

Lighted Pushbutton Switch

A3D

Lighted Pushbutton Switch with Cylindrical 18-mm × 8-dia. Body

- Good illumination with even surface brightness.
- Cylindrical body means panel cutouts can be made easily.
- Combines miniature design with excellent operating sensitivity.



Ordering Information

■ Model Number Legend:

The model numbers used to order sets of Units are illustrated below. One set comprises the Pushbutton (LED lamp built-in) and Switch.

(1) (2) (3)
A 3 D J - 9 0 A 1 - 0 0 E R

(1) Shape of Pushbutton

| Symbol | Shape |
|--------|-------------|
| J | Rectangular |
| A | Square |
| T | Round |

(2) Switch Specifications
Microload (30 VDC, 0.1 A)

| Symbol | Terminals | Operation | Contact |
|--------|-----------|-----------|---------|
| A | Solder | Momentary | SPST-NO |
| B | | Alternate | |

Minimum applicable load: 1 mA at 5 VDC

Standard load models are not available.

If PCB terminals are required, use the Socket given under *Accessories* on page 22.

Momentary operation: Self-resetting
Alternate operation: Self-holding

(3) Color of Pushbutton

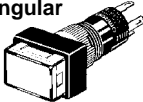
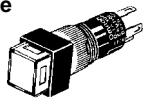
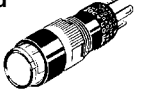
| Symbol | Color |
|--------|--------|
| R | Red |
| Y | Yellow |
| G | Green |
| W | White |

All models are illumination only. Colored-illumination models are not available.

Non-lighted models are not available.

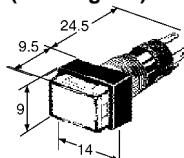
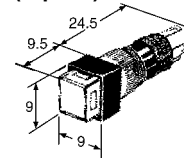
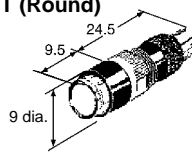
An external resistor is required. (Refer to page 28.)

■ List of Models

| Appearance | Model |
|--|-------|
|  Rectangular | A3DJ |
|  Square | A3DA |
|  Round | A3DT |

■ Ordering as a Set

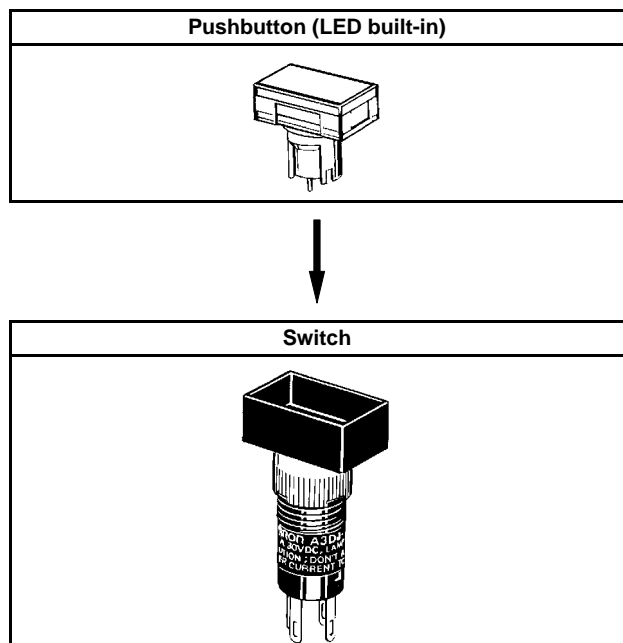
The model numbers used to order sets of Units are given in the following table. One set comprises the Pushbutton (LED lamp built-in), and Switch.

| Appearance | Degree of protection | Operation | Model number | Color symbol for Pushbutton | |
|--|----------------------|--|----------------|-----------------------------|----------------|
| A3DJ (Rectangular)  | IP40 | Momentary | A3DJ-90A1-00E□ | R, Y, G, W | |
| A3DA (Square)  | | Alternate | A3DJ-90B1-00E□ | | |
| | | A3DT (Round)  | Momentary | | A3DA-90A1-00E□ |
| | | | Alternate | | A3DA-90B1-00E□ |
| | | | Momentary | | A3DT-90A1-00E□ |
| | | Alternate | A3DT-90B1-00E□ | | |




- Note:**
1. Enter the desired color symbol for the Pushbutton in □.
 2. All the above are solder-terminal, microload, SPST-NO, LED lamp-lighted models.

■ Ordering Individually

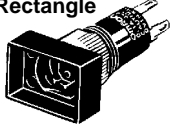
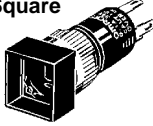
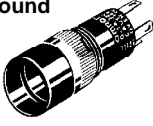
Pushbuttons and Switches can be ordered separately. Combinations that are not available as sets can be created using individual Units. Also, store the parts as spares for maintenance and repairs.







Pushbutton (All Lighted with LED Built-in)

| Appearance | Rectangular | Square | Round |
|---|-------------|---|---|
|  | |  |  |
| Color | | | |
| Red | A3DJ-500R | A3DA-500R | A3DT-500R |
| Yellow | A3DJ-500Y | A3DA-500Y | A3DT-500Y |
| Green | A3DJ-500GY | A3DA-500GY | A3DT-500GY |
| White | A3DJ-500W | A3DA-500W | A3DT-500W |

Switch

| | | | Sealing Appearance | IP40 | | |
|--------------|------------------|------------------|--------------------|---|---|---|
| | | | | Rectangle | Square | Round |
| Contact type | Operating action | Terminal type | |  |  |  |
| SPST-NO | Momentary | Solder terminals | | A3DJ-7111 | A3DA-7111 | A3DT-7111 |
| | Alternative | Solder terminals | | A3DJ-7121 | A3DA-7121 | A3DT-7121 |

■ Accessories (Order Separately)

| Name | Appearance | Classification | Model | Application precautions |
|------------------|---|--------------------|-----------|--|
| Socket |  | Wire-wrap terminal | A3D-4101 | Cannot be used together with Insulation Cover. |
| | | PCB terminal | A3D-4102 | |
| | | Solder terminal | A3D-4103 | |
| Insulation Cover |  | --- | A3D-3002 | Cannot be used together with the Socket. |
| Tightening Tool |  | --- | A3D-3004 | Do not tighten to a torque exceeding 0.29 N·m. |
| Legend Plate |  | Rectangular | A3DJ-5201 | One milky-white Legend Plate is included with standard products. |
| | | Square | A3DA-5201 | |
| | | Round | A3DT-5201 | |

Specifications

■ Ratings

Contact Rating: 30 VDC, 0.1 A (Minimum Applicable Load: 5 VDC, 1 mA)

The above ratings conform to JIS C4505, for testing under the following conditions.

