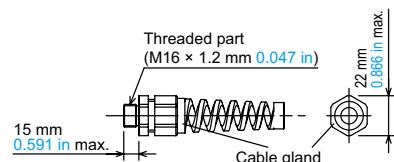


- In order to avoid electric shock or fire, turn the power off before installation, removal, wire connection, maintenance, or inspection of the safety switch.
- Do not disassemble or modify the grip switch.
- When using the **SG-C1** series for safety-related equipment in a control system, refer to the safety standards and regulations in each country and region depending on the application purpose of the actual machines and installations to make sure of correct operation. Also, perform risk assessment to make sure of safety before starting operation.
- Do not tie the grip switch around the button with a tape or string to keep the switch in position 2. Doing so will prevent the grip switch from functioning as designed and is extremely dangerous. Systems that stop operation after the grip has been operated for a certain period of time and require the operator to grip it again are effective in preventing circumvention of the device's intended purpose.
- Please note that permanent installation of the grip switch at the machine is inadmissible.

- Use proper size wires to meet voltage and current requirements.
- Do not apply an excessive shock to the **SG-C1** series.
- When wiring, prevent dust, water, or oil from entering the grip switch.
- If used in wet locations, this device must be used with cable suitable for wet locations.
- When multiple safety components are connected in series, the EN ISO 13849-1 performance level will fall due to the deterioration in fault detection functionality.
- The suitability of control systems in which this product has been embedded must be verified in accordance with EN ISO 13849-2.
- SG-C1** series is a device used for enabling a machine (robot, etc.) when teaching the machine in a hazardous area manually. Configure the enabling system so that the machine can operate when the switch is in position 2 and an additional "start" is pushed to initiate the operation.
- In order to ensure safety of the control system, connect each pair of the contacts of the 3 position enabling switch (terminal No. NO1-C1 and NO2-C2) to a discrepancy detection circuit such as a safety relay module. (ISO13849-1)
- The base and the plastic part of rubber boot frame are made of glass-reinforced ABS / PBT. The rubber boot is made of silicone rubber. The screw is made of iron. When cleaning the **SG-C1** series, use a detergent compatible with the materials.
- As for momentary pushbutton switch and key selector switch of additional control unit, do not connect NO and NC contacts of a microswitch to different voltages or different power sources to prevent a dead short-circuit.
- Do not operate key selector switch of additional control unit without completely insertion of the key.
- The rubber boot may deteriorate depending on the operating environment and conditions.

Cable glands

- The product includes one cable gland. When purchasing replacements, ensure that they conform to the following dimensional range:
- Dimension diagram



- Waterproofness: Use a cable gland that can maintain performance of IP67 or higher.
- Recommended connector: Model SKINTOP-BS-M16 × 1.5-B (manufactured by LAPP in Germany and imported by K.mecs Co., Ltd.)
- Applicable cable diameter: Outer diameter of 4.5 to 10 mm **0.177 to 0.787 in**

