Safety Precautions

For the individual precautions for a Switch, refer to the safety precautions in the section for that Switch.

<table>
<thead>
<tr>
<th>Precautions for Safe Use</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Note:</strong> Always observe the following cautions to ensure safety.</td>
</tr>
</tbody>
</table>

**Mounting**
Before mounting, dismounting, 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.

**Wiring**
- Do not perform wiring when power is being supplied to a switch. Also, do not touch any of the charged terminals when power is being supplied. Otherwise, electric shock may be received.
- Follow the instructions provided in *Precautions for Correct Use* for all wiring and soldering work. Using a switch with improper wiring or soldering may result in abnormal heating when power is supplied, possibly resulting in burning.

**Contact Load**
Select suitable switch ratings after confirming contact load. If the contact load is excessive for the contacts, the contacts may weld or shift, possibly resulting in short-circuits or burning when power is supplied.

**Load Types**
Some types of load have a large difference between steady-state current and inrush current, as shown in the following diagram. Select a switch with ratings suitable for the type of load. The higher the inrush current in the closed circuit is, the more the contact abrasion or shift there will be. Consequently, contact welding or shifting may occur, possibly resulting in short-circuits or burning.

**Types of Load vs. Inrush Current**

- **Solenoid** (x 10 to 20)
- **Incandescent lamp** (x 10 to 15)
- **Motor** (x 5 to 10)
- **Relay** (x 4 to 5)

**Operating Atmosphere**
Do not use switches in atmospheres containing combustible or explosive gases. Arc or heat generated by switching may cause fires or explosions.

**Shock on Individual Switches**
Do not drop or disassemble switches. Not only will characteristics be jeopardized, but also damage, electric shock, or burning may result.

**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.
Safety Precautions for All Detection Switches

1. Using Switches

• When switches are actually used, unforeseen accidents may occur. Before using a switch, perform all possible testing in advance.

• Unless otherwise specified, ratings and performances given in this catalog are for standard test conditions (i.e., 15 to 35% humidity, and 86 to 106 kPa atmospheric pressure). When performing testing in the actual application, always use the same conditions as will be used in actual usage conditions for both the load and the operating environment.

• Reference data provided in this catalog represents actual measurements from production samples in graph form. All reference data values are nominal.

• All ratings and performance values provided in this catalog are the results of a single test each rating and performance value therefore may not be met for composite conditions.

2. Selecting Correct Switch

Select an appropriate switch for the operating environment and load conditions.

• Use the Selection Guide to select a suitable switch for the rated current, operating load, actuator type, and operating environment.

• It is not recommended to use a switch for a large current to switch a micro current, in terms of contact reliability. Select a switch that is suitable for the current actually being switched.

• Use a sealed switch in environments subject to water, other liquids and excessive dirt or dust.

3. Electrical Conditions

(1) Load

• The switching capacity of a switch significantly differs depending on whether the switch is used to break an alternating current or a direct current. Be sure to check both the AC and DC ratings of a switch. The control capacity will drop drastically if it is a DC load. This is because a DC load, unlike an AC load, has no current zero cross point. Therefore, if an arc is generated, it may continue for a comparatively long time. Furthermore, the current direction is always the same, which results in contact relocation phenomena, and the contacts hold each other with ease and will not separate if the surfaces of the contacts are uneven.

• If the load is inductive, counter-electromotive voltage will be generated. The higher the voltage is, the higher the generated energy is, which increase the abrasion of the contacts and contact relocation phenomena. Make sure to use a switch within the rated conditions.

• If a switch is used for switching both micro and high-capacity loads, be sure to connect relays suitable to the loads.

• The rated loads of a switch are according to the following conditions:
  Inductive Load: A load having a minimum power factor of 0.4 (AC) or a maximum time constant of 7 ms (DC).
  Lamp Load: A load having an inrush current ten times the steady-state current.
  Motor Load: A load having an inrush current six times the steady-state current.

Note: It is important to know the time constant (L/R) of an inductive load in a DC circuit.

