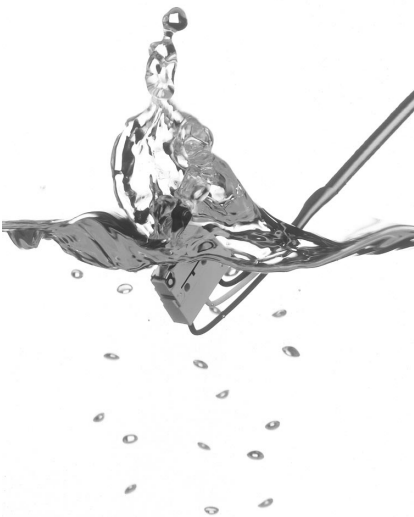


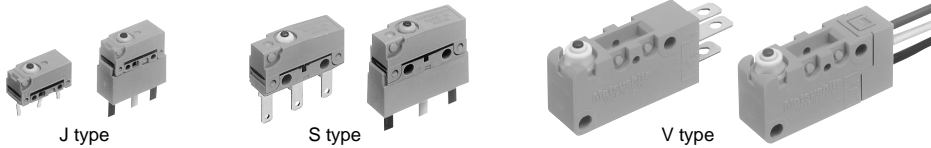
TURQUOISE SWITCHES

High Environmental Resistance Turquoise Colored Seal Switches

Against dust, gas and water



Elastomer double molding technology, an industry first, and ultrasonic swaging technology contribute to uniform sealing in high production quantities IP67 type (immersion protected) Broad lineup: J, S and V models make up over 1,000 types.



Lineup

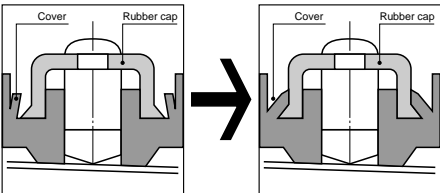
Size	Type	Terminal						Contact	Actuator								Mounting hole
		Solder	PC board		.110 quick-connect	.187 quick-connect	Wire leads		Pin plunger	Hinge lever	Short hinge lever	Long hinge lever	Simulated roller lever	Roller lever	Short roller lever	Leaf lever	
			Straight	Angle													
J type	Terminals	●	●				Au, Ag	●	●				●	●		M1.2, M2.3, M3	
	Wire leads					●	Au, Ag	●	●				●	●	●		
S type	Terminals	●	●	●	●		Au, Ag	●	●	●	●		●	●		M2.3	
	Wire leads					●	Au, Ag	●	●	●	●		●	●	●		
V type	Terminals					●	Au, Ag	●	●				●	●	●	M3	
	Wire leads					●	Au, Ag	●	●				●	●	●		

● Available

Ultrasonic swaging process

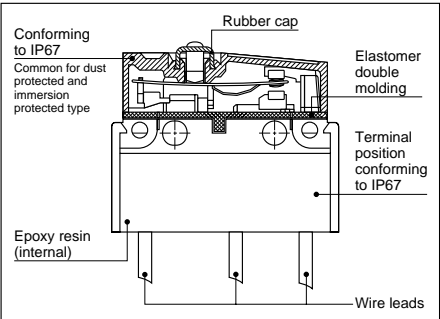
The rubber cap is securely sealed to the switch cover during an ultrasonic swaging process.

