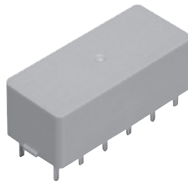




2a2b/3a1b/4a 4A polarized power relays

S RELAYS



Protective construction: Sealed type

FEATURES

1. Compact with high sensitivity
The high-efficiency polarized electromagnetic circuits of the 4-gap balanced armature and our exclusive spring alignment method achieves, with high-sensitivity in a small package, a relay that can be directly controlled by a driver chip.

2. Strong resistance to vibration and shock

Use of 4G-BA technology realizes strong resistance to vibration and shock.

3. High reliability and long life

Our application of 4G-BA technology, along with almost perfectly complete twin contact, ensures minimal contact bounce and high reliability.

4. Ability to provide wide-ranging control

Use of 4G-BA technology with goldclad silver alloy contacts in a twin contact structure enables control across a broad range from microcurrents of 100 μ A 100 mV DC to 4 A 250 V AC.

5. Latching types available

With 4G-BA technology, as well as single side stable types, convenient 2 coil latching types for circuit memory applications are also available.

6. Wide variety of contact formations available

The compact size of the 4G-BA mechanism enables the provision of many kinds of package, including 2a2b, 3a1b, and 4a. These meet your needs across a broad range of applications.

7. Low thermal electromotive force

High sensitivity (low power consumption) is realized by 4G-BA technology. Separation of the coil and spring sections has resulted in a relay with extremely low levels of thermal electromotive force (approx. 3 μ V).

8. DIL terminal array

Deployed to fit a 2.54 mm .100 inch grid, the terminals are presented in DIL arrays which match the printed circuit board terminal patterns commonly in international use.

9. Relays that push the boundaries of relay efficiency

High-density S relays take you close to the limits of relay efficiency.

10. Sockets are available.

TYPICAL APPLICATIONS

Telecommunications equipment, data processing equipment, facsimiles, alarm equipment, measuring equipment.

4-GAP BALANCED ARMATURE MECHANISM

1. Armature mechanism has excellent resistance to vibration and shock

The armature structure enables free rotation around the armature center of gravity. Because the mass is maintained in balance at the fulcrum of the axis of rotation, large rotational forces do not occur even if acceleration is applied along any vector. The mechanism has proven to have excellent resistance to vibration and shock. All our S relays are based on this balanced armature mechanism, which is able to further provide many other characteristics.

2. High sensitivity and reliability provided by 4-gap balanced armature mechanism

As a (polarized) balanced armature, the S relay armature itself has two permanent magnets. Presenting four interfaces, the armature has a 4-gap structure. As a result, the rotational axis at either end of the armature is symmetrical and, in an energized into a polarized state, the twin magnetic armature interfaces are subject to repulsion on one side and attraction on the other. This mechanism, exclusive to

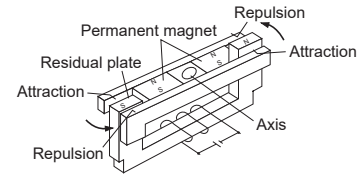
Panasonic Corporation, provides a highly efficient polarized magnetic circuit structure that is both highly sensitive and has a small form factor. Moreover, suitability for provision with many types of contact array and other advantages promise to make it possible to provide many of the various characteristics that are coming to be demanded of relays.

HOW IT WORKS (single side stable type)

1) When current is passed through the coil, the yoke becomes magnetic and polarized.

2) At either pole of the armature, repulsion on one side and attraction on the other side is caused by the interaction of the poles and the permanent magnets of the armature.

3) At this time, opening and closing operates owing to the action of the simultaneously moulded balanced armature mechanism, so that when the force of the contact breaker spring closes the contact on one side, on the other side, the balanced armature opens the contact (2a2b).



ORDERING INFORMATION

S EB - -

Contact arrangement
2: 2 Form A 2 Form B
3: 3 Form A 1 Form B
4: 4 Form A

Operating function
Nil: Single side stable
L: 1 coil latching*
L2: 2 coil latching

Nominal coil voltage (DC)
3, 5, 6, 12, 24, 48 V

Note: *1 coil latching type are manufactured by lot upon receipt of order.