1. Load: Resistive load
2. Mounting conditions: No vibration or shock
3. Ambient temperature: $20 \pm 2^{\circ}\text{C}$.
4. Operating frequency: 20 times/min.

Built-in LED Lamp

| Item | | Color | | |
|-----------------------------|-------------------------------|--------|---------------------------------|--------|
| | | Red | Yellow (White) (See note 4.) | Green |
| Forward voltage, V_F | Reference value (See note 3.) | 1.7 V | 2.2 V | 2.1 V |
| | Maximum value | 2.0 V | 2.5 V | 2.5 V |
| Forward current, I_F | Reference value | 20 mA | 20 mA | 20 mA |
| | Absolute maximum value | 50 mA | 50 mA | 50 mA |
| Permissible dissipation, PD | Absolute maximum value | 100 mW | 125 mW | 122 mW |
| Reverse voltage, V_R | Absolute maximum value | 4 V | 4 V | 4 V |

- Note:**
1. The above ratings are for an ambient temperature of 25°C .
 2. The built-in LED lamp has no limiting resistor and so it is necessary to connect an external resistor within the range shown in the above table. (For details of calculation formulas, refer to page 28.)
 3. Refer to the characteristic graphs of $V_F - I_F$ on page 24.
 4. The same LED lamp is used for both yellow illumination and white illumination and so the ratings are the same.

■ Characteristics

| | |
|---------------------------------|--|
| Operating frequency | Mechanical: 120 operations/minute max. (See note 1.) Electrical: 20 operations/minute max. |
| Insulation resistance | 100 M Ω min. (at 500 VDC) |
| Dielectric strength | 1,000 VAC, 50/60 Hz for 1 minute between terminals of same polarity |
| | 2,000 VAC, 50/60 Hz for 1 minute between terminals of different polarity, and between each terminal and ground |
| | 1,000 VAC, 50/60 Hz for 1 minute between lamp terminals (See note 2.) |
| Vibration resistance | Malfunction: 10 to 55 Hz, 1.5 mm double amplitude (See note 3.) |
| Shock resistance | Destruction: 500 m/s ² Malfunction: 150 m/s ² (See note 3.) |
| Life expectancy | Mechanical: Momentary operation models: 1,000,000 operations min. Alternate operation models: 100,000 operations min. (One operation consists of set and reset operations.) |
| | Electrical: 100,000 operations min. |
| Weight | Approx. 3 g |
| Ambient operating temperature | -10°C to 55°C (with no icing or condensation) |
| Ambient operating humidity | 35% to 85% |
| Ambient storage temperature | -25°C to 65°C |
| Degree of protection | IP40 |
| Electric shock protection class | Class II |
| PTI (proof tracking index) | 175 |
| Pollution degree | 3 (IEC947-5-1) |


- Note:**
1. With alternate operation models, 60 operations/minute max. One operation cycle consists of set and reset operations.
 2. The figure for dielectric strength between lamp terminals is for when the LED lamp is not mounted.
 3. "Malfunction" in the above table indicates malfunctions of less than 1 ms.

■ Operating Characteristics

| | |
|----------------------|----------------|
| OF max. | 2.45 N |
| RF min. | 0.196 N |
| TT | Approx. 3.5 mm |
| LTA min. (See note.) | 0.5 mm |
| PT max. | 2.5 mm |

Note: The figure for LTA in the table applies only to models with alternate operation.

■ Contact Form

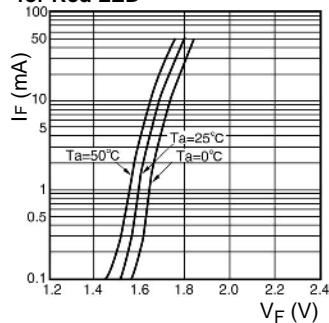
| Contact name | Contact form |
|--------------|--|
| SPST-NO | COM  NO |

Engineering Data

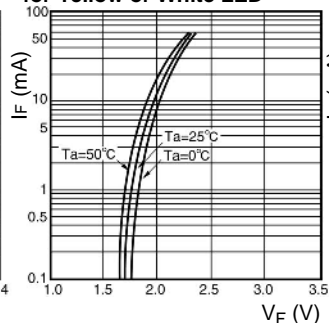
■ LED Characteristics

T_a: Ambient Temperature

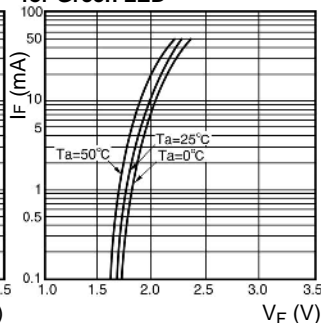
V_F – I_F Characteristic for Red LED



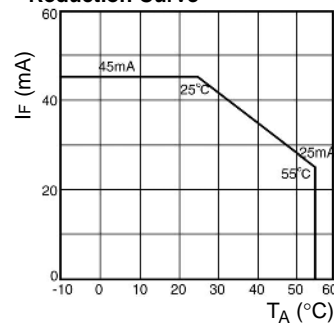
V_F – I_F Characteristic for Yellow or White LED



