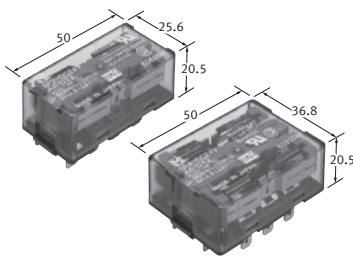




**2c 15A, 4c 10A polarized  
power relays**

# SP RELAYS

Protective construction : Dust cover type



(Unit : mm)

## FEATURES

### 1. Small, slim form factor

Facilitating the form factor reduction of devices, the overall height of the relay package is less than half that of our HP relay.

### 2. High sensitivity

The high-efficiency polarized electromagnetic mechanism in conjunction with our exclusive spring alignment method achieves levels of sensitivity higher than relays that have been available up to now. For both the 2 Form C and 4 Form C single side stable and 2 coil latching types, the 150 mW minimum operating power level allows direct driving by transistor or chip controllers.

### 3. High reliability and long life

With a structure that ensures almost perfectly complete twin contact and minimal contact bounce, you get greater reliability than has so far been provided by power relays.

### 4. Latching types also available

1 coil latching and 2 coil latching types are available. In cases where it was formerly unavoidable to use plural relays for large power memory, you can now use a single SP relay.

### 5. Strong resistance to vibration and shock

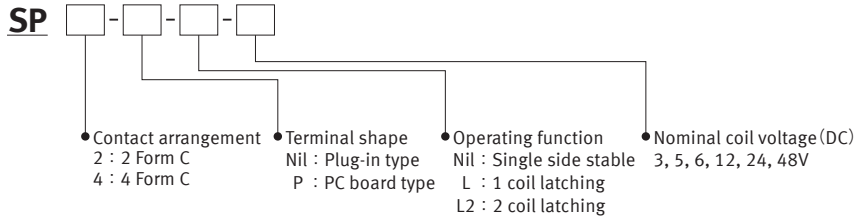
Our balanced armature technology well withstands vibration and shocks. It provides strong resistance to vibration and shock.

### 6. Terminals and mounting boards are available

## TYPICAL APPLICATIONS

1. Electrical power device
2. Robots
3. Railway signal equipment

## ORDERING INFORMATION



Notes : 1. PC board type and 1 coil latching type are manufactured by lot upon receipt of order.  
2. Certified by UL, CSA and TÜV

## TYPES

Contact arrangement	Nominal coil voltage	Single side stable		2 coil latching	
		Part No.		Part No.	
2 Form C	3V DC	SP2-DC3V		SP2-L2-DC3V	
	5V DC	SP2-DC5V		SP2-L2-DC5V	
	6V DC	SP2-DC6V		SP2-L2-DC6V	
	12V DC	SP2-DC12V		SP2-L2-DC12V	
	24V DC	SP2-DC24V		SP2-L2-DC24V	
	48V DC	SP2-DC48V		SP2-L2-DC48V	
4 Form C	3V DC	SP4-DC3V		SP4-L2-DC3V	
	5V DC	SP4-DC5V		SP4-L2-DC5V	
	6V DC	SP4-DC6V		SP4-L2-DC6V	
	12V DC	SP4-DC12V		SP4-L2-DC12V	
	24V DC	SP4-DC24V		SP4-L2-DC24V	
	48V DC	SP4-DC48V		SP4-L2-DC48V	

Standard packing (2 Form C): Carton: 20 pcs.; Case: 200 pcs.

Standard packing (4 Form C): Carton: 10 pcs.; Case: 100 pcs.

Note: PC board type and 1 coil latching type are manufactured by lot upon receipt of order.

\* Terminal sockets and mounting boards 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

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
3V DC	70%V or less of nominal voltage (Initial)	10%V or more of nominal voltage (Initial)	100 mA		30 $\Omega$	300mW	150%V of nominal voltage
5V DC			60.2mA		83 $\Omega$		
6V DC			50 mA		120 $\Omega$		
12V DC			25 mA		480 $\Omega$		
24V DC			12.5mA		1,920 $\Omega$		
48V DC			6.2mA		7,700 $\Omega$		

#### 2) 2 coil latching

Nominal coil voltage	Set voltage (at 20°C 68°F)	Reset 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
			Set coil	Reset coil	Set coil	Reset coil	Set coil	Reset coil	
3V DC	70%V or less of nominal voltage (Initial)	70%V or less of nominal voltage (Initial)	100mA	100mA	30 $\Omega$	30 $\Omega$	300mW	300mW	150%V of nominal voltage
5V DC			60.2mA	60.2mA	83 $\Omega$	83 $\Omega$			
6V DC			50mA	50mA	120 $\Omega$	120 $\Omega$			
12V DC			25mA	25mA	480 $\Omega$	480 $\Omega$			
24V DC			12.5mA	12.5mA	1,920 $\Omega$	1,920 $\Omega$			
48V DC			6.2mA	6.2mA	7,680 $\Omega$	7,680 $\Omega$			