TYPES

Contact arrangement	Nominal coil voltage	Single side stable		2 coil latching	
		Part No.		Part No.	
2 Form A 2 Form B	3V DC	S2EB-3V		S2EB-L2-3V	
	5V DC	S2EB-5V		S2EB-L2-5V	
	6V DC	S2EB-6V		S2EB-L2-6V	
	12V DC	S2EB-12V		S2EB-L2-12V	
	24V DC	S2EB-24V		S2EB-L2-24V	
	48V DC	S2EB-48V		S2EB-L2-48V	
3 Form A 1 Form B	3V DC	S3EB-3V		S3EB-L2-3V	
	5V DC	S3EB-5V		S3EB-L2-5V	
	6V DC	S3EB-6V		S3EB-L2-6V	
	12V DC	S3EB-12V		S3EB-L2-12V	
	24V DC	S3EB-24V		S3EB-L2-24V	
	48V DC	S3EB-48V		S3EB-L2-48V	
4 Form A	3V DC	S4EB-3V		S4EB-L2-3V	
	5V DC	S4EB-5V		S4EB-L2-5V	
	6V DC	S4EB-6V		S4EB-L2-6V	
	12V DC	S4EB-12V		S4EB-L2-12V	
	24V DC	S4EB-24V		S4EB-L2-24V	
	48V DC	S4EB-48V		S4EB-L2-48V	

Standard packing: Carton: 50 pcs.; Case: 500 pcs.

* Sockets available.

RATING

1.Coil data

- Operating characteristics such as 'Operate voltage' and 'Release voltage' are influenced by mounting conditions, ambient temperature, etc. Therefore, please use the relay within $\pm 5\%$ of rated coil voltage.
- 'Initial' means the condition of products at the time of delivery.

1) Single side stable

Type	Nominal coil voltage	Pick-up voltage (at 20°C 68°F)	Drop-out voltage (at 20°C 68°F)	Nominal operating current [$\pm 10\%$] (at 20°C 68°F)	Coil resistance [$\pm 10\%$] (at 20°C 68°F)	Nominal operating power	Max. applied voltage (at 40°C 104°F)
Standard	3V DC	70%V or less of nominal voltage (Initial)	10%V or more of nominal voltage (Initial)	66.7mA	45Ω	200mW	5.5V DC
	5V DC			38.5mA	130Ω	192mW	9.0V DC
	6V DC			33.3mA	180Ω	200mW	11.0V DC
	12V DC			16.7mA	720Ω	200mW	22.0V DC
	24V DC			8.4mA	2,850Ω	202mW	44.0V DC
	48V DC			5.6mA	8,500Ω	271mW	75.0V DC

2) 2 coil latching

Type	Nominal coil voltage	Set voltage (at 20°C 68°F)	Reset voltage (at 20°C 68°F)	Nominal operating current [±10%] (at 20°C 68°F)		Coil resistance [±10%] (at 20°C 68°F)		Nominal operating power (at 20°C 68°F)		Max. applied voltage (at 40°C 104°F)
				Set coil	Reset coil	Set coil	Reset coil	Set coil	Reset coil	
Standard	3V DC	70%V or less of nominal voltage (Initial)	70%V or less of nominal voltage (Initial)	66.7mA	66.7mA	45Ω	45Ω	200mW	200mW	5.5V DC
	5V DC			38.5mA	38.5mA	130Ω	130Ω	192mW	192mW	9.0V DC
	6V DC			33.7mA	33.7mA	180Ω	180Ω	200mW	200mW	11.0V DC
	12V DC			16.7mA	16.7mA	720Ω	720Ω	200mW	200mW	22.0V DC
	24V DC			8.4mA	8.4mA	2,850Ω	2,850Ω	202mW	202mW	44.0V DC
	48V DC			7.4mA	7.4mA	6,500Ω	6,500Ω	355mW	355mW	65.0V DC