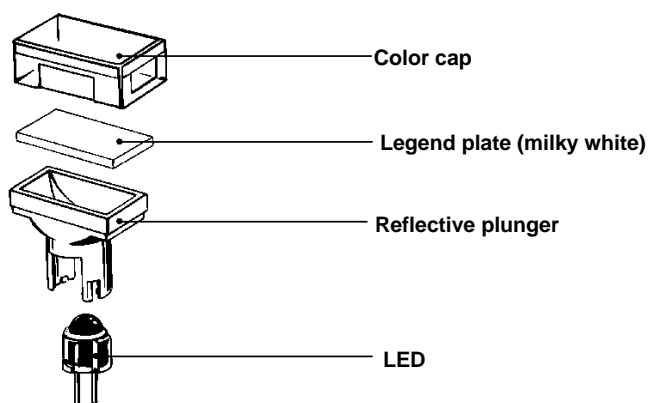
V_F – I_F Characteristic for Green LED



Forward Current Reduction Curve



Nomenclature



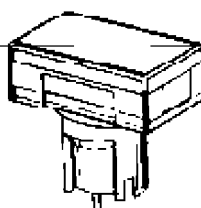
Pushbutton

Shape of Pushbutton

Rectangular (A3DJ)

Square (A3DA)

Round (A3DT)



**– Color of Pushbutton
(All models LED-lighted)**

Red, yellow, green, white

Note: The LED lamp is built into the Pushbutton.

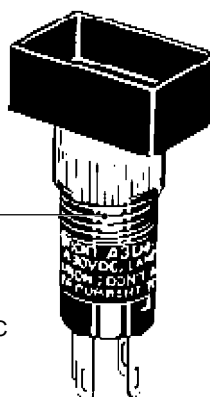
Switch

Switch Specifications

Microload

0.1 A at 30 VDC

Minimum applicable load: 1 mA at 5 VDC

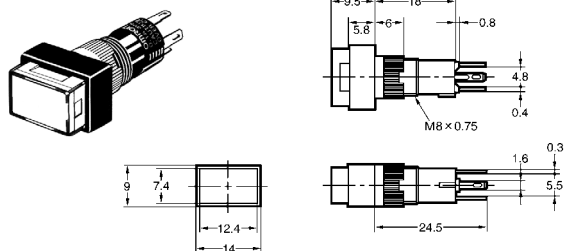


Note: The A3DJ model is shown here as a representative example.

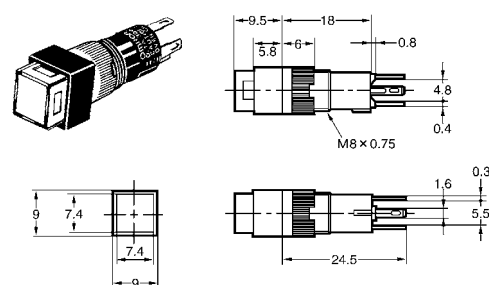
Dimensions

Note: All units are in millimeters unless otherwise indicated.

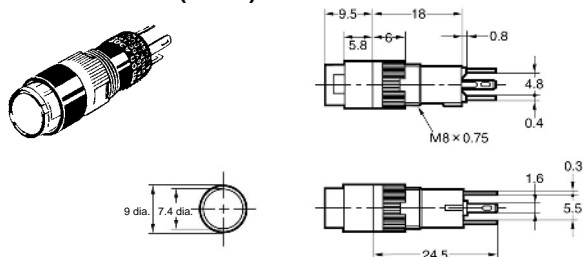
Rectangular Models (A3DJ)



Square Models (A3DA)

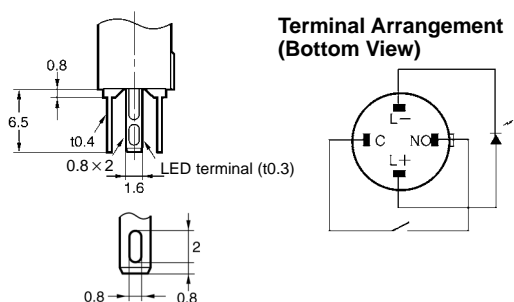


Round Models (A3DT)



■ Terminals

Solder Terminals of SPST-NO Lighted Models



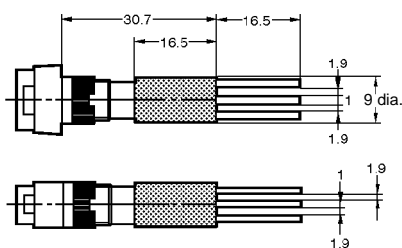
■ Panel Cutouts (Top View)

| Rectangular models (A3DJ) | Square models (A3DA) and round models (A3DT) |
|---|---|
| <p>Note: Recommended panel thickness: 1.0 to 3.2 mm.</p> | <p>Note: Recommended panel thickness: 1.0 to 3.2 mm.</p> |

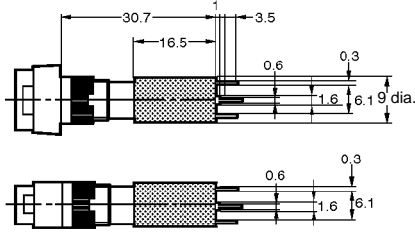
■ Accessory Mounting Dimensions

Socket Mounting Dimensions

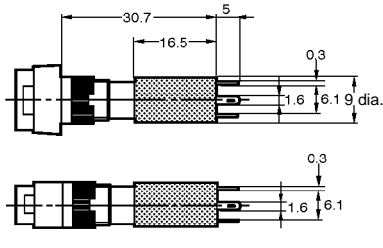
Wire-wrap Terminal A3D-4101



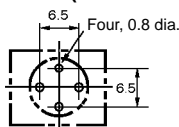
PCB Terminal A3D-4102



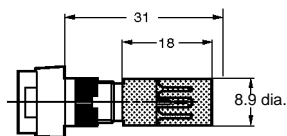
Solder Terminal A3D-4103



PCB Cutout (bottom view)



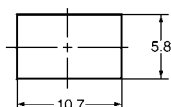
Insulation Cover Mounting Dimensions A3D-3002



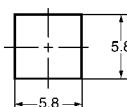
- Note:**
1. The diagram above shows the rectangular model as a representative example.
 2. Unless specified, there is a tolerance of ± 0.4 mm for dimensions.

