

Power Rocker Switches with an Electromagnetic Reset Function

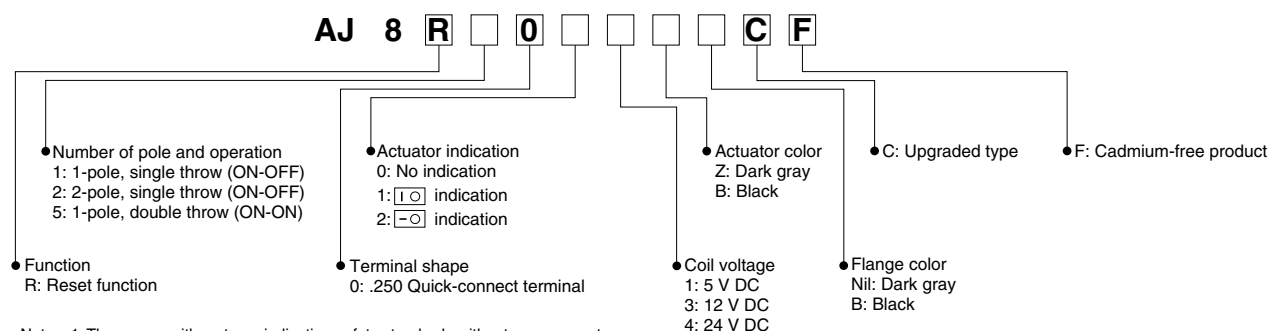
AJ8 SWITCHES WITH TRIP FUNCTION UPGRADED TYPE



FEATURES

- CT terminal adopted for coil terminal
- Long electrical life
- Assures excellent ability to withstand inrush current when used to turn a power supply on/off.

ORDERING INFORMATION



PRODUCT TYPES

Standard actuator color is dark gray and black. To order switches with a black actuator, replace the letter "Z" with "B" in the part numbers shown below when ordering.

(Ex.) AJ8R1001ZC (Actuator color: Dark gray Flange color: Dark gray)

→ AJ8R1001BC (Actuator color: Black Flange color: Dark gray)

■ Without indication on actuators (Actuator color: Dark gray)

Poles	Operation type	Coil voltage	Part No.	
			Flange color: Dark gray	Flange color: Black
1-pole	Single throw (ON-OFF)	5V DC	AJ8R1001ZCF	AJ8R1001ZBCF
		12V DC	AJ8R1003ZCF	AJ8R1003ZBCF
		24V DC	AJ8R1004ZCF	AJ8R1004ZBCF
	Double throw (ON-ON)	5V DC	AJ8R5001ZCF	AJ8R5001ZBCF
		12V DC	AJ8R5003ZCF	AJ8R5003ZBCF
		24V DC	AJ8R5004ZCF	AJ8R5004ZBCF
2-pole	Single throw (ON-OFF)	5V DC	AJ8R2001ZCF	AJ8R2001ZBCF
		12V DC	AJ8R2003ZCF	AJ8R2003ZBCF
		24V DC	AJ8R2004ZCF	AJ8R2004ZBCF

AJ8 Switches with Trip Function Upgraded Type

■ With indication on actuator

1) With | ○ indication (Actuator color: Dark gray)

Poles	Operation type	Coil voltage	Part No.	
			Flange color: Dark gray	Flange color: Black
1-pole	Single throw (ON-OFF)	5V DC	AJ8R1011ZCF	AJ8R1011ZBCF
		12V DC	AJ8R1013ZCF	AJ8R1013ZBCF
		24V DC	AJ8R1014ZCF	AJ8R1014ZBCF
	Double throw (ON-ON)	5V DC	AJ8R5011ZCF	AJ8R5011ZBCF
		12V DC	AJ8R5013ZCF	AJ8R5013ZBCF
		24V DC	AJ8R5014ZCF	AJ8R5014ZBCF
2-pole	Single throw (ON-OFF)	5V DC	AJ8R2011ZCF	AJ8R2011ZBCF
		12V DC	AJ8R2013ZCF	AJ8R2013ZBCF
		24V DC	AJ8R2014ZCF	AJ8R2014ZBCF