Safety door switch
Safety door switch with solenoid interlock
SG-B1
SG-A1

Safety door switch with key
SG-B2
Enable grip switch
SG-C1

Emergency stop switch
SG-E1

Key selector switch
SG-D1



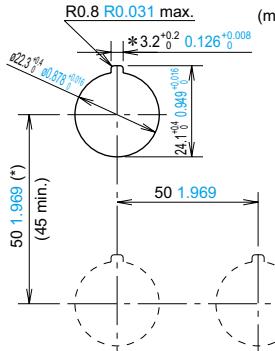
Specifications

Designation	Pushbutton type emergency stop switch														
Item Series	SG-E1 series														
Applicable standards	JIS C 8201-5-1, IEC 60947-5-1, EN 60947-5-1, UL 508 (UL listed Certification), CSA 22.2 No.14 (c-UL listed Certification)														
Operating condition	Ambient temperature	-25 to +60 °C -13 to +140 °F (No dew condensation or icing allowed) Storage: -40 to +80 °C -40 to +176 °F													
	Ambient humidity	45 to 85 % RH													
	Pollution degree	3													
	Altitude	2,000 m 6,561.68 ft max.													
Impulse withstand voltage (Uimp)	4 kV														
Rated insulation voltage (Ui)	600 V														
Thermal current (Ith)	10 A														
Rated operational voltage (Ue) / Rated operational current (Ie)	le	Ue	24 V	48 V	50 V	110 V	220 V	440 V							
	AC	Resistive load (AC-12)	10 A	-	10 A	10 A	6 A	2 A							
		Inductive load (AC-15) (A600)	10 A	-	7 A	5 A	3 A	1 A							
	DC	Resistive load (DC-12)	8 A	4 A	-	2.2 A	1.1 A	-							
		Inductive load (DC-13) (P600)	4 A	2 A	-	1.1 A	0.6 A	-							
Contact resistance	50 mΩ max. (initial value)														
Insulation resistance	100 MΩ min. (500 V DC megger)														
Electric shock protection class	Class II (IEC 61140)														
Overvoltage category	II (IEC60664-1)														
Reset action	Turn reset														
Protection	Front of the panel: IP65 (IEC 60529)														
Shock resistance	Malfunction: 100 m/s ² , Destruction: 1,000 m/s ²														
Vibration resistance	Malfunction: 5 to 55 Hz, half amplitude 0.5 mm 0.020 in Destruction: 30 Hz, half amplitude 1.5 mm 0.059 in														
B _{10d}	100,000 (ISO 13849-1 Annex C Table C.1)														
Mechanical durability	500,000 operations min.														
Electrical durability	500,000 operations min. (900 operations/hour)														
Material	Actuator: PA6, Contact block: PA66														
Connecting method	Terminal screw (M3.5 philips & flathead)														
Applicable wire size	Max. 2 mm ² (Single core Ø1.6 Ø0.063 max.) 2 wires max.														
Tightening torque of the terminal screws	1.0 to 1.3 N·m														
Tightening torque of the locking ring	2.0 N·m														
Weight	SG-E1-02 : Approx. 60 g, SG-E1-12 : Approx. 75 g														
Accessory	Lever lock: 1 pc														

Precautions for proper use

- In order to avoid electric shock or fire, turn the power off before installation, removal, wire connection, maintenance, or inspection of the safety switch.
- Use wiring that is appropriate for the applied voltage and energized current, and tighten terminal screws (M3.5) to the recommended tightening torque (1.0 to 1.3 N·m). Using the switch when the screws are loose will cause it to become extremely hot, posing the risk of fire.

Mounting hole layout / minimum mounting center



Note:
When using the safety lever lock, determine the vertical spacing* in consideration of convenience for installing and removing the safety lever lock. (Recommended vertical spacing: 100 mm **3.937 in** or more)

The **3.2^{0.2} 0.126^{0.008}** recess is for preventing rotation and not necessary when anti-rotation is not used. When anti-rotation is not required or when the panel cut-out does not have anti-rotation recess, remove the "Projection" using pliers.

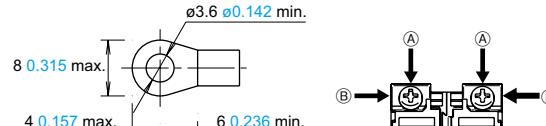
- The minimum mounting centers are applicable to switches with one layer of contact blocks (two contact blocks). When two layers of contact blocks are mounted, determine the minimum mounting centers in consideration of convenience for wiring.

Applicable wiring

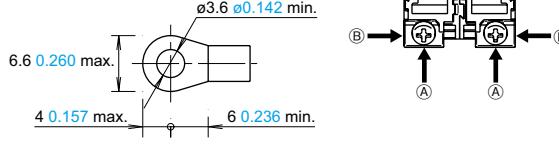
(1) The applicable wire size is 2 mm² maximum. (single wire Ø1.6 mm **Ø0.063** in maximum) One or two wires can be connected.

• Applicable crimping terminal (Unit: mm in)

When using direction **(A)**

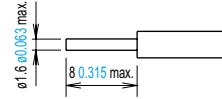


When using direction **(B)**



Be sure to use an insulation tube or cover on the crimping part of the crimping terminal to prevent electrical shocks.

• Single wire (Unit: mm in)



Note: When connecting wires to contact blocks or transformers in the direction **(B)**, keep the insulation stripping length 6.6 mm **0.260 in** at the maximum.

(2) Tighten the M3.5 terminal screws to a torque of 1.0 to 1.3 N·m.

Using the lever lock

- Panasonic Industrial Devices SUNX strongly recommends using the lever lock (yellow) to prevent heavy vibration or maintenance personnel from unlocking the contact assembly.