2. Specifications

Characteristics	Item	Specifications	
Contact	Arrangement	2 Form A 2 Form B, 3 Form A 1 Form B, 4 Form A	
	Contact resistance (Initial)	Max. 50 mΩ (By voltage drop 6 V DC 1A)	
	Electrostatic capacitance (initial)	Approx. 3pF	
	Contact material	Au clad Ag alloy (Cd free)	
	Thermal electromotive force (at nominal coil voltage) (initial)	Approx. 3μV	
Rating	Nominal switching capacity (resistive load)	4 A 250 V AC, 3 A 30 V DC	
	Max. switching power (resistive load)	1,000 VA, 90 W	
	Max. switching voltage	250 V AC, 48 V DC (30 to 48 V DC at less than 0.5 A)	
	Max. switching current	4 A (AC), 3 A (DC)	
	Min. switching capacity (Reference value)*1	100μA 100 m V DC	
Electrical characteristics	Insulation resistance (Initial)	Min. 10,000MΩ (at 500V DC) Measurement at same location as "Breakdown voltage" section.	
	Breakdown voltage (Initial)	Between open contacts	750 Vrms for 1min. (Detection current: 10mA.)
		Between contact sets	1,000 Vrms for 1min. (Detection current: 10mA.)
		Between contact and coil	1,500 Vrms for 1min. (Detection current: 10mA.)
	Operate time [Set time] (at 20°C 68°F)	Max. 15 ms [15 ms] (Nominal coil voltage applied to the coil, excluding contact bounce time.)	
Release time [Reset time] (at 20°C 68°F)	Max. 10 ms [15 ms] (Nominal coil voltage applied to the coil, excluding contact bounce time.) (without diode)		
Mechanical characteristics	Shock resistance	Functional	Min. 490 m/s ² (Half-wave pulse of sine wave: 11 ms; detection time: 10μs.)
		Destructive	Min. 980 m/s ² (Half-wave pulse of sine wave: 6 ms.)
	Vibration resistance	Functional	10 to 55 Hz at double amplitude of 3 mm (Detection time: 10μs.)
		Destructive	10 to 55 Hz at double amplitude of 4 mm
Expected life	Mechanical	Min. 10 ⁸ (at 50 cps)	
Conditions	Conditions for operation, transport and storage*2	Ambient temperature: -55°C to +65°C -67°F to +149°F Humidity: 5 to 85% R.H. (Not freezing and condensing at low temperature)	
Unit weight		Approx. 8 g .28 oz	

Notes: *1. This value can change due to the switching frequency, environmental conditions, and desired reliability level, therefore it is recommended to check this with the actual load.

*2. The upper limit of the ambient temperature is the maximum temperature that can satisfy the coil temperature rise value. Refer to Usage, transport and storage conditions in NOTES.

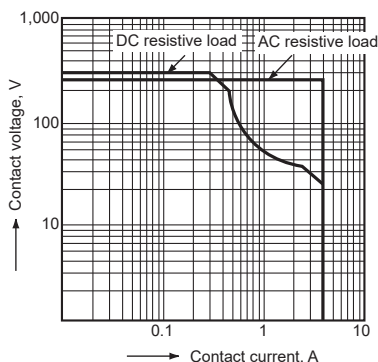
3. Electrical life

Condition: Resistive load, at 20 times/min.

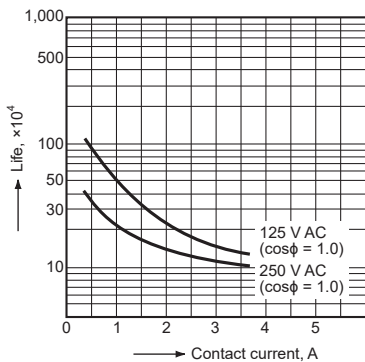
Types	Switching capacity	No. of operations
2 Form A 2 Form B, 3 Form A 1 Form B, 4 Form A	4A 250 V DC	Min. 1×10 ⁵
	3A 30V DC	Min. 2×10 ⁵