2) With —○ indication (Actuator color: Dark gray)

Poles	Operation type	Coil voltage	Part No.	
			Flange color: Dark gray	Flange color: Black
1-pole	Single throw (ON-OFF)	5V DC	AJ8R1021ZCF	AJ8R1021ZBCF
		12V DC	AJ8R1023ZCF	AJ8R1023ZBCF
		24V DC	AJ8R1024ZCF	AJ8R1024ZBCF
	Double throw (ON-ON)	5V DC	AJ8R5021ZCF	AJ8R5021ZBCF
		12V DC	AJ8R5023ZCF	AJ8R5023ZBCF
		24V DC	AJ8R5024ZCF	AJ8R5024ZBCF
2-pole	Single throw (ON-OFF)	5V DC	AJ8R2021ZCF	AJ8R2021ZBCF
		12V DC	AJ8R2023ZCF	AJ8R2023ZBCF
		24V DC	AJ8R2024ZCF	AJ8R2024ZBCF

SPECIFICATIONS

■ Contact rating

Contact voltage	Resistive load (Power factor = 1)	Motor load* (EN61058-1) (Power factor = 0.6)	Inrush load
125V AC	16A	—	100A (8.3ms)
250V AC	10A	4A	—

Note: * The motor load is in accordance with EN61058-1. Inrush current can be switched up to the value of 6 times the indicated rating.

■ Coil rating for electromagnetic reset function

Nominal voltage *(Max. 10 sec)	Drop-out voltage (at 20°C)	Nominal operating current [±10%] (at 20°C)	Coil resistance [±10%] (at 20°C)	Maximum voltage (Max. 1 s)
5V DC	Min. 0.5V Max. 4.5V	725mA	6.9Ω	5.5V
12V DC	Min. 1.2V Max. 10.8V	300mA	40Ω	13.2V
24V DC	Min. 2.4V Max. 21.6V	150mA	160Ω	26.4V

Notes: * If the rated voltage is applied to the coil for more than ten seconds or the maximum voltage is applied for more than one second, coil performance will deteriorate.

* Please apply more than 90% of coil voltage to reset the switch.

■ Characteristics

Item		Specifications
Electrical life	Manual operation	Min.10 ⁴ (at 7 cpm.,at rated load)
	Coil operation	Min.10 ³ (at 7 cpm.,at rated load), Min.5×10 ⁴ (at 7 cpm. 5A 125V AC)
Mechanical life		Min.5×10 ⁴ (at 20 cpm.)
Contact resistance		Initial, Max. 100mΩ (by voltage drop at 1A, 2 to 4V DC)
Insulation resistance		Initial, Min. 100MΩ (at 500V DC measured by insulation resistive meter)
Dielectric strength	Between contacts	Initial, 2,000 Vrms (detection current: 10mA)
	Between coil and contact	Initial, 4,000 Vrms (detection current: 10mA)
Ambient temperature		0°C to +60°C (no freezing and condensing)
Vibration resistance		10 to 55 Hz at single amplitude of 0.75mm, 2 hours each in X, Y and Z directions, Contact opening Max. 1ms
Shock resistance	Functional	Min. 294m/s ² Contact opening Max. 1ms
	Destructive	Min. 980m/s ²
Terminal strength		.250 Quick-connect terminal: Min. 98N/min. (Pull & push direction)
Actuator strength		Min. 39.2N for 1min. (operating direction)
Contact release time		Max. 100ms (at rated voltage)
Operating force (Initial) * Reference value		4.9N or less Setting force after reset has been released: Max. 6.86N
Flame retardancy		UL94V-0
Tracking resistance		Min. 175
Unit weight		1-pole single throw: Approx. 17g, 1-pole double throw: Approx. 19g, 2-pole single throw: Approx. 20g
Contact material		AgSnO ₂ alloy

Note: Test conditions and judgement are in accordance with JIS C 6571, EN61058-1 and UL61058-1.