Safety door switch
Safety door switch with solenoid interlock

SG-B1
SG-A1

Safety door switch with key

SG-B2

Enable grip switch

SG-C1
Emergency stop switch

Key selector switch

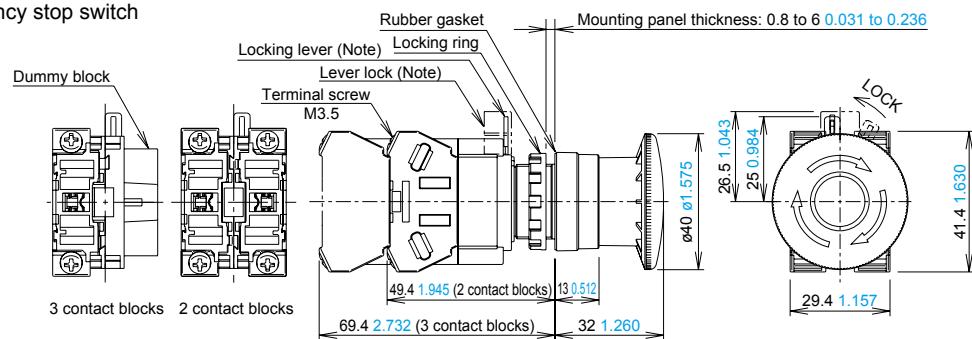
SG-D1



SG-E1 SERIES

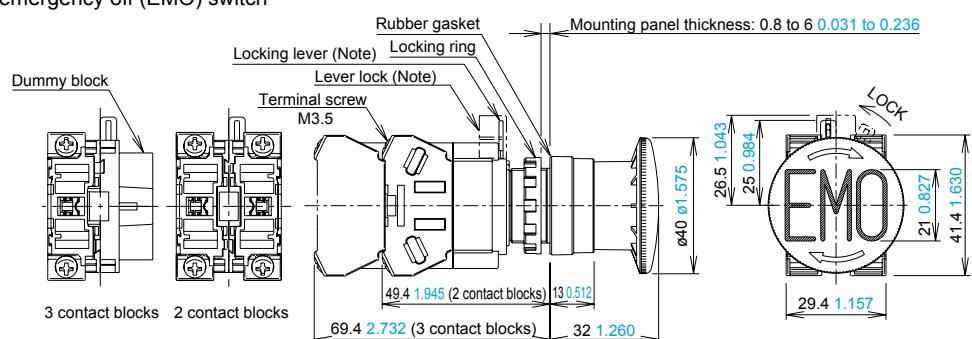
Dimensions (Unit: mm in)

SG-E1-□ Emergency stop switch



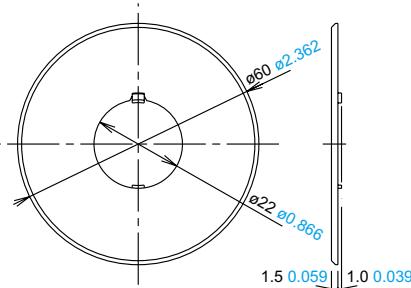
Note: Please attach the lever lock (yellow) after locking to prevent personnel from forgetting to lock the lock lever.

SG-E1-□-E SEMI emergency off (EMO) switch

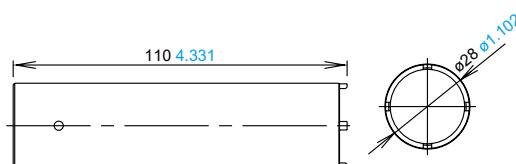


Note: Please attach the lever lock (yellow) after locking to prevent personnel from forgetting to lock the lock lever.

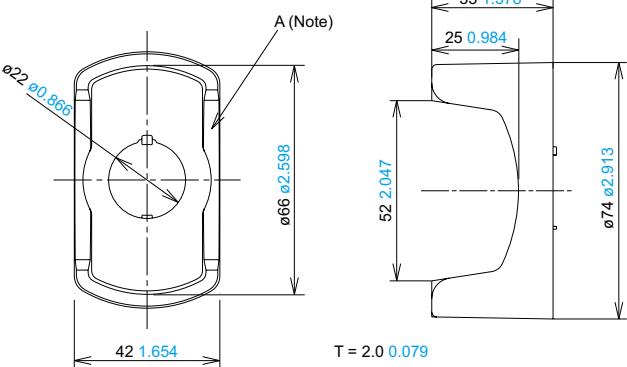
SG-EP□ Emergency stop nameplate (Optional)



SG-ET1 Locking ring wrench (Optional)

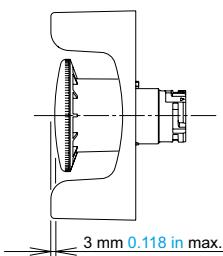


MS-SG-GR1 SEMI guard ring (Optional)



Note: When anti-rotation is not required or when the panel cut-out does not have an anti-rotation recess, remove part "A" of the SEMI guard ring using pliers.