Legend Plate Mounting Dimensions

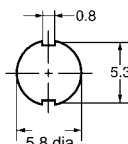
Rectangular A3DJ-5201



Square A3DA-5201



Round A3DT-5201

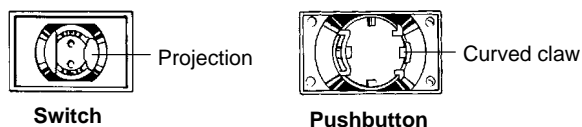


- Note:**
1. The thickness is 0.8 mm.
 2. Since the legend plate is made of polycarbonate, use alcohol-based paints such as melanin, phthalic acid, or acryl paint when marking the legend.

Installation

Mounting and Replacing the Pushbutton

Mounting Direction for the Pushbutton and Switch

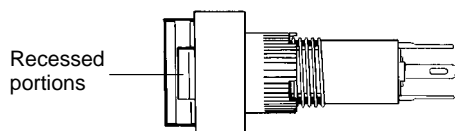


Align the curved claw on the outside of the protruding part of the Pushbutton with the projection on the upper part of the Switch and insert.

Apply a pressure between 9.8 and 24.5 N.

Note: If the terminals of the LED lamp become bent, it may be impossible to fit them into the LED lamp terminal holes. Ensure that the terminals are straight when they are inserted. Be sure to insert the lamp terminals for round models with the correct orientation. Inserting the terminals with the reverse orientation will result in damage.

Removing the Pushbutton



Hold the recessed portions on the cap of the Pushbutton and pull.

Note: Do not use tools such as pliers to remove the Pushbutton as this may damage the cap.

Panel Mounting

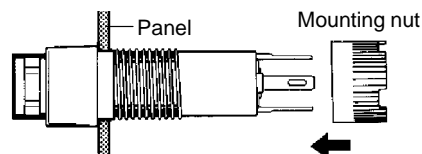
Using the Mounting Nut

Insert the Switch from the front of the panel. Mount the mounting nut from the terminal end of the Switch and tighten it.

Tighten the nut to a torque 0.20 to 0.39 N·m.

- After securing the Switch to the panel using the mounting nut, pass the lead wires through the holes in the Insulation Cover before performing wiring. Hold the Insulation Cover so that the cylindrical hole is facing the Switch, and insert the lead wires from the end with the barriers.
- After wiring is completed, mount the Insulation Cover by pushing it into the Switch.

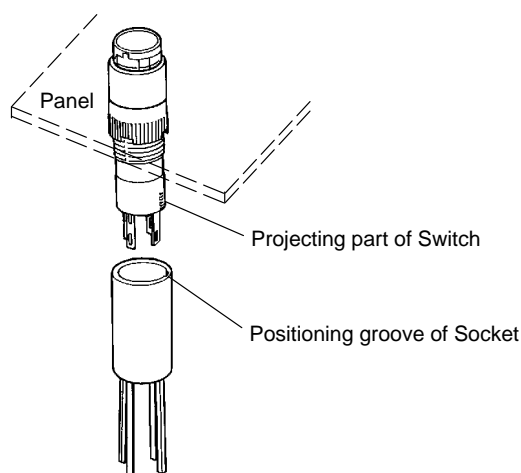
If soldering is used, mount the mounting nut first. Lead wires and mounds of solder may make it impossible to mount the nut after soldering.



Socket Mounting

After securing the Switch to the panel using the mounting nut, insert the Socket into the Switch.

When inserting the Socket, align the positioning groove of the Socket with the projecting part of the Switch.



Precautions

Refer to the *Common Precautions* for Pushbutton Switches on page 14.

Correct Use

Mounting

Always make sure that the power is turned OFF before mounting, removing, or wiring the Switch, or performing maintenance.

Do not tighten the mounting ring excessively using pliers or a similar tool. Excessive tightening may damage the mounting ring. (Tightening torque: 0.20 to 0.29 N·m)

Wiring

When wiring, use wires of a size appropriate for the applied voltage and carry current. Perform soldering correctly under the conditions given below. Using the Switch with the wires soldered incorrectly may cause the terminals to become abnormally hot and cause a fire.

1. Hand soldering: At 30 W within 5 seconds.
2. Dip soldering: At 240°C within 3 seconds.

Wait for one minute after soldering before exerting any external force on the solder.

Use a non-corrosive rosin liquid for the flux.

Perform wiring so that the wire sheaths do not come into contact with the Switch. If this is unavoidable, use wires that can withstand temperatures of 100°C min.

After wiring to the Switch has been completed, ensure an appropriate insulation distance.

LED

The polarity of the LED is indicated on the back of the Switch. Wire the LED correctly according to the polarity.

The built-in LED does not have a limiting resistor. Connect a limiting resistor.

Make sure that the limiting resistor satisfies the characteristics of the built-in LED. The forward current of the built-in LED must be 8 mA minimum.

The resistance can be calculated by using the following expression.

$$R = (E - V_F) / I_F (\Omega)$$

E: Operating voltage (V)

V_F: LED forward voltage (V)

I_F: LED forward current (A)

Recommended Values for Limiting Resistance

| Voltage | Red | Yellow (White) | Green |
|---------|----------------|----------------|----------------|
| 5 VDC | 165 Ω | 140 Ω | 145 Ω |
| 12 VDC | 515 Ω | 490 Ω | 495 Ω |
| 24 VDC | 1,100 Ω | 1,090 Ω | 1,095 Ω |

Note: The above values are calculated values that can be used as reference.