Inrush Current

![Inrush Current Graph](image)

(2) Application of Switch to Electronic Circuits

The Basic switch may have contact bouncing or chattering in switching, thus generating noise or pulse signals that may interfere the operation of electronic circuits or audio equipment. To prevent this, take the following countermeasures.

• Design the circuits so that they include appropriate CR circuits to absorb noise or pulse signals.

• Use switches with gold-plated contacts for micro loads, which are more resistive to environmental conditions.

(3) Switches for Micro Loads

If a switch for a general load is used for switching a micro load, it may cause contact failures. Be sure to select a switch within the permissible range. Even if a switch for a micro load is used within the permissible range, the inrush current of the load may deteriorate the contacts, thus decreasing the durability of the switch. Therefore, if necessary, insert a proper contact protective circuit.
Safety Precautions for All Detection Switches

(4) Contact Protective Circuit

Apply a contact protective circuit (surge killer) to extend contact durability, prevent noise, and suppress the generation of carbide or nitric acid due to arc. Be sure to apply the contact protective circuit properly, otherwise an adverse effect may result. Some typical examples of contact protective circuit are described in the following table.

When a switch is used under high humidity, arcs resulting from certain types of load (e.g., inductive loads) will generate nitrous oxides and, with water the nitrous oxides will become nitric acid, which will corrode internal metal parts and may cause malfunctions. Always use a contact protective circuit according to information provided in the following table when using a switch under circuit conditions of frequent switching and arcing.

The use of a contact protective circuit may delay the response time of the load.

Typical Examples of Contact Protective Circuits (Surge Killers)

<table>
<thead>
<tr>
<th>Circuit example</th>
<th>Applicable current</th>
<th>Feature</th>
<th>Element selection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AC</td>
<td>DC</td>
<td></td>
</tr>
<tr>
<td>CR circuit</td>
<td>Yes</td>
<td>Yes</td>
<td>The operating time will increase if the load is a relay or solenoid. It is effective to connect the CR circuit in parallel to the load when the power supply voltage is 24 or 48 V and in parallel to the contacts when the power supply voltage is 100 to 200 V.</td>
</tr>
<tr>
<td>Diode method</td>
<td>No</td>
<td>Yes</td>
<td>Energy stored in the coil is changed into current by the diode connected in parallel to the load. Then the current flowing to the coil is consumed and Joule heat is generated by the resistance of the inductive load. The reset time delay in this method is longer than that of the CR method.</td>
</tr>
<tr>
<td>Diode and Zener diode method</td>
<td>No</td>
<td>Yes</td>
<td>This method will be effective if the reset time delay caused by the diode method is too long.</td>
</tr>
<tr>
<td>Varistor method</td>
<td>Yes</td>
<td>Yes</td>
<td>This method makes use of constant-voltage characteristic of the varistor so that no high-voltage is imposed on the contacts. This method causes a reset time delay more or less. It is effective to connect varistor in parallel to the load when the supply voltage is 24 to 48 V and in parallel to the contacts when the supply voltage is 100 to 200 V.</td>
</tr>
</tbody>
</table>

Do not apply contact protective circuit as shown below.

Incorrect

This circuit effectively suppresses arcs when the contacts are OFF. The capacitance will be charged, however, when the contacts are OFF. Consequently, when the contacts are ON again, short-circuited current from the capacitance may cause contact weld.

Incorrect

This circuit effectively suppresses arcs when the contacts are OFF. When the contacts are ON again, however, charge current flows to the capacitor, which may result in contact weld.
4. Mechanical Conditions

(1) Operating Stroke Setting
The setting of stroke is very important for a switch to operate with high reliability.
The chart below shows the relationship among operating force, stroke, and contact force. To obtain high reliability from a switch, a switch actuator must be manipulated within an appropriate range of operating force.
Be sure to pay the utmost attention when mounting a switch.

- 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 overtravel (OT) of the switch.