Height of SEMI emergency off (EMO) switch and SEMI guard ring
As illustrated below, the height of the SEMI emergency off (EMO) switch and SEMI guard ring should be 3 mm 0.118 in or less.



• Note

The EMO switch and the guard ring have been designed for applications in semiconductor manufacturing equipment only. Do not use EMO switch and/or the guard ring which are installed on machine tools or food processing machines. (Machinery Directive of the European Commission and IEC 60204-1 require that emergency stop switches be installed in a readily accessible area and the usage of switch guards is not permitted.)



Specifications

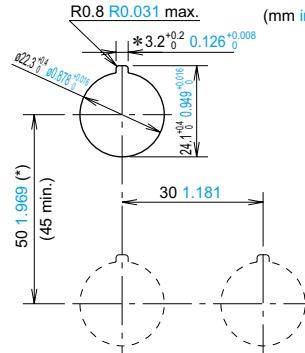
Designation		Key selector switch							
Item	Series	SG-D1 series							
Applicable standards		JIS C 8201-5-1, IEC 60947-5-1, EN 60947-5-1, UL 508 (UL listed Certification), CSA 22.2 No.14 (c-UL listed Certification)							
Operating condition	Ambient temperature	-25 to +60 °C -13 to +140 °F (No dew condensation or icing allowed) Storage: -40 to +80 °C -40 to +176 °F							
	Ambient humidity	45 to 85 % RH							
	Pollution degree	3							
	Altitude	2,000 m 6,561.68 ft max.							
Impulse withstand voltage (Uimp)		4 kV							
Rated insulation voltage (Ui)		600 V							
Thermal current (Ith)		10 A							
Rated operational voltage (Ue) / Rated operational current (Ie)	AC	Ie	Ue	24 V	48 V	50 V	110 V	220 V	440 V
	AC	Resistive load (AC-12)	10 A	-	10 A	10 A	6 A	2 A	
	DC	Inductive load (AC-15) (A600)	10 A	-	7 A	5 A	3 A	1 A	
	DC	Resistive load (DC-12)	8 A	4 A	-	2.2 A	1.1 A	-	
Inductive load (DC-13) (P600)		4 A	2 A	-	1.1 A	0.6 A	-		
Contact resistance		50 mΩ max. (initial value)							
Insulation resistance		100 MΩ min. (500 V DC megger)							
Electric shock protection class		Class II (IEC 61140)							
Overvoltage category		II (IEC60664-1)							
Protection		Front of the panel: IP65							
Shock resistance		Malfunction: 100 m/s ² , Destruction: 1,000 m/s ²							
Vibration resistance		Malfunction: 5 to 55 Hz, half amplitude 0.5 mm 0.020 in Destruction: 30 Hz, half amplitude 1.5 mm 0.059 in							
B _{10d}		100,000 (ISO 13849-1 Annex C Table C.1)							
Mechanical durability		100,000 operations min.							
Electrical durability		100,000 operations min. (1,200 operations/hour)							
Material		Actuator: PA6, Contact block: PA66							
Connecting method		Terminal screw (M3.5 philips & flathead)							
Applicable wire size		Max. 2 mm ² (Single core Ø1.6 Ø0.063 max.) 2 wires max.							
Tightening torque of the terminal screws		1.0 to 1.3 N·m							
Tightening torque of the locking ring		2.0 N·m							
Selector behavior		2 positions							
Minimum direct opening operating angle		90°							
Minimum direct opening torque		0.4 N·m							
Maximum operation angle		90°							
Weight		SG-D1-2-11: Approx. 75 g, SG-D1-2-22: Approx. 95 g							
Accessory		Key: 2pcs., Lever lock: 1 pc.							

Precautions for proper use



- In order to avoid electric shock or fire, turn the power off before installation, removal, wire connection, maintenance, or inspection of the safety switch.
- Use wiring that is appropriate for the applied voltage and energized current, and tighten terminal screws (M3.5) to the recommended tightening torque (1.0 to 1.3 N·m). Using the switch when the screws are loose will cause it to become extremely hot, posing the risk of fire.

Mounting hole layout / minimum mounting center



Note:
When using the safety lever lock, determine the vertical spacing* in consideration of convenience for installing and removing the safety lever lock. (Recommended vertical spacing: 100 mm **3.937 in** or more)
The **3.2*0.2 0.126*0.008** recess is for preventing rotation and not necessary when anti-rotation is not used.