Calculation Example for Limiting Resistance

Conditions: Red LED with an I_F of 20 mA at 24 V and a T_a of 25°C. From the red LED characteristic given previously, V_F will be 1.7 V when I_F is 20 mA. Therefore, $R = (24 \text{ V} - 1.7 \text{ V}) / 0.02 \text{ A} = 1,100 \Omega$. Thus the recommended resistance is 1.1 k Ω at 1 W ($2 \times I_F^2 R$). (see note)

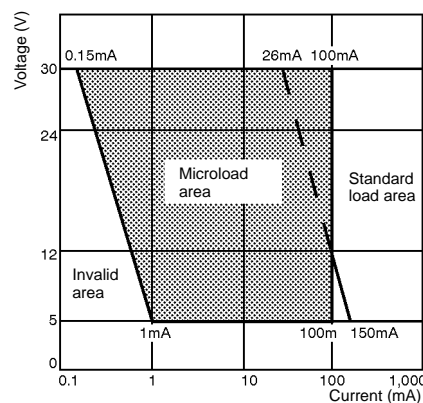
Note: A factor of 2 is applied because the permissible wattage of the resistor must be twice as large as the required wattage.

Operating Environment

Ensure that dust, metal powder, or oil do not enter the interior of the Switch.

Using Microloads

Using a standard load switch for opening and closing a microload circuit may cause wear on the contacts. Use the switch within the operating range. (Refer to the diagram below.) Even when using microload models within the operating range shown below, if inrush current occurs when the contact is opened or closed, it may cause the contact surface to become rough, and so decrease life expectancy. Therefore, insert a contact protection circuit where necessary. The minimum applicable load is the N-level reference value. This value indicates the malfunction reference level for the reliability level of 60% ($\lambda 60$) (conforming to JIS C5003). The equation, $\lambda 60 = 0.5 \times 10^{-4}$ times indicates that the estimated malfunction rate is less than 1/2,000,000 with a reliability level of 60%.



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Common Precautions

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

Cautions

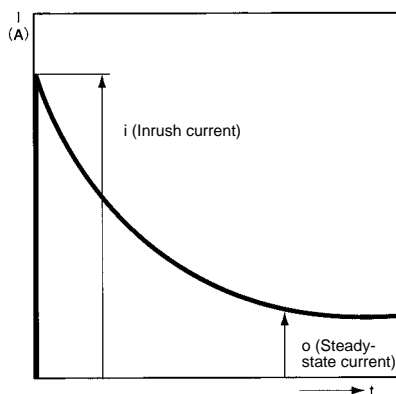
Do not perform wiring or touch the charged parts of terminals while power is being supplied to the Switch. Doing so may result in electric shock.

Electrical Characteristics

Electrical Conditions

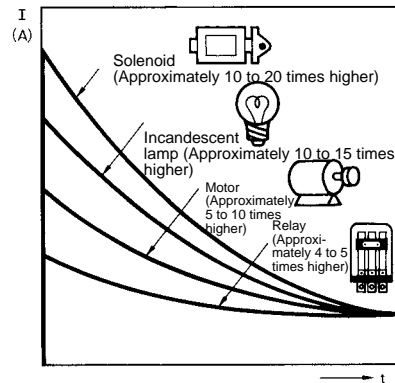
- The switching load capacity of the Switch greatly varies between AC and DC. Always be sure to apply the rated load. The control capacity will drastically drop if it is a DC load. This is because a DC load has no current zero-cross point, unlike an AC load. Therefore, if an arc is generated, it may continue for a comparatively long time. Furthermore, the current direction is always the same, which results in a contact relocation phenomena whereby the contacts easily stick to each other and do not separate when the surfaces of the contacts are uneven.
- Some types of load have a great difference between normal current and inrush current. Make sure that the inrush current is within the permissible value. The greater the inrush current in the closed circuit is, the greater the contact abrasion or shift will be. Consequently, contact weld, contact separation failures, or insulation failures may result. Furthermore, the Switch may be broken or damaged.
- If the load is inductive, counter-electromotive voltage will be generated. The higher the voltage is, the higher the generated energy will be, which will increase the abrasion of the contacts and contact relocation phenomena. Be sure to use the Switch within the rated conditions.

Inrush Current



- Approximate control capacities are given in ratings tables, but these alone are insufficient to guarantee correct operation. For special types of load, with unusual switching voltage or current waveforms, test whether correct operation is possible with the actual load before application.
- When switching for microloads (voltage or current), use a Switch with microload specifications. The reliability of silver-plated contacts, which are used in Switches for standard loads, will be insufficient for microloads.
- When switching microloads or very high loads that are beyond the switching capacity of the Switch, connect a relay suitable for the load.

Type of Load vs. Inrush Current



- All the performance ratings given are for operation under the following conditions unless otherwise specified.

Inductive load: A minimum power factor of 0.4 (AC) and a maximum time constant of 7 ms (DC)

Lamp load: An inrush current 10 times higher than the steady-state current

Motor load: An inrush current 6 times higher than the steady-state current

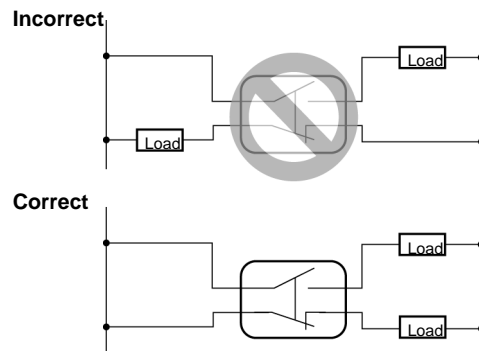
Note: Inductive loads can cause problems especially in DC circuitry. Therefore, it is essential to know the time constants (L/R) of the load.

Load Connections

Do not connect a single Switch to two power supplies that are different in polarity or type.

Connection of Different Polarities

The power supply may short-circuit if the loads are connected in the way shown in the "incorrect" example below.