- If stroke is set in the vicinity of the operating position (OP) or the releasing position (RP), contact force may become unstable. As a result, the switch cannot ensure high reliability. Furthermore, the switch may malfunction due to vibration or shock.
If stroke is set exceeding the total travel position (TTP), the moment of inertia of the operating body may damage the actuator or the switch itself, and the stress applied to the moving spring inside the switch will increase and then, the durability of the switch may be deteriorated.

(2) 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.
- 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.
The permissible switching speed and switching frequency of a switch indicate the operational reliability of the switch. The durability of a switch is based on operation under specific conditions regarding the switching speed and switching frequency. The durability of a switch may not meet the durability due to conditions even if the switch is operated within the permissible switching speed and frequency ranges. Test a switch sample under the actual conditions to ascertain its durability.

(3) 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 the changes of its characteristics operating may result.

(4) 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, 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.
Safety Precautions for All Detection Switches

- 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 or simulated hinge lever type in the direction shown below.

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

- Do not modify the actuator. If the actuator is modified, excessive external force may be applied to the internal switch mechanism, characteristics may change, and the switch may stop functioning.
- If an external actuator is used as an operating object, check the material and thickness of the lever to make sure that the force applied to the lever is within the permissible range.

5. Mounting

(1) Securing
When mounting a switch, be sure to use the specified mounting screws and tighten the screws with flat 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 flat washers come into contact with the switch housing as shown below. 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.

- Do not modify the switch in any way, for example, by widening the mounting holes.

Locking Agent
If glue or locking agent is applied, make sure that it does not stick to the moving parts or intrude into the inside of the switch, otherwise the switch may have operating failure or contact failure. Some types of glue or locking agent may generate gas that has a bad influence on the switch. Pay the utmost attention when selecting glue or locking agent.

Wiring
Make sure that the lead wires are connected with no inappropriate pulling force.

Mounting Location
Be sure not to mount a switch in locations where the switch may be actuated by mistake.

Maintenance and Inspection
Make sure that a switch is mounted in locations that allow easy inspection or replacement of the switch.

Mounting Direction
When using a switch with a low operating force mounted with a long lever, make sure that the switch is mounted in the direction where the weight of the lever is not applied to the pushbutton directly, otherwise the switch may have releasing failures.
Safety Precautions for All Detection Switches

(2) Terminal Connections
Solder Terminals
When soldering lead wires to a switch, make sure that the temperature of the iron tip is 380°C maximum. Improper soldering may cause abnormal heat radiation from the switch and the switch may burn.
Complete soldering within 5 seconds at 350°C or within 3 seconds at 380°C. If heat is applied for longer period of time, switch characteristics will be deteriorated, e.g., the case will melt and lead wire insulation will scorch.
Soldering conditions are even more strict for ultra subminiature switches. Refer to the Precautions for individual models for details.

Quick-Connect Terminals
Use the specified receptacles to connect to quick-connect terminals.
Do not apply excessive force horizontally or vertically to the terminals, otherwise the terminal may be deformed or the housing may be damaged.

Wiring Work
When wiring a switch, check the insulation distance between the switch and the mounting plate. If the insulation distance is insufficient, use an insulation guard or separator. Be particularly careful when mounting a switch to metal.
Use wire sizes suitable for the applied voltage and carrying current.
Do not wire a switch while power is being supplied.

(3) Soldering Precautions
When soldering by hand, place the terminal horizontal to the ground, use a soldering iron with a suitable heat capacity and a suitable amount of solder, and complete soldering quickly. Prevent flux from entering a switch by exhausting flux gas with an exhaust fan and by avoiding the contact of the tip of the soldering iron and the switch body. Flux gas inside a switch may cause contact failure. Do not apply any force to the terminal or wire immediately after soldering.

Using Separators
If providing sufficient insulation distance is a problem or there are metal components or copper wire near a switch, use a separator (order separately) to provide sufficient insulation distance.

(6) Operation and Storage Environment
(1) Handling
Do not apply oil, grease, or other lubricants to the sliding parts of a switch. The intrusion of oil, grease, or other lubricants into the internal part may cause operating failure or contact failure.

