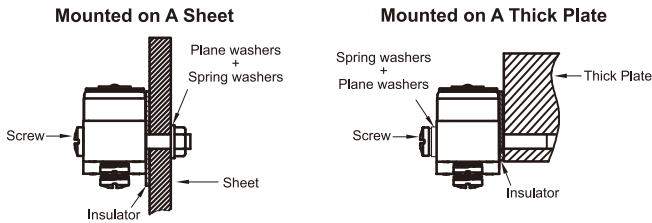


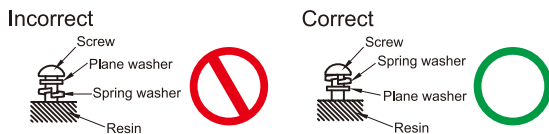
# Safety Precautions

## ■ Mounting

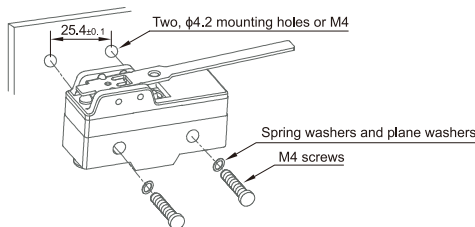
- Before mounting, dismantling, wiring, or inspecting a switch, be sure to turn OFF the power supply to the switch, otherwise an electric shock may be received or the switch may burn.
- Use an insulation guard or separator if the insulation distance between the switch and the mounting plate is insufficient. Be particularly careful when mounting a switch to metal.
- Mounting Means: Side Mount



1. When mounting a switch, be sure to use the specified mounting screws and tighten the screws with plane washers or spring washers securely. However, the switch housing may incur crack damage if it comes into contact with the spring washers directly. In that case make sure that the plane washers come into contact with the switch housing as shown below.

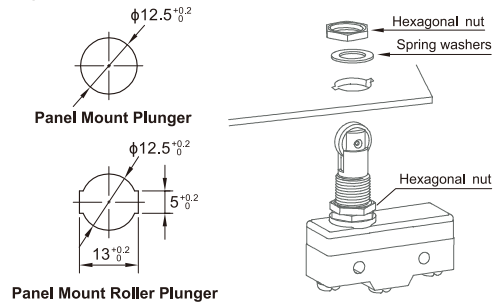


2. When use M4 screws with plane washers and spring washers to mount the switch, tighten each mounting screw securely to a torque of 1.18 to 1.47 N·m. Do not over tighten the mounting screws.



3. Do not subject the switch to excessive shock or high-frequency vibrations when mounting (e.g., do not use an impact driver) as it may cause contacts stick or switch damage.
4. Do not modify the switch in any way, for example, by widening the mounting holes.
5. When using the panel mount plunger model mounted with screws on a side surface, be careful not to apply a large shock. Applying a shock exceeding 1,000 m/s<sup>2</sup> may damage the switch.
6. When using the panel mount plunger model mounted with screws on a side surface, remove the hexagonal nuts from the actuator.

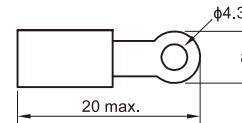
- Mounting Means: Panel Mount



- When mounting the switch to a panel, use a tightening torque of 2.94 to 4.9 N·m for the hexagonal nuts on the actuator.
- If mounting the switch with an adhesive, use extreme care to avoid contaminating the interior of the switch.
- Make sure that sufficient insulation distance is provided between terminals and electrical ground.
- Make sure that there is no force applied to the plunger when it is at the free position. Design the actuating device to strike the switch plunger in line with the plunger axis.

## ■ Wiring

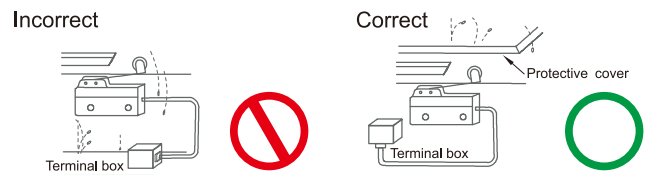
- Use round solderless terminals having the following dimensions to connect leads to the terminals. Tighten the screws of terminals to a torque of 0.78 to 1.18 N·m.



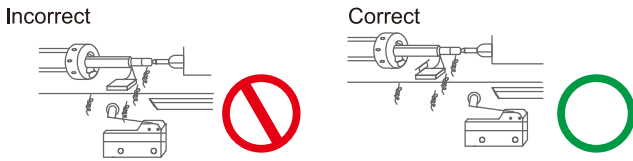
- Use wire sizes suitable for the applied voltage and carrying current.
- When soldering lead wires to the switch, make sure that the capacity of the soldering iron is 60 W maximum and complete soldering within 5 seconds. Excessive soldering temperature or time will deteriorate the characteristics of the switch.
- If a switch is used with insufficient soldering, abnormal heat and burning may occur.