Cross section of the rubber cap

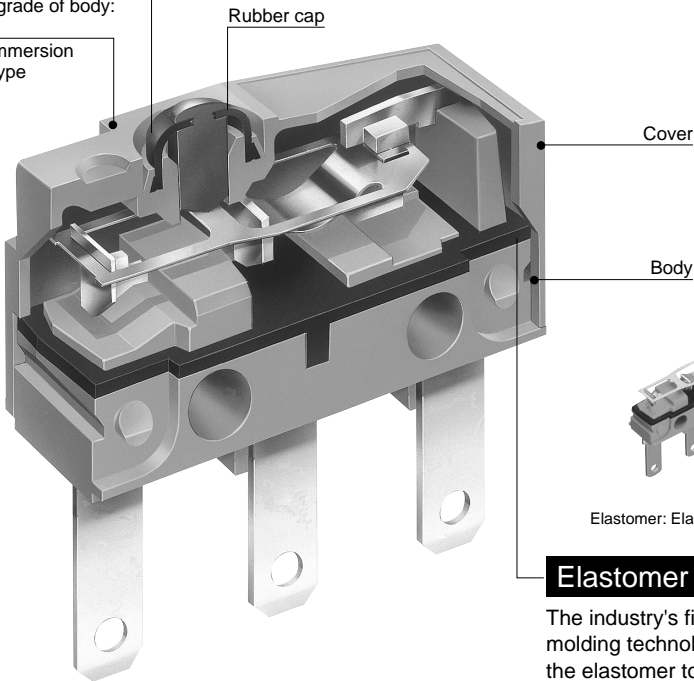


Ultrasonic swaging process: A process which bends the material through ultrasonic vibration.

Cross section of wire leads type



Protective grade of body: IP67
Dust and immersion protected type



Elastomer: Elastic thermoplastic resin

Elastomer double molding

The industry's first elastomer double molding technology is used to mold the elastomer to the switch body. A reliable seal of the body and cover is achieved.

Construction

The dust protected type (IP50) and the immersion protected type (IP67) pass the following tests, respectively. The immersion protected type is especially tested to check for the entry of water after soaking for a certain period of time. Avoid operation where they are immersed in water.

[Test conditions]

- Dust protected type (IP50)
The powder circulation pump may be replaced by other means suitable to maintain the talcum powder in suspension in a closed test chamber. The talcum powder used shall be able to pass through a square- meshed sieve the nominal wire diameter of which is 50 μm and the nominal width between wires 75

μm . The amount of talcum powder to be used is 2 kg per cubic metre of the test chamber volume. The duration of the test is 8 hours.

- Immersion protected type (IP67)
The lowest point of enclosures should be least 1,000 mm below the surface of the water. The duration of the test is 30 minutes.

TURQUOISE SWITCHES IMPORTANT NOTES REGARDING USE

1. Fastening of the switch body

1) When fastening the switch body, use flat filister head M2.3 screws, with tightening torque.

It is recommend that spring washers be used with the screws and adhesive be applied to lock the screws to prevent loosening of the screws and prevent them from loosening.

	Screws	Tightening torque
ABJ	M1.2	Not more than 0.098N·m {1 kgf·cm}
	M2.3	Not more than 0.29N·m {3 kgf·cm}
	M3.0	Not more than 0.29N·m {3 kgf·cm}
ABS	M2.3	Not more than 0.29N·m {3 kgf·cm}
ABV	M3.0	Not more than 0.49N·m {5 kgf·cm}

2) Fixed pin type

To secure the switch unit, thermally crimp or press-fit the mounting pins. If the pins are to be press-fitted, install a guide on the opposite surface to the mounting pins to prevent them from slipping out of position and developing play.

3) Be sure to maintain adequate insulating clearance between each terminal and ground.

4) The positioning of the switch should be such that direct force is not applied to the pushbutton or actuator in its free position. The operating force to the pushbutton should only be applied in a perpendicular direction.

5) The standard value of overtravel used should be within the range of 70% to 100% of the rated O.T. value.

6) When soldering the V-type turquoise switch or the immersion protected type of the J and S type switches, the sealing material sometimes forms a lump or bulge at the base of the terminal or lead. Be sure to allow enough space for this when attaching the switch.

2. Soldering operations

1) Manual soldering: use soldering irons (max. 350°C 662°F) capable of temperature adjustment. This is to prevent deterioration due to soldering heat. Care should be taken not to apply force to the terminals during soldering.

Specifications

	Wattage	Soldering time
ABJ	18 W	Within 3 seconds
ABS	60 W	Within 3 seconds
ABV	60 W	Within 3 seconds

2) Automatic soldering: Soldering must be done as quickly as possible.

250°C 482°F: within 6 seconds

350°C 662°F: within 3 seconds

(Specifications for soldering PC board terminals of dust protected ABJ1/ABS1 switches.)