(2) Operating Environment
- A general switch is not water-resistant. Protect the switch appropriately when using the switch in places with water or oil spray.
- Do not use a switch under the condition where vibration or shock is continuously applied to the switch. If continuous vibration or shock is applied to a switch, contact failure, malfunction, or decrease in durability may be caused by abrasive powder generated from the internal parts. If excessive vibration or shock is applied to a switch, the contacts may malfunction, stick, or be damaged.
  Mount a switch in the location where vibration and shock is not applied to the switch and in the direction where they do not resonate.
- Do not use a switch in the atmosphere of corrosive gas, such as sulfurous gas (H₂S or SO₂), ammonium gas (NH₃), nitric gas (HNO₃), or chlorine gas (Cl₂), or in the atmosphere of high temperature and humidity. Otherwise, contact failure or corrosion damage may result.
  - If a switch is used in the atmosphere of silicon gas, arc energy may attract silicon dioxide (SiO₂) to the contacts and contact failure may result. If there is silicon oil, silicon sealant, a wire covered with silicon, or any other silicon-based product near the switch, attach a contact protective circuit to suppress the arcing of the switch or eliminate the source of silicon gas generation. Even for a sealed switch, it may not be possible to prevent all of the gas from penetrating the seal rubber, and contact failure may result.
  - Be sure to use a switch at a temperature and humidity within the specified ranges. If a switch is exposed to radical temperature changes or intense heat, the characteristics of the switch may change. Separate the switch as far as possible from sources of heat to eliminate the influence.

(3) Storage Environment
When storing a switch, consider countermeasures (e.g., storing in a plastic bag) to prevent discoloration resulting from sulfidization of terminals (silver-plated). Make sure that the location is free of corrosive gas or dust with no high temperature or humidity. It is recommended that a switch be inspected before use if it is stored for three months or more after the production, depending on the location.
### 7. Switch Trouble and Corrective Action

