

Technical Terminology & Cautions for Use

TECHNICAL TERMINOLOGY

1. Rated values

Values indicating the characteristics and performance guarantee standards of the snap-action switches. The rated current and rated voltage, for instance, assume specific conditions (type of load, current, voltage, frequency, etc.).

2. Mechanical life

The service life when operated at a preset operating frequency without passing electricity through the contacts. (The life test is performed at a switching frequency of 60 times/minute and operating speed of 100 mm/second at the regular cam.)

3. Electrical life

The service life when the rated load is connected to the contact and switching operations are performed. (The life test is performed at a switching frequency of 20 times/minute and operating speed of 100 mm/second at the regular cam.)

4. Contact form

This refers to the components determining the type of application which make up the electrical input/output circuits in the contact.

Switching type	
Normally closed type	
Normally open type	

Terminal symbols
 COM: Common terminal
 NC: Normally closed terminal
 NO: Normally open terminal

5. Insulation resistance

Resistance between noncontinuous terminals, terminals and metal parts not carrying current, and between terminals and the ground.

6. Withstand voltage

Threshold limit value that a high voltage can be applied to a predetermined measuring location for one minute without causing damage to the insulation.

7. Contact resistance

This indicates the electrical resistance at the contact part. Generally, this resistance includes the conductor resistance of the spring and terminal portions.

8. Vibration resistance

Malfunction vibration ... Vibration range where a closed contact does not open for longer than a specified time due to vibrations during use of the snap-action switches.

9. Shock resistance

Shock durability ... Shock range where the mechanical shocks received during snap-action switches transport and installation do not damage the parts or harm the operating characteristics. Malfunction shock ... Shock range where a closed contact does not open for longer than a specified time due to shocks during use of the snap-action switches.

10. Operating Force (O.F.)

The force required to cause contact snap-action. It is expressed terms of force applied to the plunger or the actuator.

11. Release Force (R.F.)

The force to be applied to the plunger or the actuator at the moment contact snaps back from operated position to unoperated position.

12. Pretravel (P.T.)

Distance of the plunger or the actuator movement from free position to operating position.

13. Overtravel (O.T.)

The distance which the plunger or the actuator is permitted to travel after actuation without any damage to the switching mechanism.

14. Movement Differential (M.D.)

The distance from operating to release position of the plunger or the actuator.

15. Operating Position (O.P.)

The position of the plunger or the actuator when the traveling contacts snaps with the fixed contact.

16. Free Position (F.P.)

Position of the switch plunger or the actuator when no force is applied to.

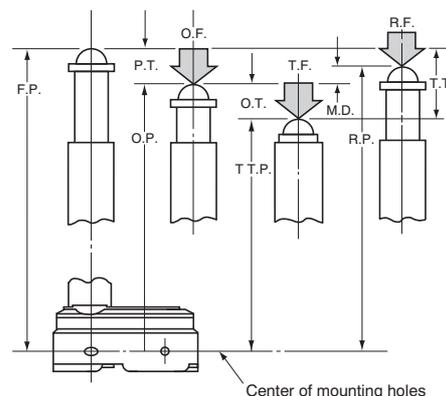
17. Overtravel Position (O.T.P.)

The stopping position of the plunger or the actuator after total travel.

18. Release Position (R.P.)

The position of the plunger or the actuator when the traveling contact snaps back from operating position to its original position.

The following terminologies are applied to all our switches.



CAUTIONS FOR USE

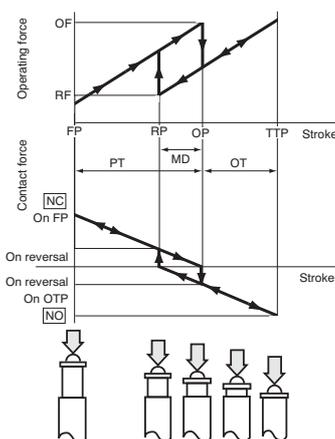
■ Technical Notes on Mechanical Characteristics

1. Actuation Force and Stroke

Adequate stroke setting is the key to high reliability. It is also important that adequate contact force be maintained to ensure high reliability. For a normally closed circuit, the driving mechanism should be set so that the actuator is normally in the free position. For a normally open circuit, the actuator should be pressed to 70% to 100% of the specified stroke to absorb possible errors.

If the stroke is set too close to the operating point (O.P.), this may cause unstable contact, and in the worst case

may cause actuator damage due to inertia of the drive mechanism. It is advisable that the stroke be adjusted with the mounting plate or driving mechanism. The figure at right shows a typical example of activation and contact forces varying with stroke. In the vicinity of the O.P. and R.P., the contact force is diminished, causing chatter and contact bounce immediately before or after reversal. For this reason, use the switch while giving due consideration to this. This also causes the snap action switch to be sensitive to vibration or physical impact.