DIMENSIONS

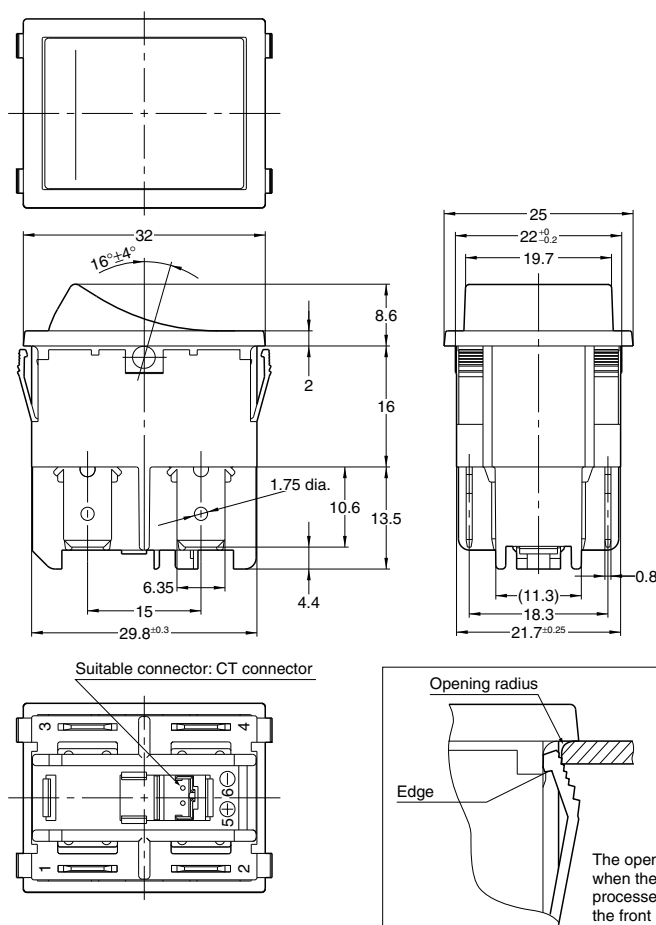
(Unit: mm) General tolerance: ±0.5

CAD Data The CAD data of the products with a "CAD Data" mark can be downloaded from our Website.

2-pole, single throw (ON-OFF)

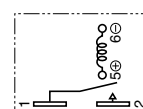
CAD Data

External dimensions



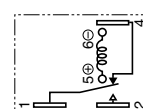
Wiring diagram (Bottom view)

1-pole, single throw (ON-OFF)



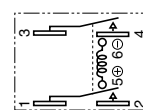
ON (set): 1-2 closed

1-pole, double throw (ON-ON)



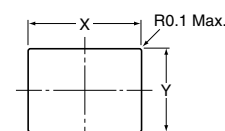
Reset: 1-4 closed
Set: 1-2 closed

2-pole, single throw (ON-OFF)