<table>
<thead>
<tr>
<th>Type</th>
<th>Location of failure</th>
<th>Failure</th>
<th>Possible cause</th>
<th>Corrective action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Failures related to electrical characteristics</strong></td>
<td><strong>Contact</strong></td>
<td>Contact failure</td>
<td>Dust and dirt on the contacts.</td>
<td>Remove the cause of the problem, place the switch in a box, or use a sealed switch.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Water or other liquid has penetrated into a switch.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Chemical substances have been generated on the contact surface due to the atmosphere containing chemical corrosive gas.</td>
<td>Use a switch having contacts with high environmental resistivity (such as gold or alloy contacts).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Chemical substances have been generated on the contact surface when the switch switches a very low load.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Solder flux has penetrated into the switch.</td>
<td>Review the soldering method or use a sealed or flux-light switch.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Silicon gas exists near the switch.</td>
<td>Remove the material generating gas, or adjust contact capacity to prevent formation of silicon compounds on the contacts.</td>
</tr>
<tr>
<td></td>
<td><strong>Malfunction</strong></td>
<td></td>
<td>The contacts are separated from each other by vibration or shock.</td>
<td>Use a switch having a high contact force (generally a high OF).</td>
</tr>
<tr>
<td></td>
<td><strong>Contact welding</strong></td>
<td></td>
<td>The load connected to the switch is too high.</td>
<td>Switch the load with a high-capacity relay or magnetic relay or insert a contact protection circuit.</td>
</tr>
<tr>
<td></td>
<td><strong>Insulation degradation (burning)</strong></td>
<td></td>
<td>Contacts have been melted and scattered by arc.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Water has penetrated into the switch because the switch has been used in an extremely hot environment.</td>
<td>Remove the cause of the problem, place the switch in a box, or use a sealed switch.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Liquid has penetrated into the switch and been carbonized by arc heat.</td>
<td></td>
</tr>
<tr>
<td><strong>Failures related to mechanical characteristics</strong></td>
<td><strong>Actuator</strong></td>
<td>Operating failure</td>
<td>The sliding part of the actuator has been damaged because an excessive force was applied on the actuator.</td>
<td>Make sure that no excessive force is applied to the actuator, or use an auxiliary actuator mechanically strong.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Foreign material like dust, dirt and oil has penetrated into the switch.</td>
<td>Remove the cause of the problem or place the switch in a box.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The actuator does not release because the operating body is too heavy.</td>
<td>Use a switch having a higher OF.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The switch is loosely installed and thus does not operate even when the actuator is at the rated OP.</td>
<td>Use a switch having a higher OF.</td>
</tr>
<tr>
<td></td>
<td><strong>Low durability</strong></td>
<td></td>
<td>The shape of the dog or cam is improper.</td>
<td>Change the design of the dog or cam.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The operating method is improper.</td>
<td>Review the operating stroke and operating speed.</td>
</tr>
<tr>
<td></td>
<td><strong>Damage</strong></td>
<td></td>
<td>A shock has been applied to the actuator.</td>
<td>Remove the cause of problem or use a switch mechanically strong.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The caulked part is not good enough or the assembled condition is poor.</td>
<td>Replace the switch with a new one.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Deformation or drop-out Actuator was subjected to an excessive force and force from an inappropriate direction.</td>
<td>Review the handling and operating method.</td>
</tr>
<tr>
<td></td>
<td><strong>Mounting section</strong></td>
<td>Damage</td>
<td>Screws have not been inserted straight.</td>
<td>Check and correct screw insertion method.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The mounting screws were tightened with too much torque.</td>
<td>Tighten the screws with an appropriate torque.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The mounting pitch is wrong.</td>
<td>Correct the pitch.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The switch is not installed on a flat surface.</td>
<td>Install the switch on a flat surface.</td>
</tr>
<tr>
<td></td>
<td><strong>Terminal</strong></td>
<td>Damage</td>
<td>An excessive force was applied to the terminal while being wired.</td>
<td>Do not apply an excessive force.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The plastic part has been deformed by soldering heat.</td>
<td>Reduce the soldering time or soldering temperature. (Refer to the information given under Precautions for that model.)</td>
</tr>
</tbody>
</table>
Safety Precautions for All Tactile Switches

For the individual precautions for a Switch, refer to the safety precautions in the section for that Switch.

<table>
<thead>
<tr>
<th>Precautions for Safe Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use the Switch within the rated voltage and current ranges, otherwise the Switch may have a shortened life expectancy, radiate heat, or burn out. This particularly applies to the instantaneous voltages and currents when switching.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Precautions for Correct Use</th>
</tr>
</thead>
</table>

## Storage

### Storage Environment
To prevent degradation, such as discoloration, in the terminals during storage, do not store the Switch in locations that are subject to the following conditions.

1. High temperature or humidity
2. Corrosive gases
3. Direct sunlight

### Storage Condition
Store the Switches in the packaging box. After the packaging box is opened, use the contents as quickly as possible. When storing leftover parts, make sure that appropriate measures are taken against humidity and corrosive gases.

## Handling

### 1. Operation
Do not repeatedly operate the Switch with excessive force. Applying excessive pressure or applying additional force after the plunger has stopped may deform the contact dome of the Switch, resulting in malfunction. In particular, applying excessive force to Side-operated Switches may damage the caulking, which in turn may damage the Switch. Do not apply force exceeding the maximum (29.4 N (300 gf) for 1 minute, one time) when installing or operating Side-operated Switches. Be sure to set up the Switch so that the plunger will operate in a straight vertical line. A decrease in the life of the Switch may result if the plunger is pressed off-center or from an angle.

### 3. Usage Environment
Before installing the Switch, make sure that the area of installation is not subject to corrosive gases emitted from surrounding parts. Do not use in areas subject to high temperatures, high humidity, or toxic gases such as sulfuric gas (H2S, SO2), ammonia gas (NH3), nitric gas (HNO3), or chlorine gas (Cl2). It can cause corrosive damage to the contacts and result in malfunction.

If there is silicon in the atmosphere, it may stop the contacts from functioning properly.