TECHNICAL TERMINOLOGY & CAUTIONS FOR USE

2. Changes in Operation Characteristics

Exercise design care so that malfunctions will not occur if the snap action switch characteristics vary by as much as 20% from, rated values.

3. Mechanical Conditions for Type Selection

Actuator type should be selected according to activation method, activation

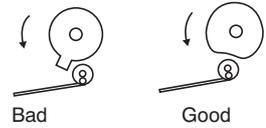
speed, activation rate, and activation frequency.

- 1) An extremely slow activation speed may cause unstable contact transfer, possibly resulting in contact failures or contact fusion.
- 2) An extremely high activation speed may cause damage to contacts or contact response failure.

4. Driving Mechanism

Use of a driving mechanism which will cause physical impact to the actuator should be avoided.

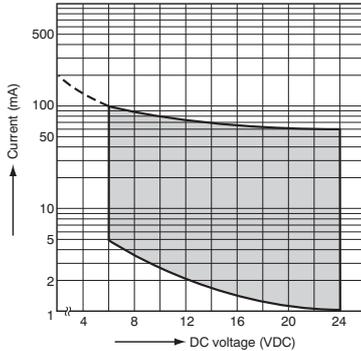
<Example>



■ Technical Notes on Electrical Characteristics

1. The snap-action switch is designed for AC operations. While it has small contact gaps and no arc absorber, it may be used for low-capacity DC operations. (However, a DC magnetic blow-out switch is available in the NZ Basic switches.)
2. For applications with very small switching voltage or current, choose the dry circuit type.

Small current and voltage Application Range (Dry Circuit type)



3. Application to Electronic Circuits

1) The snap-action switch contacts can sustain bounce or chatter when closed. Bounce or chatter can cause noise or pulse count errors when the snap action switch is used in electronic circuits.

2) If contact bounce or chatter poses problems in the vicinity of the O.P. and R.P., use a suitable absorption network, such as a C/R network.

4. Check the surge current, normal current and surge duration.

5. Contact resistance given in performance specifications is measured with a voltage drop method using 6 to 8 V DC, 1 A (except for low-level load type). Contact resistance across COM and NC terminals is measured in the open position, while contact resistance across COM and NO terminals is measured in the closed position.

6. Ratings are measured under the following conditions:

Inductive load:

Power factor = 0.6 to 0.7

Time constant = 7 ms or less (DC)

7. To prevent contact fusion failure, be sure to use a serial resistance for each capacitive load.

8. If snap action switch operation is synchronized with the AC supply phase, this may cause: shortened electrical life, contact fusion failure, contact transfer, or other reliability problems.

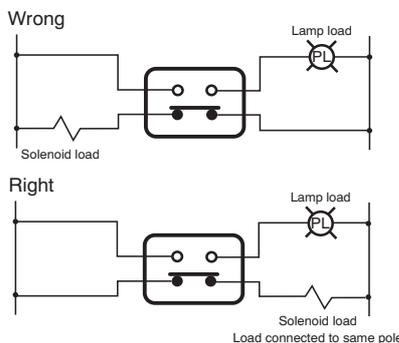
■ Cautions in a circuit

1. Contact protection is recommended when snap-action switches are used in an inductive load circuit. (except for NZ Basic Switches magnetic blow-out types for DC)

2. Do not connect the contacts on individual switches to different type or different poles of the power supply.

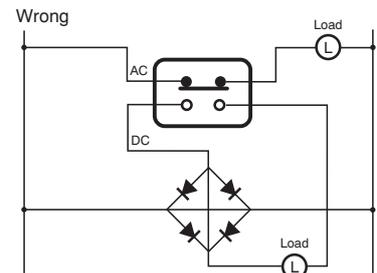
Examples of power supply connections (connection to different poles)

Circuit diagram	Notes
	1. r = more than 10 ohms 2. In an AC circuit. Impedance of L is to be slightly smaller than impedance of r and c .
	Can be used for both AC and DC circuits. Impedance of r is nearly equal to impedance of L. C: 0.1 μ F
	For DC circuits only.
	Can be used for both AC and DC circuits.

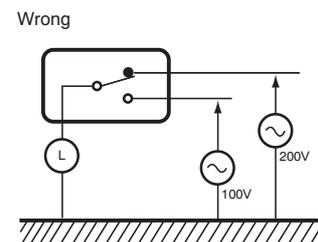


Example of wrong power supply connection (connection to different poles of power supply)

This may lead to mixed DC and AC.



3. Avoid circuits which apply voltage between contacts. (This may lead to mixed deposition.)



■ Mounting state and environment

1. Checking the insulation distance

After mounting and wiring, check the insulation distance between terminals and the ground. If the insulation distance is inadequate, mount insulating material between as required.

2. Fastening the snap-action switch body

See the Section "NOTES" for the individual switch.