REFERENCE DATA

1. Maximum switching power

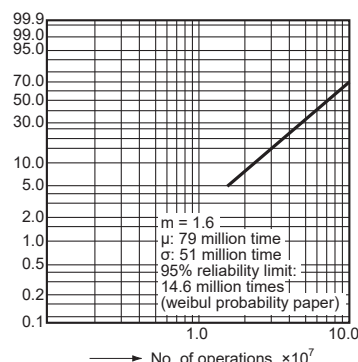


2. Life curve



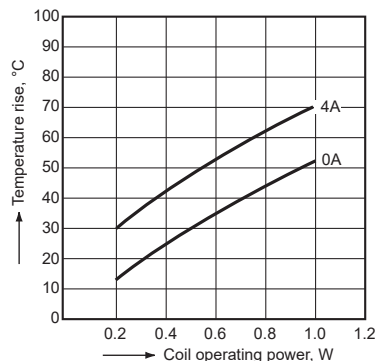
3. Contact reliability

Condition: 1V DC, 1mA
 Detection level 10 Ω
 Tasted Sample: S4EB-24V, 10pcs



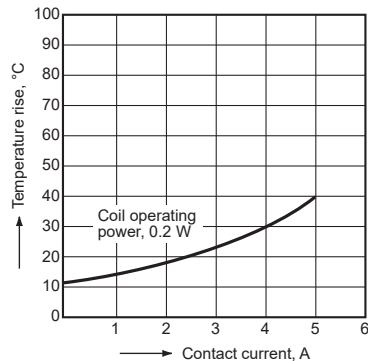
4.-(1) Coil temperature rise

Tested Sample: S4EB-24V, 4 Form A



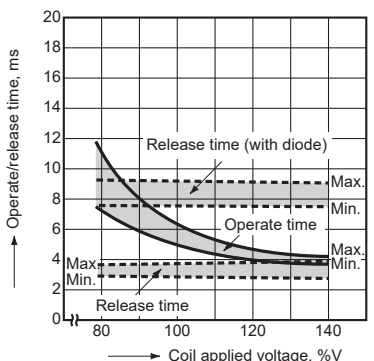
4.-(2) Coil temperature rise

Tested Sample: S4EB-24V, 4 Form A

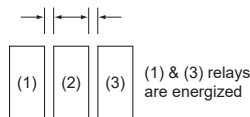


5. Operate and release time

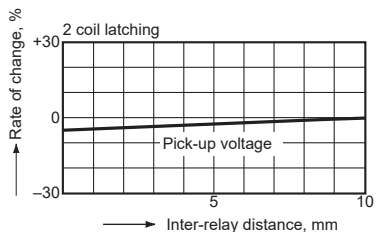
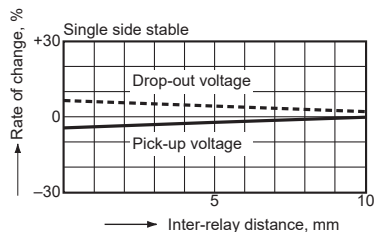
(Single side stable type)
 Tested Sample: S4EB-24V, 10pcs



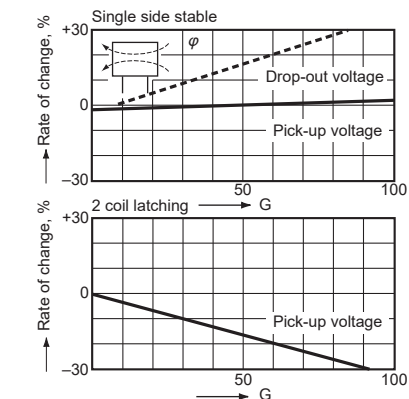
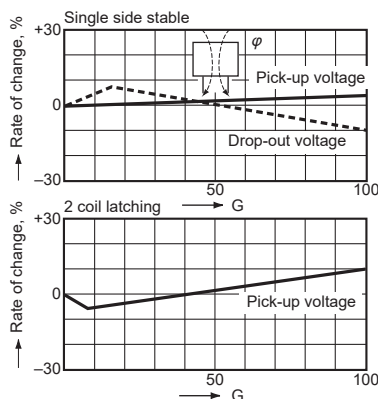
6. Influence of adjacent mounting



Note: When installing an S-relay near another, and there is no effect from an external magnetic field, be sure to leave at least 10 mm .394 inch between relays in order to achieve the performance listed in the catalog.