If silicon products, such as silicon oil, silicon filler, or silicon wires, are used in the surrounding area, install a contact protection circuit to prevent arcing or remove the silicon source.

The following situations may cause water to enter inside the Switch, resulting in a malfunction due to contact failure or corrosion.

- Using the Switch in an outdoor environment where it is exposed to water drops for an extended period of time.
- Using the Switch in an underwater setting where it is subject to strong water pressure.

Do not use Switches that have been dropped. The mating section or other internal parts may be damaged, resulting in malfunction.

## PCBs
The Switch is designed for a 1.6-mm thick, single-side PCB. Using PCBs with a different thickness or using double-sided, through-hole PCBs may result in loose mounting, improper insertion, or poor heat resistance in soldering. These effects will occur, depending on the type of holes and patterns of the PCB. Therefore, it is recommended that a verification test is conducted before use.

If the PCBs are separated after mounting the Switch, particles from the PCBs may enter the Switch. If PCB particles or foreign particles from the surrounding environment, workbench, containers, or stacked PCBs become attached to the Switch, contact failure may result.

### Tactile Switch is not recommended to use for detection purpose due to the sort of Manual Switch. Omron’s Detection Switch is recommended for this purpose.

## 2. Dust Protection
Do not use Switches that are not sealed in dust-prone environments. Doing so may cause dust to penetrate inside the Switch and cause contact failure. If a Switch that is not sealed must be used in this kind of environment, use a sheet or other measure to protect it against dust.

### Soldering

#### 1. General Precautions
Before soldering the Switch on a multilayer PCB, test to confirm that soldering can be performed properly. Otherwise the Switch may be deformed by the soldering heat on the pattern or lands of the multilayer PCB.

Do not solder the Switch more than twice, including rectification soldering. An interval of five minutes is required between the first and the second soldering.

#### 2. Automatic Soldering Baths (B3W)
Soldering temperature: 260°C max.
Soldering time: 5 s max. for a 1.6-mm thick single-side PCB
Preheating temperature: 100°C max. (ambient temperature)
Preheating time: Within 60 s
Make sure that no flux will rise above the level of the PCB. If flux overflows onto the mounting surface of the PCB, it may enter the Switch and cause a malfunction.
3. Reflow Soldering (Surface Mounting)
Solder the terminals within the heating curve shown in the following diagram.

B3SL, B3AL

Note: The above heating curve applies if the PCB thickness is 1.6 mm.

The peak temperature may vary depending on the reflow bath used. Confirm the conditions beforehand.
Do not use an automatic soldering bath for surface-mounted switches. The soldering gas or flux may enter the switch and damage the switch’s plunger operation.

4. Manual Soldering (All Models)
Soldering temperature: 350°C max. at the tip of the soldering iron
Soldering time: 3 s max. for a 1.6-mm thick, single-side PCB
Before soldering the switch on a PCB, make sure that there is no unnecessary space between the switch and the PCB.

Washing
1. Washable and Non-washable Models

<table>
<thead>
<tr>
<th>Washable (sealed types)</th>
<th>B3W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-washable (standard types)</td>
<td>B3SL, B3AL</td>
</tr>
</tbody>
</table>

Standard switches are not sealed, and cannot be washed. Doing so will cause the washing agent, together with flux or dust particles on the PCB, to enter the switch, resulting in malfunction.

2. Washing Methods
Washing equipment incorporating more than one washing bath can be used to clean washable models, provided that the washable models are cleaned for one minute maximum per bath and the total cleaning time does not exceed three minutes.

3. Washing Agents
Apply alcohol-based solvents to clean washable models. Do not apply any other agents or water to clean any washable model, as such agents may degrade the materials or performance of the switch.

4. Washing Precautions
Do not impose any external force on washable models while washing. Do not clean washable models immediately after soldering. The cleaning agent may be absorbed into the switch through respiration as the switch cools. Wait for at least three minutes after soldering before cleaning washable models.
Do not use sealed switches while submersed in water or in locations exposed to water.