- The minimum mounting centers are applicable to switches with one layer of contact blocks (two contact blocks). When two layers of contact blocks are mounted, determine the minimum mounting centers in consideration of convenience for wiring.

Applicable wiring

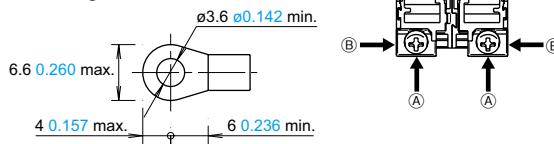
- The applicable wire size is 2 mm² maximum. (single wire **Ø1.6 mm Ø0.063 in** maximum) One or two wires can be connected.

• Applicable crimping terminal (Unit: mm in)

When using direction **(A)**

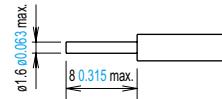


When using direction **(B)**



Be sure to use an insulation tube or cover on the crimping part of the crimping terminal to prevent electrical shocks.

• Single wire (Unit: mm in)



Note: When connecting wires to contact blocks or transformers in the direction **(B)**, keep the insulation stripping length 6.6 mm **0.260 in** at the maximum.

- Tighten the M3.5 terminal screws to a torque of 1.0 to 1.3 N·m.

Using the lever lock (accessory)

- Please attach the lever lock (yellow) after locking to prevent personnel from forgetting to lock the lock lever.

Safety door switch
Safety door switch with solenoid interlock

SG-B1
SG-A1

Safety door switch with key
SG-B2

SG-C1

Emergency stop switch
SG-E1

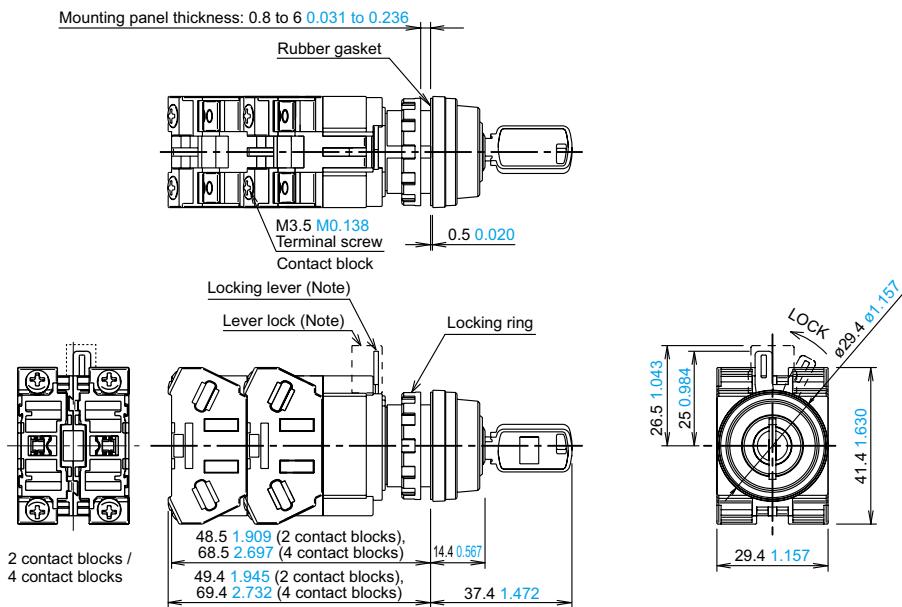
Key selector switch
SG-D1



SG-D1 SERIES

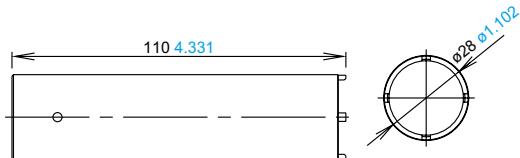
Dimensions (Unit: mm in)

SG-D1-□ Key selector switch



Note: Please attach the lever lock (yellow) after locking to prevent personnel from forgetting to lock the lock lever.

SG-ET1 Locking ring wrench (Optional)



Please contact

Panasonic Industrial Devices SUNX Co., Ltd.

2431-1 Ushiyama-cho, Kasugai-shi, Aichi, 486-0901, Japan

Global Sales Department

■Telephone: +81-568-33-7861 ■Facsimile: +81-568-33-8591

panasonic.net/id/pidsx/global

Panasonic®

All Rights Reserved ©Panasonic Industrial Devices SUNX Co., Ltd. 2013