ON (set): 1-2 closed
3-4 closed

Diagram of recommended panel mounting holes



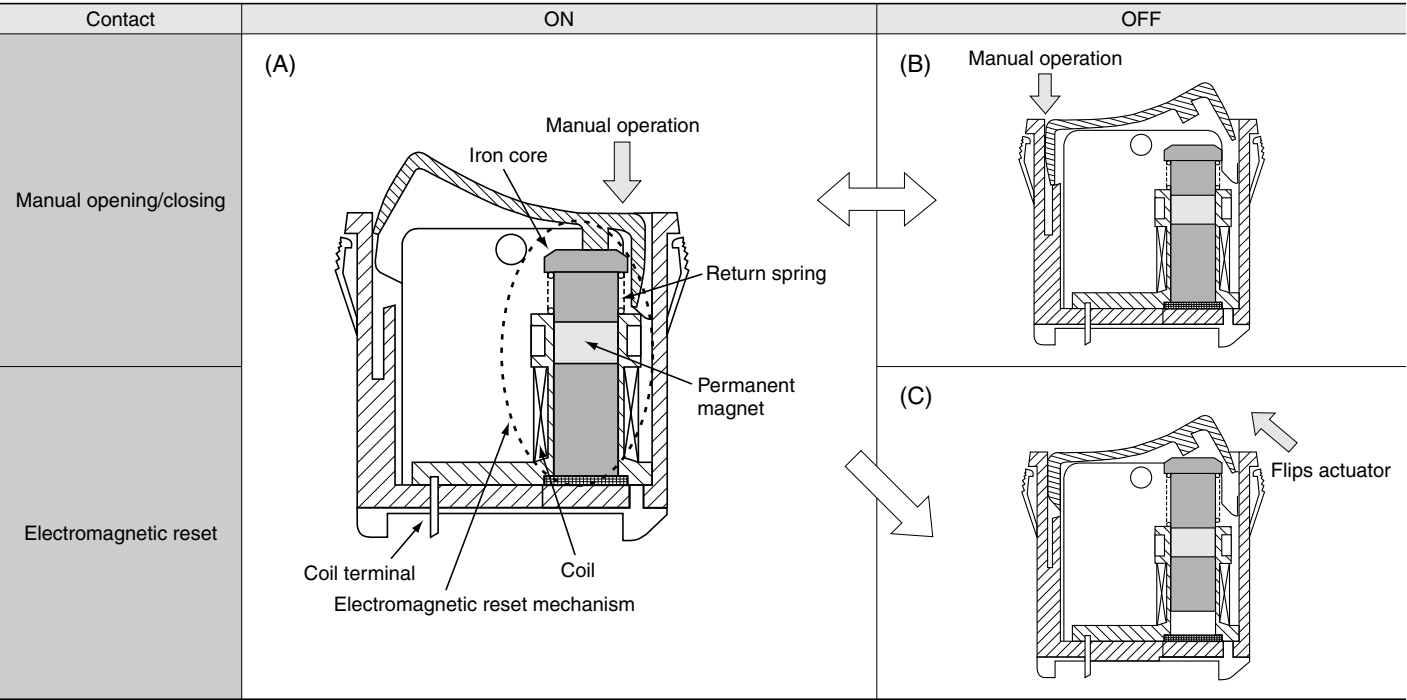
Panel thickness (T)	X	Y
1 to less than 1.8	30.4 ^{+0.1} _{-0.1}	22.0 ^{+0.1} _{-0.1}
1.8 or more to 2.3	31.1 ^{+0.1} _{-0.1}	22.0 ^{+0.1} _{-0.1}

Note: Please contact us if you are considering using a panel of other than the recommended size and shape.

- Notes: 1. The external dimensions and mounting dimensions for the 1-pole, single throw type and the 1-pole, double throw type are the same as those for the 2-pole, single throw type indicated above.
2. The figures show the 2-pole, single throw (ON-OFF) type as an example.
The contact terminals are 1, 2, 3, and 4.
In the case of the 1-pole, single throw (ON-OFF) type, the contact terminals are 1 and 2.
In the case of the 1-pole, double throw (ON-ON) type, the contact terminals are 1, 2, and 4.
There are no other terminals. Refer to the internal wiring diagram.
3. The coil is a polarized coil; coil terminal 5 is positive and coil terminal 6 is negative.

OPERATING PRINCIPLE

- Manual operation is a repetition of (A) and (B). This operation is independent of the electromagnetic reset function.
- The reset mechanism operates only when an electromagnetic reset has occurred. (C)



CAUTIONS FOR USE

■ Operating voltage application time

If the rated voltage is applied to the coil for more than 10 seconds or the maximum voltage is applied for more than 1 second, coil performance may deteriorate.

■ The shape of the mounting panel should be as recommended in the dimensions diagram.

Please contact us if you are considering using a panel of other than the recommended size and shape.

■ The mounting panel should be made of SPCC. If a different material is used, its adhesion to the switch unit may not be as strong. Check this with actual application necessary.

■ Note that the actuator could come off from the switch housing if 19.6N or more of force is applied to the side of the actuator.

■ Regarding fastening lead wires to terminals

- 1) When connecting the .250 Quick-connect terminals, use a .250 receptacle and insert the terminals straight in. If you insert them at an angle, the terminals could catch on the opening and will require greater insertion force.
- 2) The coil terminals have specific polarities. Make sure you connect them correctly.