7. Effect from an external magnetic field

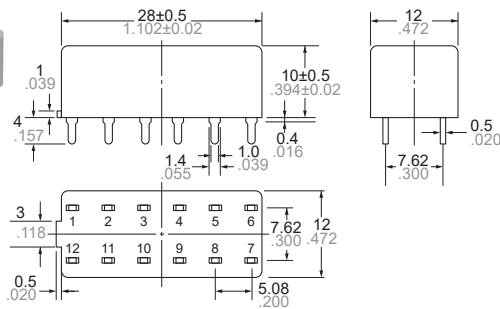
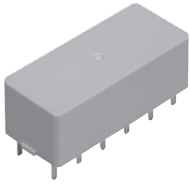


DIMENSIONS (mm inch)

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

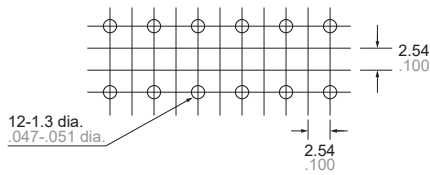
CAD

External dimensions



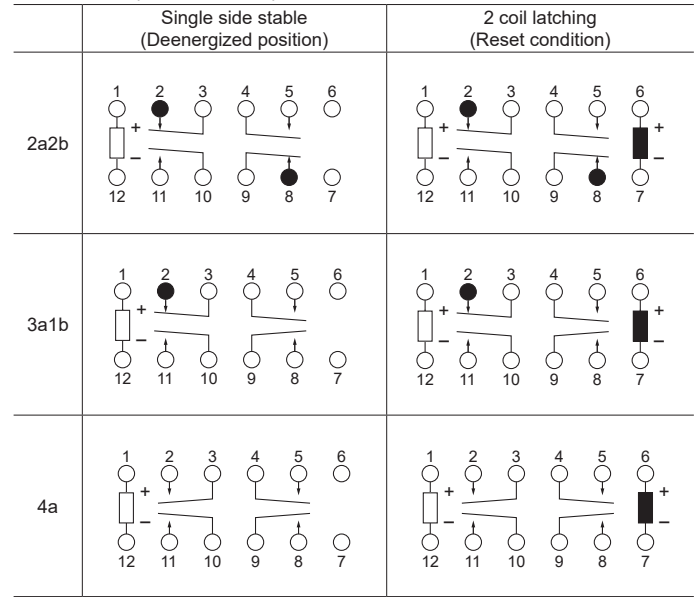
General tolerance: $\pm 0.3 \pm 0.012$

PC board pattern (Copper-side view)



Tolerance: $\pm 0.1 \pm 0.004$

Schematic (Bottom view)

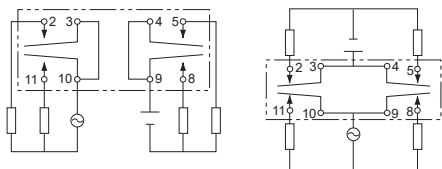


SAFETY STANDARDS

UL/C-UL (Recognized)		CSA (Certified)	
File No.	Contact rating	File No.	Contact rating
E43028	4A 250V AC	LR26550	4A 250V AC
	3A 30V DC		3A 30V DC
	1/20HP 250V AC (FLA0.75A)		1/20HP 250V AC
	1/20HP 125V AC (FLA1.5A)		1/20HP 125V AC

NOTES

- For cautions for use, please read "GENERAL APPLICATION GUIDELINES".
- Based on regulations regarding insulation distance, there is a restriction on same-channel load connections between terminals No. 2, 3 and 4, 5, as well as between No. 8, 9 and 10, 11. See the figure below for an example.
- Please note that when this relay (2 Form A 2 Form B type, 3 Form A 1 Form B type) operates and releases, contacts a and b may go ON at the same time.



- | | |
|---|--|
| <ul style="list-style-type: none"> Between 2, 3 and 4, 5: different channels, therefore not possible Between 10, 11 and 8, 9: different channels, therefore not possible <p>No good</p> | <ul style="list-style-type: none"> Between 2, 3 and 4, 5: same channels, therefore possible Between 10, 11 and 8, 9: same channels, therefore possible <p>Good</p> |
|---|--|

Please refer to "the latest product specifications" when designing your product.