## ■ Mounting Location

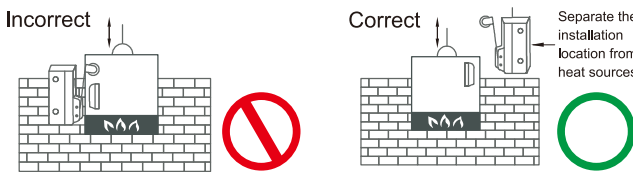
- Do not use the switch alone in atmospheres such as flammable or explosive gases. Arcing and heat generation associated with switching may cause fires or explosions.
- Switches are generally not constructed with resistance against water. Use a protective cover to prevent direct spraying if the switch is used in locations subject to splashing or spurring oil or water, dust adhering.



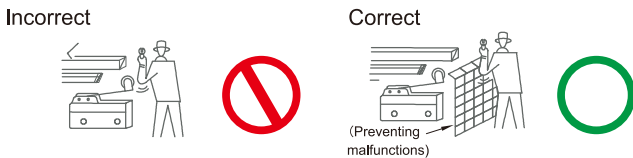
- Install the switch in a location that is not directly subject to debris and dust from cutting. The actuator and the switch body must be protected from accumulated cutting debris and dirt.



- Do not use the switch in locations subject to hot water (60°C min.) or in water vapor.
- Do not use the switch outside the specified temperature and atmospheric conditions. The permissible ambient temperature depends on the model (refer to the specifications in this catalog). Sudden thermal changes may cause thermal shock to distort the switch and result in faults.



- Mount a cover if the switch is to be installed in a location where worker inattention could result in incorrect operation or accidents.



- Subjecting the switch to continuous vibration or shock may result in contact failure or faulty operation due to abrasion powder and in reduced durability. Excessive vibration or shock will cause the contacts to operate malfunction or become damaged. Mount the switch in a location that is not subject to vibration or shock and in a direction that does not subject the switch to resonance.

- If silver contacts are used with relatively low frequency for a long time or are used with microloads, the sulfide coating produced on the contact surface will not be broken down and contact faults will result. In that cases, use gold contacts or use a microload switch.

- Do not use the switch in atmospheres with high humidity or heat or in harmful gases, such as sulfide gas (H<sub>2</sub>S, SO<sub>2</sub>), ammonia gas (NH<sub>3</sub>), nitric acid gas (HNO<sub>3</sub>), or chlorine gas (Cl<sub>2</sub>). Doing so may impair functionality, such as with damage due to contacting faults or corrosion.

- Do not use the switch in an atmosphere with silicon gas, or arc energy may cause silicon oxide (SiO<sub>2</sub>) to accumulate on the contacts and result in contact failure. If there is silicon oil, silicon filling, silicon wiring, or other silicon products in the vicinity of the switch, use a contact protection circuit to limit arcing and remove the source of the silicon gas.

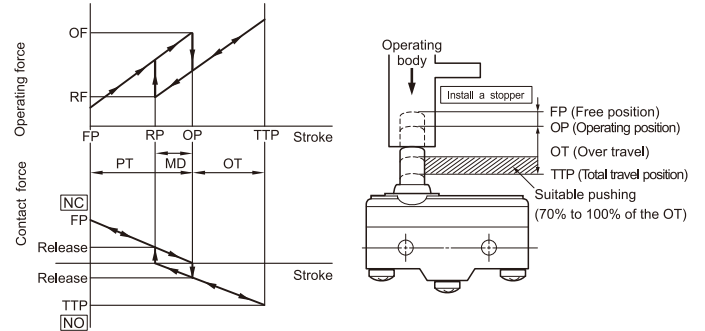
- Do not use the switch outdoors (places that receives constant sunlight or is exposed to rain) and in an atmosphere with ozone, or the case may deteriorate.

## ■ Durability

The durability of a switch greatly varies with switching conditions. Before using a switch, be sure to test the switch under actual conditions in the actual application and to use the switch within the switching operations causing no problem. If a deteriorated switch is used continuously, insulation failures, contact welding, contact failures, switch damage, or switch burnout may result.

## ■ Operating Stroke Setting

- To obtain high reliability from a switch, a switch actuator must be manipulated within an appropriate range of operating force. The diagram below shows the relationship among operating force, stroke, and contacting force.

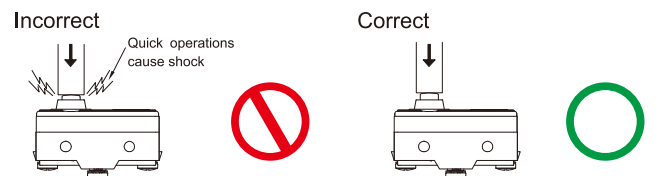


- Make sure that the operating body is set so that the actuator should return to the free position when the operating body has moved if a switch is used to form a normally closed (NC) circuit. If a switch is used to form a normally open (NO) circuit, the operating body must move the switch actuator to the distance of 70% to 100% of the rated over travel (OT) of the switch.