3) Terminal portions should not be moved within 1 minute after soldering.

3. Variance of operating characteristics
Allow for up to $\pm 20\%$ variation of the specified characteristics values to compensate for long term operational wear of the switch in your design.

4. Cautions regarding use

1) When switching inductive loads (relays, solenoids, buzzers, etc.), an arc absorbing circuit is recommended to protect the contacts.

2) If switching of the contact is synchronized with the phase of the AC power, reduced electrical life or welded contact may occur. Therefore, test the switch while it is operating under actual loads for this condition. If found, you may wish to take corrective action in your design.

3) In the following operating condition, the electrical life might be greatly reduced depending upon the switching load. Please consult us before use.

a) Switching operation at a high or low speed (near limits specified).

b) Continuous usage in high temperature and/or high humidity atmosphere.

c) Usage is high and low cyclically repeated temperatures.

Note: When switching under excessively humid conditions, NO_x generated by the arc and the moisture-laden external atmosphere creates HNO₃ (Nitric acid) which leads to corrosion of the metal parts, thus affecting the operation of the switch.

4) If the build up of dust or dirt becomes so severe that it requires the use of the attached lever, there is the concern that the flexible part may be impeded and return movement may not be possible. In this situation take the following precautions:

- Select a product number for a switch with a higher operation load or use a leaf type lever.
- Attach a protective cover to the lever.

5. Protection from dust, water and corrosive gas

1) The pin button and the space around the body cap Turquoise switches are sealed with elastic material, the terminal portion is integrally molded. This prevents dust entry and protects the switch against corrosive gases. Wireleaded types are recommended for applications subject to water or oil splash. However, avoid soaking these immersion protected types in oil or water, because they types are not of completely oil tight construction.

2) Take care that breathing actions don't allow water vapor to get inside during opening and closing or cause rapid temperature changes.

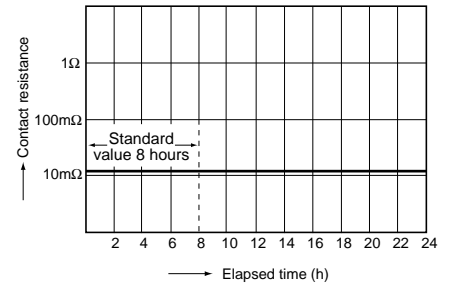
3) Keep away from environments where silicon based adhesives, oil or grease are present as faulty contacts may result from silicon oxide. Do not use in areas where

flammable or explosive gases from gasoline and thinner, etc., may be present.

• Dust protection test

Test conditions:

Dust-protected switches ... Repeatedly pass pure talc powder through a standard wire sieve with a 75 μ m nominal diameter so that the talc is suspended in the air around the switch area. Two kilograms of talc powder should be suspended for each cubic meter of laboratory space. The talc suspension should then be left for eight hours.

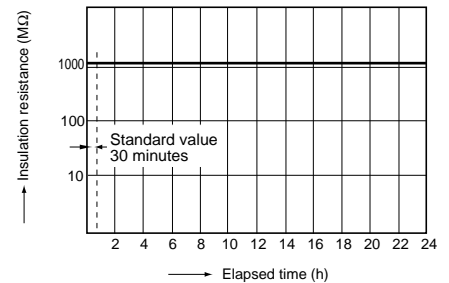


• Waterproof test

Test conditions:

Immersion protected IP67 switches ...

Submerge at 1 m below the water surface for 30 minutes.



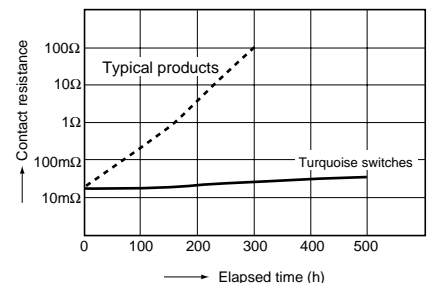
• Hydrogen sulfide exposure test

Test conditions:

Concentration: 3 ppm

Temperature: 40°C 104°F

Humidity: 75% RH



6. Oil-proof and chemical-proof characteristics

The rubber elastomer swells when exposed to oil and chemicals. The extent of swelling will vary widely depending on the type and amount of oil and chemicals. Check with the actual oil or chemicals used.