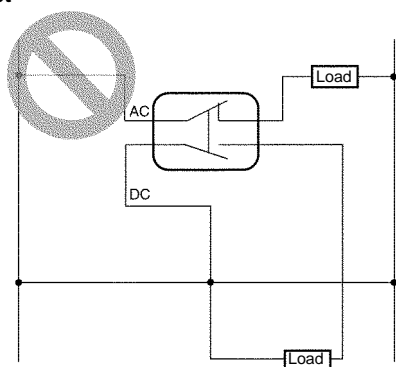
Even in the "correct" example, note that the insulation performance of the switch may deteriorate and the switch life may be shortened because loads are connected to both contacts.

Connection of Different Power Supplies

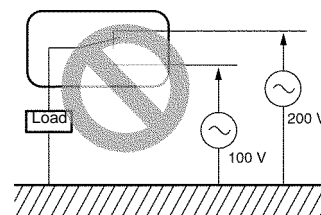
The DC and AC power may be mixed for the circuit shown below.

Do not design a circuit where voltage is imposed between contacts, otherwise contact weld may result.

Incorrect



Incorrect

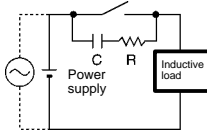
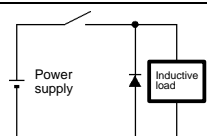
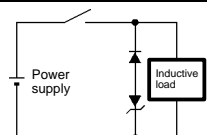
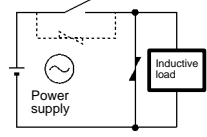


Contact Protective Circuit

Apply a contact protective circuit to extend the contact life, prevent noise, and suppress the generation of carbide or nitric acid. Be sure to apply the contact protective circuit correctly, otherwise an adverse effect may occur.

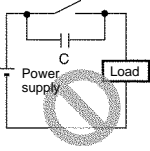
The following provides typical examples of contact protective circuits. If the Limit Switch is used in an excessively humid location for switching a load that easily generates arcs, such as an inductive load, the arcs may generate NOx, which will change into HNO₃ if it reacts with moisture. Consequently, the internal metal parts may corrode and the Limit Switch may fail. Be sure to select the ideal contact preventive circuit from the following.

Typical Examples of Contact Protective Circuits

| Circuit example | Applicable current | | Feature | Element selection |
|---|--------------------|-----|---|--|
| | AC | DC | | |
| CR circuit  | * | Yes | *When AC is switched, the load impedance must be lower than the CR impedance. | C: 1 to 0.5 μ F x switching current (A) R: 0.5 to 1 Ω x switching voltage (V) The values may change according to the characteristics of the load. The capacitor suppresses the spark discharge of current when the contacts are open. The resistor limits the inrush current when the contacts are closed again. Consider the roles of the capacitor and resistor and determine ideal capacitance and resistance values through testing. Basically, use a capacitor with a dielectric strength between 200 and 300 V. When AC is switched, make sure that the capacitor has no polarity. |
| | Yes | Yes | The operating time will be greater if the load is a relay or solenoid. Connecting the CR circuit in parallel to the load is effective 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. | |
| Diode method  | No | Yes | 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 with this method is longer than that in the CR method. | The diode must withstand a peak inverse voltage 10 times higher than the circuit voltage and a forward current as high or higher than the load current. |
| Diode and Zener diode method  | No | Yes | This method will be effective if the reset time delay caused by the diode method is too long. | Use a Zener diode with a Zener voltage that is approximately 1.2 x power supply voltage as, depending on the environment, the load may not operate. |
| Varistor method  | Yes | Yes | 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. Connecting a varistor in parallel to the load is effective when the supply voltage is 24 to 48 V and in parallel to the contacts when the supply voltage is 100 to 200 V. | --- |

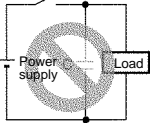
Do not apply contact protective circuits as shown below.

Incorrect



This circuit effectively suppresses arcs when the contacts are OFF. The capacitor 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 will flow to the capacitor, which may result in contact weld.

Switching a DC inductive load is usually more difficult than switching a resistive load. By using an appropriate contact protective circuit, however, switching a DC inductive load will be as easy as switching a resistive load.

Switching

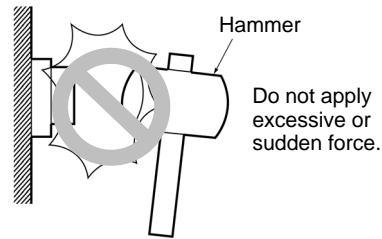
- Do not use the Switch for loads that exceed the rated switching capacity or other contact ratings. Doing so may result in contact weld, contact separation failures, or insulation failures. Furthermore, the Switch may be broken or damaged.
- Do not touch the charged switch terminals while power is supplied, otherwise an electric shock may be received.
- The life of the Switch varies greatly with switching conditions. Before using the Switch, be sure to test the Switch under actual conditions. Make sure that the number of switching operations is within the permissible range. If a deteriorated Switch is used continuously, insulation failures, contact weld, contact failures, switch damage, or switch burnout may result.
- Do not apply excessive or incorrect voltages to the Switch or incorrectly wire the terminals. Otherwise, the Switch may not function properly and have an adverse effect on external circuitry. Furthermore, the Switch itself may become damaged or burnt.
- Do not use the Switch in locations where flammable or explosive gases are present. Otherwise switching arcs or heat radiation may cause a fire or explosion.
- Do not drop or disassemble the Switch, otherwise it may not be capable of full performance. Furthermore, it may be broken or burnt.