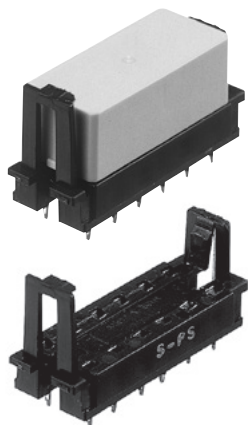
- Requests to customers : <https://industrial.panasonic.com/ac/e/salespolicies/>

ACCESSORIES

S RELAYS PC BOARD SOCKET

DIMENSIONS (mm inch)

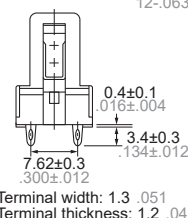
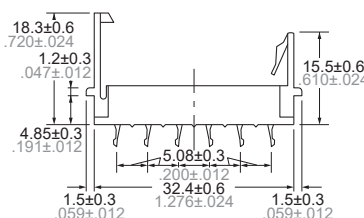
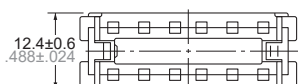
CAD The CAD data of the products with a "CAD" mark can be downloaded from our Website.



CAD

External dimensions

PC board pattern
(Copper-side view)



12-1.6 dia. hole
12-0.63 dia. hole

Tolerance: $\pm 0.1 \pm 0.04$

General tolerance: $\pm 0.3 \pm 0.12$

TYPES

Product name	Part No.
S Relays PC board socket	S-PS

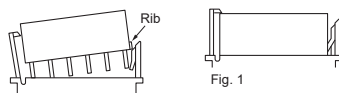
SPECIFICATIONS

Maximum continuous current	4 A
Breakdown voltage	1,500 Vrms between terminals
Insulation resistance	More than 100 MΩ between terminals at 500 V DC Mega
Heat resistance	150 $\pm 3^{\circ}\text{C}$ (302 $\pm 5.4^{\circ}\text{F}$) for 1 hour.

NOTES

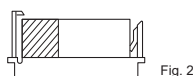
Inserting and removing method

Inserting method: Insert the relay as shown in Fig. 1 until the rib of the relay snaps into the clip of the socket.

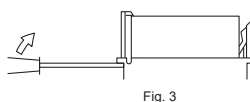


Removing method:

(1) Remove the relay straight from the socket holding the shaded portion of the relay as shown in Fig. 2.



(2) When sockets are mounted in close proximity, use a slotted screw driver as shown in Fig. 3.



Please refer to "the latest product specifications" when designing your product.

• Requests to customers :
<https://industrial.panasonic.com/ac/e/salespolicies/>

GUIDELINES FOR POWER RELAYS AND HIGH-CAPACITY DC CUT OFF RELAYS USAGE

For cautions for use, please read “GUIDELINES FOR RELAY USAGE”.

https://industrial.panasonic.com/ac/e/control/relay/cautions_use/index.jsp

Precautions for Coil Input

■ Long term current carrying

A circuit that will be carrying a current continuously for long periods without relay switching operation. (circuits for emergency lamps, alarm devices and error inspection that, for example, revert only during malfunction and output warnings with form B contacts) Continuous, long-term current to the coil will facilitate deterioration of coil insulation and characteristics due to heating of the coil itself.

For circuits such as these, please use a magnetic-hold type latching relay. If you need to use a single stable relay, use a sealed type relay that is not easily affected by ambient conditions and make a failsafe circuit design that considers the possibility of contact failure or disconnection.

■ DC Coil operating power

Steady state DC current should be applied to the coil. The wave form should be rectangular. If it includes ripple, the ripple factor should be less than 5%.

However, please check with the actual circuit since the electrical characteristics may vary. The rated coil voltage should be applied to the coil and the set/reset pulse time of latching type relay differs for each relays, please refer to the relay's individual specifications.

■ Coil connection

When connecting coils of polarized relays, please check coil polarity (+,-) at the internal connection diagram (Schematic). If any wrong connection is made, it may cause unexpected malfunction, like abnormal heat, fire and so on, and circuit do not work. Avoid impressing voltages to the set coil and reset coil at the same time.

Ambient Environment

● Usage, Transport, and Storage Conditions

During usage, storage, or transportation, avoid locations subjected to direct sunlight and maintain normal temperature, humidity and pressure conditions.

● Temperature/Humidity/Pressure

When transporting or storing relays while they are tube packaged, there are cases the temperature may differ from the allowable range. In this case be sure to check the individual specifications. Also allowable humidity level is influenced by temperature, please check charts shown below and use relays within mentioned conditions. (Allowable temperature values differ for each relays, please refer to the relay's individual specifications.)