- 3) Use a receptacle that is compliant with JIS C 2809. In addition, there is some deviation regarding the insertion force depending on the model used from different manufacturers, so the insertion force should be checked under actual conditions.
- 4) Use TE Connectivity Ltd.'s CT connector for the coil terminals.

■ Because special receptacle terminals are used for the contact terminals and the common terminals, do not attempt to solder them. Doing so could melt plastic components and otherwise harm the performance of the switch

■ The terminals should be connected in such a way that they are not under constant stress from the connecting wires.

■ Take care not to drop the product as it may impair performance.

■ Resistance to chemicals

To clean the switch unit, use a neutral detergent diluted with water. Do not use acidic or alkaline solvents as they may damage the switch. Furthermore, be careful not to get any of the detergent solution inside of the switch while cleaning it.

■ This product is not hermetically sealed, so its performance could deteriorate under certain ambient conditions. Avoid using and storing these switches in a location where they will be exposed to corrosive gases, silicon, or high dust levels, all of which can have an adverse effect on the contacts. In addition, because these switches contain permanent magnets, avoid using and storing these switches in a location where metallic dust, etc., is present.

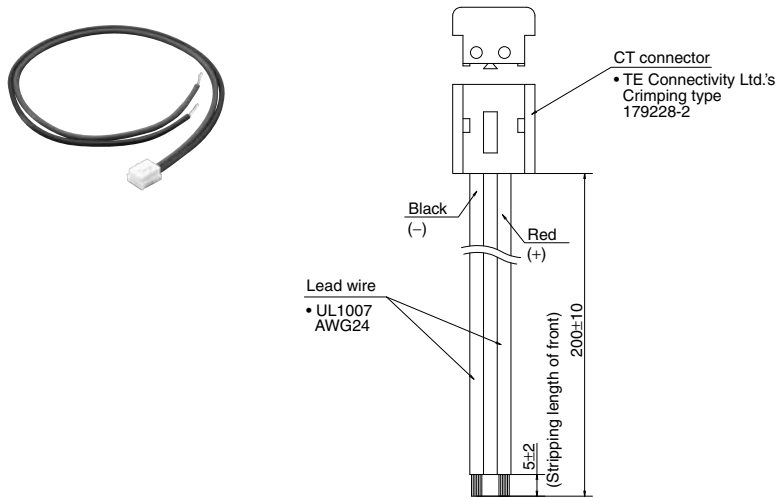
■ When these switches are used with weak currents of 500mA or less, a layer of material on the surface of the contacts may cause contact instability. Check and evaluate this possibility before using these switches under such conditions.

■ When using an ON-OFF type switch with no (| ○) indication on the actuator, the “OFF” position should be indicated on the set in which the switch is installed.

■ To assure reliability, check the switch under actual loading conditions. Avoid any situation that may adversely affect switching performance.

CONNECTION OF COIL TERMINALS

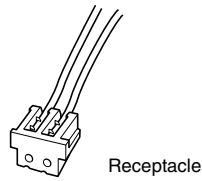
- **Cable with connector** Min. order unit: 1 bag (set of 10)
AJ8C0001 Outer carton: contains 20 bags (total of 200 sets)



(Reference)

Because CT terminals are used for the coil terminals, TE Connectivity Ltd.'s CT connector can be used.

TE Connectivity Ltd.'s CT connector



- **Pressure welding type:**
173977-2: for AWG26, 28
2-179694-2: for AWG24
- **Crimping type:**
179228-2

Technical Terminology & Cautions for Use

(Operation Switches)

TECHNICAL TERMINOLOGY

■ Rated values

Values indicating the characteristics and performance guarantee standards of the switches. The rated current and rated voltage, for instance, assume specific conditions.

■ Electrical life

The service life when the rated load is connected to the contact and switching operations are performed.

■ Mechanical life

The service life when operated at a preset operating frequency without passing electricity through the contacts.