Mechanical Conditions

Operating Force and Operating Method

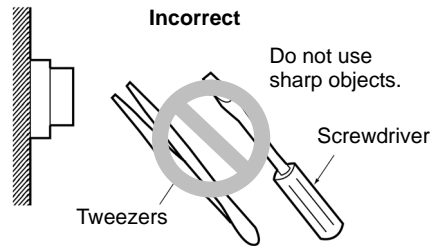
- Fingertip operation is an important feature of Pushbutton Switches. In terms of Switch operation, Pushbutton Switches differ greatly from detection switches such as Microswitches. Operating the Switch using a hard object (e.g., metal), or with a large or sudden force, may deform or damage the Switch, resulting in faulty or rough operation, or shortening of the Switch life. The strength varies with the size and construction of the Switch. Use the appropriate Switch for the application after confirming the operating method and operating force with this catalog.

Incorrect



- The pushbutton surface is composed of resin. Therefore, do not attempt to operate the pushbutton using a sharp object, such as a screwdriver or a pair of tweezers. Doing so may damage or deform the pushbutton surface and result in faulty operation.

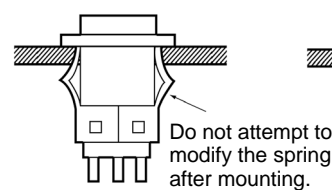
Incorrect



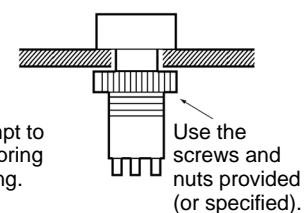
Mounting

- Switches can be broadly divided into two categories according to mounting method: panel-mounting models and PCB-mounting models. Use the appropriate model for the mounting method required. Basically, panel-mounting Switches can withstand a greater operating force than PCB-mounting Switches. If, however, the panel thickness or the panel-cutout dimensions are not suitable for the Switch, it may not be able to withstand the normal operating force. With continuous mounting in particular, select a panel of a thickness that is easily sufficient to withstand the total operating force.
- Panel-mounting Switches can be divided into two categories according to the mounting method: snap-in mounting models and screw-mounting models. Snap-in mounting Switches are held in place with the elasticity of resin or a metal leaf spring. Do not attempt to modify the spring after mounting. Doing so may result in faulty operation or damage the mounting structure. Mount screw-mounting models using the screws and nuts provided (or individually specified). Tighten the screws to the specified torque. Mounting with different screws or nuts, or tightening beyond the specified torque may result in distortion of the inside of the case or damage to the screw section.

Snap-in Mounting

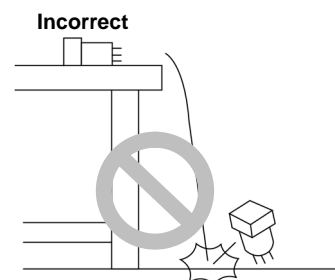


Screw Mounting

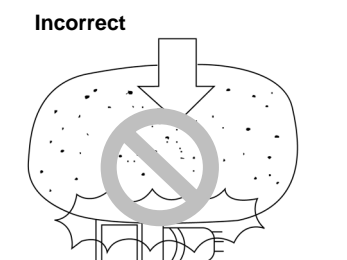


- Subjecting the Switch to severe vibrations or shock may result in faulty operation or damage. Also, many of the Switches are

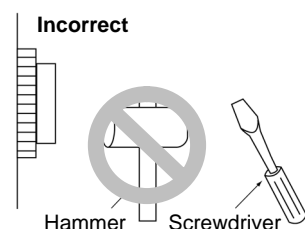
composed of resin so contact with sharp objects may result in damage to the surface. This kind of damage may spoil the appearance of the Switch or result in faulty operation. Do not throw or drop the Switch.



Do not drop or knock the Switch.



Do not drop objects or place heavy objects on the Switch.



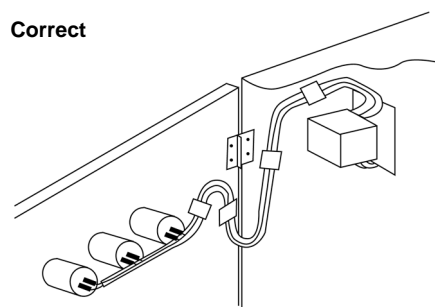
Do not operate the Switch with heavy or sharp objects.

Mounting Precautions

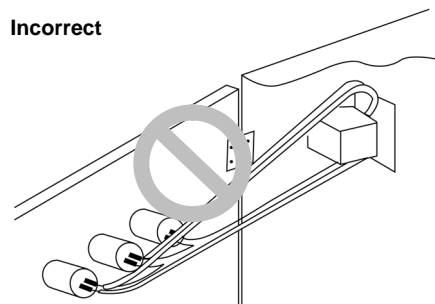
Wiring

- Perform wiring so that the lead wires will not be caught on other objects as this will cause stress on the Switch terminals. Wire the Switch so that there is slack in the lead wires and fix lead wires at intermediate points. If the panel to which the Switch is mounted needs to be opened and closed for maintenance purposes, perform wiring so that the opening and closing of the panel will not interfere with the wiring.

Correct

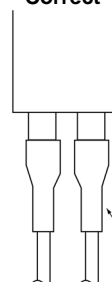


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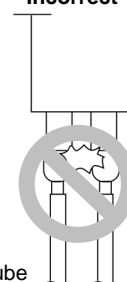


- With miniature Switches, the gap between the terminals is very narrow. Use protective or heat-absorbing tubes to prevent burning of the wire sheath or shorting.

Correct



Incorrect



Protective tube

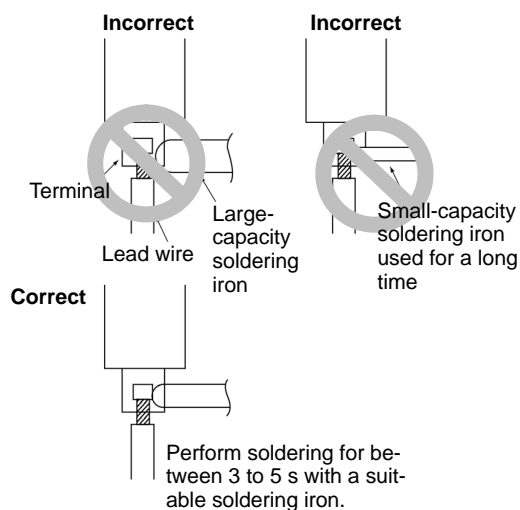
Soldering

- There are two methods for soldering the Switch: hand soldering and automatic soldering. In addition, automatic soldering itself can be divided into two types: dip soldering and reflow soldering. Use the soldering method appropriate for the mounting method.