In particular, be aware that solvents such

NOTES FOR TURQUOISE SWITCHES

as freon, chlorine, and toluene cannot be used.

7. Washability (ABJ and ABS)

The Turquoise switch terminal with lead wires type and without lead wires type-share the same main body. As a result, if the print board terminal type satisfies the set conditions, then it can undergo a complete cleaning after automatic soldering. After soldering is completed, perform cleaning within the prescribed temperature and time range, and pay careful attention to the following points.

1) Perform proper temperature, time, drying control in the cleaning process in order to prevent absorption of the liquid due to respiratory action. Be particularly careful that all the water droplets in the switch

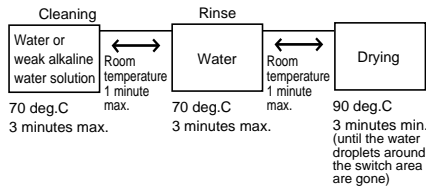
area are cleaned off in the final drying process.

2) Some cleaning liquids (solvents) may harm the rubber parts. Use water or a weak alkaline water solution.

3) Ultrasonic cleaning methods may damage the internal components or contacts. Use immersion or shower cleaning methods. In addition to the above points, the use of automatic cleaning equipment is particularly recommended for easy control of the process temperature and time. The recommended cleaning conditions for the Turquoise switches are shown below.

However, please evaluate the actual cleaning process to verify its suitability for the switch.

Recommended Cleaning Method



REFERENCE

1. Dust-protected type

This type of construction prevents dust that is large enough to have an effect on operation from getting inside the unit. This construction is stipulated by protective classes against solid matter in the IEC standards (IEC529).

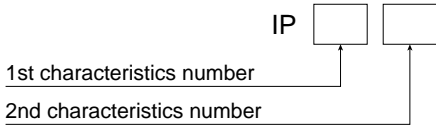
Test conditions: The switch is left for eight hours in a test chamber with a constant level of floating pure talc that has passed through a standard 75µm sieve, in a concentration of 2kg of talc per cubic meter of volume in the test chamber.

2. Immersion-protected type

This type of construction prevents any harmful effects even after the device is left underwater at a depth of one meter for thirty minutes. This construction is stipulated by protective classes against water in the IEC standards (IEC529).

3. IEC's IP Codes

The IEC (International Electrotechnical Commission) has defined the IP characteristic code that represents the levels of protection described in IEC standard 529. The two numbers that follow the IP code (the characteristics numbers) indicate the suitability of this protection for all environmental conditions.



• Level of Protection Indicated by the 1st Characteristics Number

1st Characteristics Number	Protection level (IEC529/Solid matter)
0	No protection
1	Protected against solid matter larger than 50mm
2	Protected against solid matter larger than 12mm
3	Protected against solid matter larger than 2.5mm
4	Protected against solid matter larger than 1.0mm
5	Dust-protected type Prevents dust that is large enough to have an effect on operation from getting inside the unit
6	Dust-resistant type Prevents dust from getting inside the unit

• Level of Protection Indicated by the 2nd Characteristics Number

JIS C0920	2nd Characteristics Number	Protection level (IEC529/Liquid matter)
	0	No protection
Droplet-protected type I	1	Protected against water droplets that fall perpendicular to the unit
Droplet-protected type II	2	Protected against water droplets that fall from within 15° of perpendicular to the unit
Rain-protected type	3	Protected against water droplets that fall from within 60° of perpendicular to the unit
Splash-protected type	4	Protected against water that splashes on the unit from any direction
Spray-protected type	5	Free from adverse effects even if sprayed directly with water from any direction
Water-resistant type	6	Protected against water sprayed directly on the unit from any direction
Immersion-protected type	7	Water does not get inside of the unit when submerged in water according to the specified conditions
Underwater type	8	Unit can be used underwater