■ Dielectric strength

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

■ Insulation resistance

This is the resistance value at the same place the dielectric strength is measured.

■ Contact resistance

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

■ Vibration resistance

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.

■ Shock resistance

Max. shock value where a closed contact does not open for longer than a specified time due to shocks during use of the switches.

■ Allowable switching frequency

This is the maximum switching frequency required to reach the end of mechanical life (or electrical life).

■ Temperature rise value

This is the maximum temperature rise value that heats the terminal portion when the rated current is flowing through the contacts.

■ Actuator strength

When applying a static load for a certain period on the actuator in the operation direction, this is the maximum load it can withstand before the switch loses functionality.

■ Terminal strength

When applying a static load for a certain period (in all directions if not stipulated) on a terminal, this is the maximum load it can withstand before the terminal loses functionality (except when the terminal is deformed).

TYPES OF LOAD

■ Resistance load

Resistance load is a power factor of 1 ($\cos\phi = 1$) where the load is only for the resistance portion. The displayed switch rating indicates the current capacity when using AC current.

■ DC load

Differing from AC, since the direction of current is fixed for DC, the continuous arc time lengthens when the same voltage is applied.

■ Incandescent lamp load

Since an inrush current of 10 to 15 times the rated current flows for an instant when the switch is turned on for the lamp, adhesion of the contacts may occur. Therefore, please take into consideration this transient current when selecting a switch.

■ Induction load

Since arc generation due to reverse voltage can cause contact failure to occur when there is an induction load (in relays, solenoids and buzzers, etc.), we recommend you insert a suitable spark quenching circuit (see figure below).

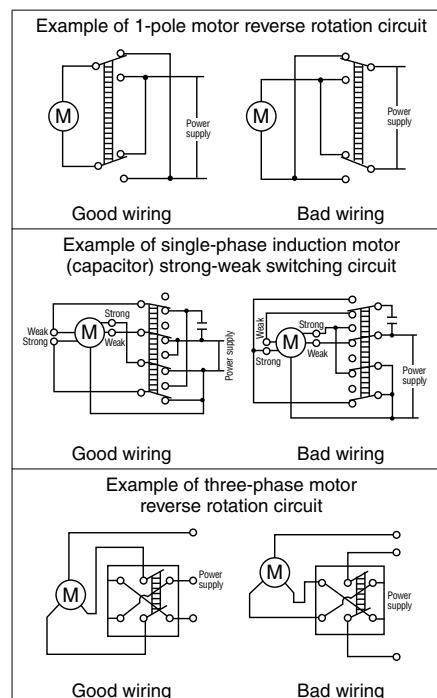
Circuit example	Notes
	(1) $r = \text{more than } 10 \Omega$ (2) In an AC circuit, impedance of R is to be slightly smaller than impedance of r and c.
	Can be used for both AC and DC circuits. $r = R$ $C: 0.1 \mu F$
	For DC circuits only.
	Can be used for both AC and DC circuits.

■ Motor load

Contacts may adhere due to the starting current at the start of motor operation which is three to eight times the steady-state current. Although it differs depending on the motor, since a current flows that is several times that of the nominal current, please select a switch taking into consideration the values in the table below. To make the motor rotate in reverse, use an ON-OFF-ON switch and take measures to prevent a multiplier current (starting current + reverse current) from flowing.

Motor type	Type	Starting current
Three-phase induction motor	Squirrel-cage	Approx. 5 to 8 times current listed on nameplate
Single-phase induction motor	Split-phase-start	Approx. 6 times current listed on nameplate
	Capacitor-start	Approx. 4 to 5 times current listed on nameplate
	Repulsion-start	Approx. 3 times current listed on nameplate

A current that is approximately two times that of the starting current will flow when reverse rotation is caused during operation. Also, when using for a load that will cause transient phenomena such as when operating the motor in reverse rotation or switching the poles, an arc short (circuit short) may occur due to the time lag between poles when switching. Please be careful.



■ Capacitor load

In the case of mercury lamps, florescent lamps and the capacitor loads of capacitor circuits, since an extremely large inrush current flows when the switch is turned on, please measure that transient value with the actual load and then either use the product keeping within the range of the rated current or after verifying the actual load.