3. Position adjustment with effector

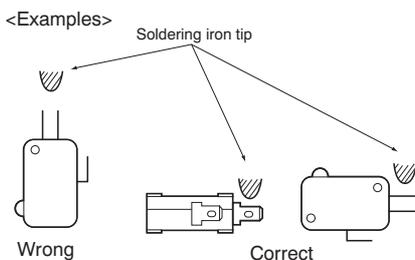
The effector should be positioned so that direct force is not applied to the push-button or actuator in its free position. The operating force to the push-button should only be applied in a perpendicular direction.

4. Soldering precautions

1) For manual soldering, lay the terminals flat (horizontal with the ground) and quickly perform the soldering operation using a soldering iron with the appropriate heat capacity and the proper amount of solder. Take care that the flux does not flow into the switch interior by using a ventilation fan to discharge flux gas and to prevent contact of the switch body with the soldering iron tip. Be careful not to apply force to the lead wires or the terminal portions immediately after soldering.

The temperature setting and time conditions vary depending on the product. See the Section "NOTES" for each product.

2) For automatic soldering also, see the Section "NOTES" for each product.



5. Avoid using in a silicon atmosphere

Avoid using organic silicon rubber, adhesives, sealing compounds, oil, grease, and wires in a silicon atmosphere.

6. Please consult us when using under the following conditions:

- 1) Environments where hydrogen sulfide or other corrosive gases are present.
- 2) Environments where gasoline, thinner or other flammable, explosive gases are present.
- 3) Dusty environments (for non-seal type

snap action switches).

- 4) The perpendicular operating speed exceeds the allowable operating speed.
- 5) Switching between different poles.
- 6) Use in environments not in the prescribed temperature or humidity range.

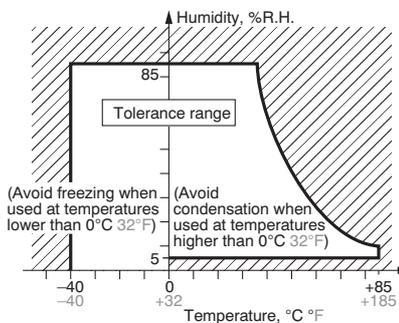
7. Storage precautions

To prevent discoloration due to sulfurization of the terminals (silver-plated), store the switches in a polyethylene bag or other suitable airtight container.

8. Usage, storage, and transport conditions

1) During usage, storage, or transportation, avoid locations subject to direct sunlight and maintain normal temperature, humidity, and pressure conditions. The allowable specifications for environments suitable for usage, storage, and transportation are given below.

- Temperature: The allowable temperature range differs for each switch, so refer to the switch's individual specifications. In addition, when transporting or storing switches while they are tube packaged, there are cases when the temperature may differ from the allowable range. In this situation, be sure to consult the individual specifications.
- Humidity: 5 to 85% R.H.



- Pressure: 86 to 106 kPa

The humidity range varies with the temperature. Use within the range indicated in the graph below.

2) Condensation

Condensation forms when there is a sudden change in temperature under high temperature, high humidity conditions. Condensation will cause deterioration of the switch insulation.

3) Freezing

Condensation or other moisture may freeze on the switch when the temperatures is lower than 0°C 32°F.

This causes problems such as sticking of movable parts or operational time lags.

- 4) Low temperature, low humidity environments

The plastic becomes brittle if the switch is exposed to a low temperature, low humidity environment for long periods of time.

5) Storage for extended periods of time (including transportation periods) at high temperatures or high humidity levels or in atmospheres with organic gases or sulfide gases may cause a sulfide film or oxide film to form on the surfaces of the contacts and/or it may interfere with the functions. Check out the atmosphere in which the units are to be stored and transported.

6) In terms of the packing format used, make every effort to keep the effects of moisture, organic gases and sulfide gases to the absolute minimum.

9. We reserve the right to modify without notice the materials, internal components, and other parts to improve product quality.

10. Handling precautions

When handling the switches, be careful not to drop them on the floor since this may damage them.

For items 5. and 6., select contact sulfurization (clipping) prevention products (FS and Au clad 2-layer contacts) for use with extremely small loads or an environment-resistant Turquoise switch.

11. Others

1) Failure modes of switches include short-circuiting, open-circuiting and temperature rises. If this switch is to be used in equipment where safety is a prime consideration, examine the possible effects of these failures on the equipment concerned, and ensure safety by providing protection circuits or protection devices. In terms of the systems involved, make provision for redundancy in the design and take steps to achieve safety design.

2) The ambient operating temperature (and humidity) range quoted is the range in which the switch can be operated on a continuous basis: it does not mean that using the switch within the rating guarantees the durability performance and environment withstanding performance of the switch. For details on the performance guarantee, check the specifications of each product concerned.