## ■ Switching Speed and Frequency

The switching frequency and speed of a switch have a great influence on the performance of the switch. Pay attention to the following and use the switch within the specifications in this catalog.

- If the actuator is operated too slowly, the switching operation may become unstable, causing contact failures or contact welding.
- If the actuator is operated too quickly, the switch may be damaged by shock.
- If the switching frequency is too high, the switching of the contacts cannot catch up with the operating speed of the actuator.
- If the operating frequency is extremely low (i.e., once a month or less frequent), a film may be generated on the surface of the contacts, which may cause contact failures.



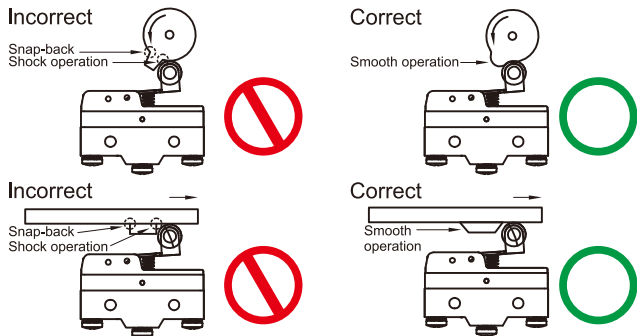
## ■ Operating Condition

Do not leave a switch with the actuator depressed for a long time, otherwise the parts of the switch may soon deteriorate and its operating characteristics may change.

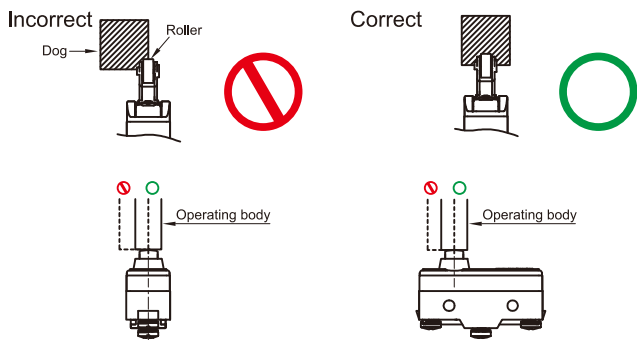
## ■ Operating Method

The operating method has a great influence on the performance of a switch. Consider the following before operating a switch.

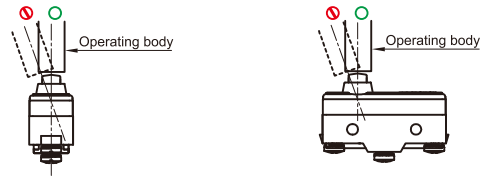
- Design the operating body (i.e., cam or dog) so that it will operate the actuator smoothly. If the actuator snaps backwards quickly or receives shock due to the shape of the operating body even only a few times, its durability may be deteriorated.



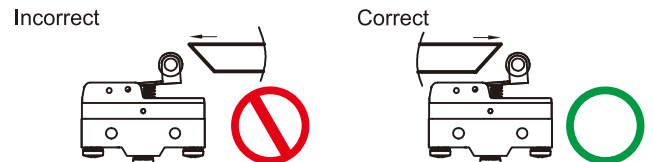
- Make sure that no improper force is applied to the actuator, otherwise the actuator may incur local abrasion. As a result, the actuator may become damaged or its durability may be deteriorated.



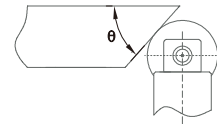
- Make sure that the operating body moves in a direction where the actuator moves. If the actuator is a pin plunger type, make sure that the operating body presses the pin plunger vertically.



- Operate the actuator of a hinge roller lever and similar actuators in the direction shown below.



- Set the angle of the cam or dog ( $\theta$ ) for roller levers and similar actuators to the range between  $30^\circ$  and  $45^\circ$ . If the angle is too large, an abnormally large horizontal stress will be applied to the lever.



## ■ Arc control

The most severe arcing usually is encountered in DC inductive circuits. In this case adding an arc suppression circuit to limit the abrasion of the contacts and to extend switch life.

## ■ Flexible Rod Switch (RZ-15□NJ□)

- When the rod is fully swung, the switch may operate when the lever returns, causing chattering. Use a circuit that compensates for chattering wherever possible.
- Do not switch the rod to the fullest extent when the switch is to break a power circuit because such a practice may cause metal deposition to occur between the mating contacts of the switch.