1) Temperature:

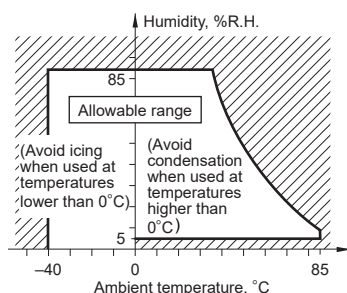
The tolerance temperature range differs for each relays, please refer to the relay's individual specifications

2) Humidity:

5 to 85 % RH

3) Pressure:

86 to 106 kPa



■ Maximum allowable voltage and temperature rise

Proper usage requires that the rated coil voltage be impressed on the coil. Note, however, that if a voltage greater than or equal to the maximum continuous voltage is impressed on the coil, the coil may burn or its layers short due to the temperature rise. Furthermore, do not exceed the usable ambient temperature range listed in the catalog.

■ Operate voltage change due to coil temperature rise (Hot start)

In DC relays, after continuous passage of current in the coil, if the current is turned OFF, then immediately turned ON again, due to the temperature rise in the coil, the pick-up voltage will become somewhat higher. Also, it will be the same as using it in a higher temperature atmosphere. The resistance/temperature relationship for copper wire is about 0.4% for 1°C, and with this ratio the coil resistance increases. That is, in order to operate of the relay, it is necessary that the voltage be higher than the pick-up voltage and the pick-up voltage rises in accordance with the increase in the resistance value. However, for some polarized relays, this rate of change is considerably smaller.

● Dew condensation

Condensation occurs when the ambient temperature drops suddenly from a high temperature and humidity, or the relay is suddenly transferred from a low ambient temperature to a high temperature and humidity. Condensation causes the failures like insulation deterioration, wire disconnection and rust etc. Panasonic Corporation does not guarantee the failures caused by condensation.

The heat conduction by the equipment may accelerate the cooling of device itself, and the condensation may occur.

Please conduct product evaluations in the worst condition of the actual usage. (Special attention should be paid when high temperature heating parts are close to the device. Also please consider the condensation may occur inside of the device.)

● Icing

Condensation or other moisture may freeze on relays when the temperature become lower than 0°C. This icing causes the sticking of movable portion, the operation delay and the contact conduction failure etc. Panasonic Corporation does not guarantee the failures caused by the icing.

The heat conduction by the equipment may accelerate the cooling of relay itself and the icing may occur. Please conduct product evaluations in the worst condition of the actual usage.

● Low temperature and low humidity

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

● High temperature and high humidity

Storage for extended periods of time (including transportation periods) at high temperature 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.

GUIDELINES FOR POWER RELAYS AND HIGH-CAPACITY DC CUT OFF RELAYS USAGE

●Package

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.

●Silicon

When a source of silicone substances (silicone rubber, silicone oil, silicone coating materials and silicone filling materials etc.) is used around the relay, the silicone gas (low molecular siloxane etc.) may be produced.

This silicone gas may penetrate into the inside of the relay. When the relay is kept and used in this condition, silicone compound may adhere to the relay contacts which may cause the contact failure. Do not use any sources of silicone gas around the relay (Including plastic seal types).

●NOx Generation

When relay is used in an atmosphere high in humidity to switch a load which easily produces an arc, the NOx created by the arc and the water absorbed from outside the relay combine to produce nitric acid. This corrodes the internal metal parts and adversely affects operation. Avoid use at an ambient humidity of 85%RH or higher (at 20°C). If use at high humidity is unavoidable, please contact our sales representative.

Others

■Cleaning

- 1) Although the environmentally sealed type relay (plastic sealed type, etc.) can be cleaned, avoid immersing the relay into cold liquid (such as cleaning solvent) immediately after soldering. Doing so may deteriorate the sealing performance.
- 2) Cleaning with the boiling method is recommended(The temperature of cleaning liquid should be 40°C or lower).
Avoid ultrasonic cleaning on relays. Use of ultrasonic cleaning may cause breaks in the coil or slight sticking of the contacts due to ultrasonic energy.

Please refer to "**the latest product specifications**" when designing your product.

•Requests to customers:

<https://industrial.panasonic.com/ac/e/salespolicies/>

Please contact

Panasonic Corporation

Electromechanical Control Business Division

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industrial.panasonic.com/ac/e/

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