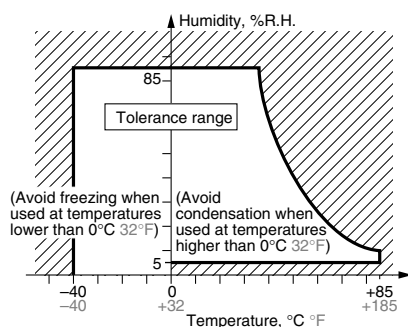
CAUTIONS FOR USE

■ Environment of use

- 1) Please consult us when using under the following conditions:
 - Environments where hydrogen sulfide or other corrosive gases are present.
 - Environments where gasoline, thinner or other flammable, explosive gases are present.
 - Dusty environments (for non-seal type snap action switches).
 - Use in environments not in the prescribed temperature or humidity range.
 - Places with low air pressure.
- 2) Unless specified the product will not be constructed to withstand water, oil or explosions. Please inquire if you intend to use the product in special applications.

■ 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.
 - 2) The allowable specifications for environments suitable for usage, storage, and transportation are given below.
 - (1) Temperature: The allowable temperature range differs for each switch, so refer to the switch's individual specifications.
 - (2) Humidity: 5 to 85% R.H.
 - (3) Pressure: 86 to 106 kPa
- The humidity range varies with the temperature. Use within the range indicated in the graph below.
(The allowable temperature depends on the switch.)



- Condensation will occur inside the switch if there is a sudden change in ambient temperature when used in an atmosphere of high temperature and high humidity. This is particularly likely to happen when being transported by ship, so please be careful of the atmosphere when shipping. Condensation is the phenomenon whereby steam condenses to cause water droplets that adhere to the switch when an atmosphere of high temperature and humidity rapidly changes from a high to low temperature or when the switch is quickly moved from a low humidity location to one of high temperature and humidity. Please be careful because condensation can cause adverse conditions such as deterioration of insulation, coil cutoff, and rust.
- 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.
- The plastic becomes brittle if the switch is exposed to a low temperature, low humidity environment for long periods of time.
- 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.
- 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.

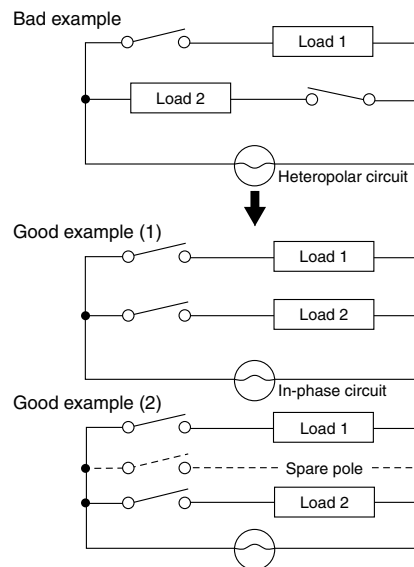
■ Wiring

- 1) When using a PC board terminal switch as soldering terminals, use thin lead wires and be sure to wind them on the terminals before soldering.
- 2) Cautions when soldering

Perform soldering quickly in accordance with the specified conditions. Be careful not to let flux flow into the product. When no instruction is specified, use a soldering iron with a tip temperature of 350°C or lower and complete soldering within five seconds. Do not pull on the lead wires immediately after soldering. Wait some time before verifying.

■ 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.
- 3) Even if 2-pole, 3-pole or 4-pole switches are used as single-pole switches in order to increase contact reliability, please keep the maximum current no higher than the rated value.
- 4) If there is the possibility of a short between poles, please use an in-phase circuit as shown below or provide a spare pole.



- 5) Be careful not to drop the product as this may cause loss of functionality.
- 6) Do not apply an unreasonable vertical force against the direction of operation of the product.
- 7) Use your hand to operate the actuator.
(Operation using a tool such as a screwdriver or hammer can cause breakdown.)

Please contact

Panasonic Corporation

Electromechanical Control Business Division

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