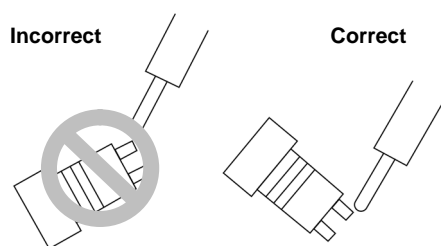
The following table gives some examples of applications using the types of soldering given above.

| Method | | Soldering device | Application |
|---------------------|------------------|--|--|
| Hand soldering | | Soldering iron | Small quantities Different materials Lead wire terminals |
| Automatic soldering | Dip soldering | Jet soldering bath Dip soldering bath | Large quantities of discrete terminals |
| | Reflow soldering | Infrared reflow (IR) soldering bath Vapor-phase (VPS) reflow soldering bath | Large quantities of miniature SMD terminals |

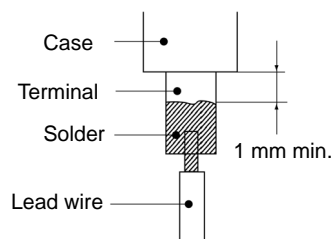
- Do not use soldering flux that contains chlorine. Doing so may result in metal corrosion.
- Perform hand soldering using the appropriate soldering iron.



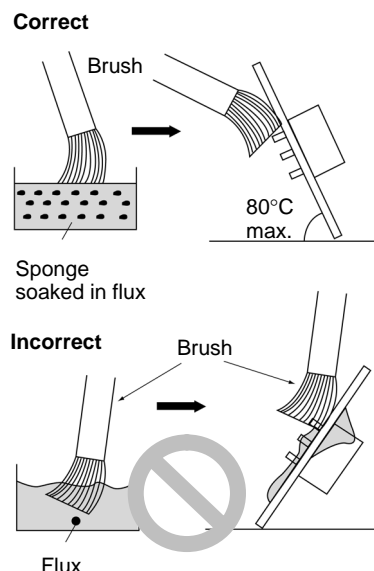
- With the exception of PCB-mounting Switches, when performing hand soldering, hold the Switch so that the terminals point downwards so that flux does not get inside the Switch.



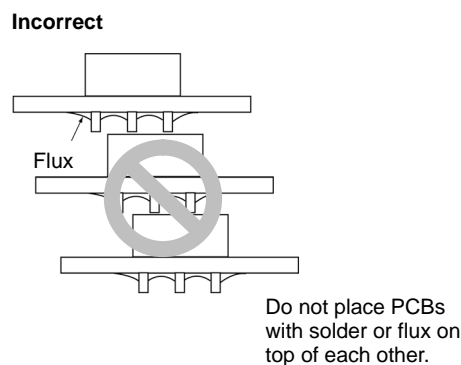
- Leave a gap of at least 1 mm between the soldered parts and the surface of the case so that flux does not get inside the Switch.



- When applying flux using a brush, use a sponge soaked in flux as shown below. Do not apply more than is necessary. Also, apply the flux with the PCB inclined at an angle of less than 80° so that flux does not flow onto the mounting surface of the Switch.



- Do not place PCBs that have had flux applied or have been soldered on top of each other. Otherwise, the flux on the PCB's solder surface may stain the upper part of the Switch or even permeate the inside of the Switch and cause contact failure.

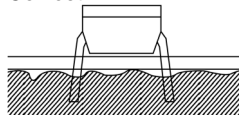


- When performing soldering with a dip soldering bath, ensure that the flux does not reach a higher level than the PCB.

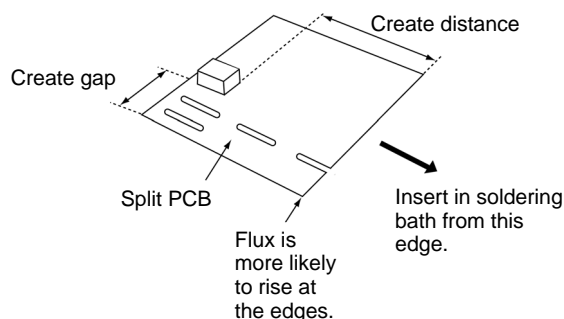
Incorrect



Correct

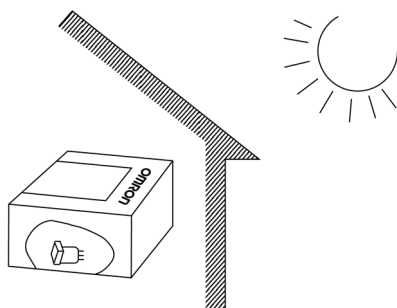


- Flux is especially likely to rise up at the edges of the PCB. If the Switch is mounted near the edge of the PCB, create a gap between the edge by using a split PCB, and insert the PCB in the soldering bath so that the edge that is farthest from the Switch enters the bath first.



Storage

- When the Switch is left unused or stored for long periods, the ambient conditions can have a great effect on the condition of the Switch. In certain environments, leaving the Switch exposed may result in deterioration (i.e., oxidation, or the creation of an oxide film) of the contacts and terminals, causing the contact resistance to increase, and making it difficult to solder the lead wires. Therefore, store in a well-ventilated room, inside, for example, a non-hygroscopic case, in a location where no corrosive gases are present.



- If the Switch is stored in a location where it will be exposed to direct light, colored resin in the colored plate may fade. Therefore, do not store the Switch in locations where it will be exposed to direct light.