**2. Specifications**

Characteristics	Item	Specifications	
Contact	Initial contact pressure	2 Form C: Approx. 0.392 N (40 g 1.41 oz), 4 Form C: Approx. 0.196 N (20 g 0.71 oz)	
	Arrangement	2 Form C, 4 Form C	
	Contact resistance (Initial)	Max. 30 mΩ (By voltage drop 6 V DC 1A)	
	Contact material	Stationary contact: Au flashed AgSnO <sub>2</sub> type, Movable contact: AgSnO <sub>2</sub> type	
Rating	Nominal switching capacity (resistive load)	2 Form C: 15 A 250 V AC, 4 Form C: 10 A 250 V AC	
	Max. switching power (resistive load)	2 Form C: 3,750 VA, 300 W, 4 Form C: 2,500 VA, 300 W	
	Max. switching voltage	2 Form C, 4 Form C: 250 V AC, 30 V DC (48V DC: Max. 2A)	
	Max. switching current	2 Form C: 15 A (AC) 10 A (DC), 4 Form C: 10 A	
	Nominal operating power	300mW (Single side stable, 2 coil latching)	
	Min. switching capacity (reference value)*1	100 mA 5V DC	
Electrical characteristics	Insulation resistance (Initial) (25°C, 50% relative humidity)	Min. 1,000MΩ (at 500V DC) Measurement at same location as "Breakdown voltage" section.	
	Breakdown voltage (Initial)	Between open contacts	1,500 Vrms for 1 min. (Detection current: 10 mA)
		Between contact and coil	3,000 Vrms for 1 min. (Detection current: 10 mA)
		Between contact sets	3,000 Vrms for 1 min. (Detection current: 10 mA)
	Operate time [Set time] (at 20°C 68°F) (Initial)	Max. 30 ms [Max. 30 ms] (Nominal coil voltage applied to the coil, excluding contact bounce time.)	
Release time [Reset time] (at 20°C 68°F) (Initial)	Max. 20 ms [Max. 30 ms] (Nominal coil voltage applied to the coil, excluding contact bounce time.) (without diode)		
Mechanical characteristics	Shock resistance	Functional	Min. 392 m/s <sup>2</sup> (Half-wave pulse of sine wave: 11 ms; detection time: 10μs.)
		Destructive	Min. 980 m/s <sup>2</sup> (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 3 mm
Expected life	Mechanical	Min. 5×10 <sup>7</sup> (at 180 times/min.)	
	Electrical (resistive load)	2 Form C: Min. 10 <sup>5</sup> (15 A 250 V AC [at 20 times/min.]), Min. 10 <sup>5</sup> (10 A 30 V DC [at 20 times/min.]) 4 Form C: Min. 10 <sup>5</sup> (15 A 250 V AC [at 20 times/min.]), Min. 10 <sup>5</sup> (10 A 30 V DC [at 20 times/min.])	
Conditions	Conditions for operation, transport and storage*2	Ambient temperature: -50°C to +60°C -58°F to +140°F; Humidity: 5 to 85% R.H. (Not freezing and condensing at low temperature)	
	Max. operating speed	20 times/min. (at rated load)	
Unit weight		2 Form C: 50 g 1.76 oz; 4 Form C: 65 g 2.29 oz	

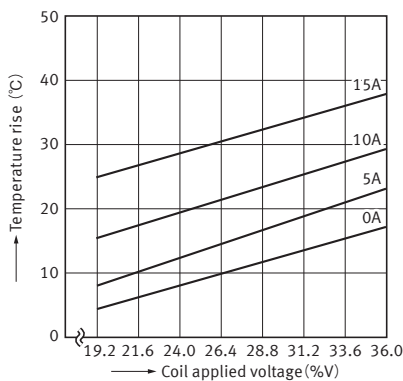
Notes: \*1. This value can change due to the switching frequency, environmental conditions, and desired reliability level, therefore it is recommended to check this with the actual load.

\*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.

**REFERENCE DATA**

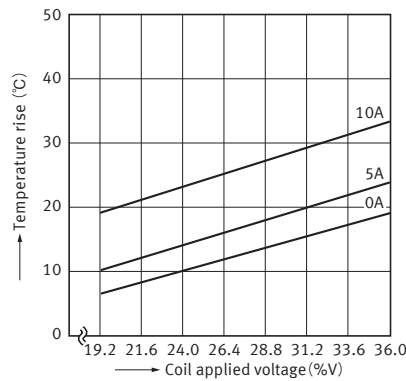
1.-(1) Coil temperature rise (2 Form C type)

Tested sample : SP2-24V DC



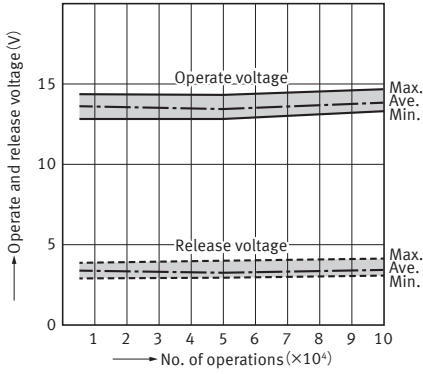
1.-(2) Coil temperature rise (4 Form C type)

Tested sample : SP4-24V DC  
Ambient temperature : 27 to 29°C

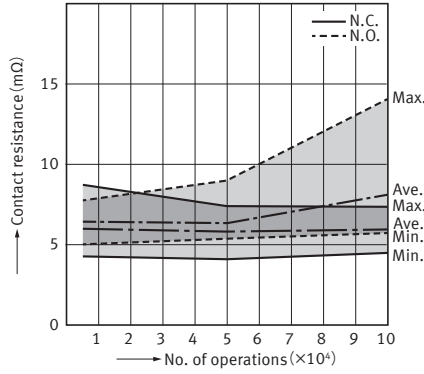


2. Electrical life (SP2, 15 A 250 V AC resistive load)

Change of operate and release voltage

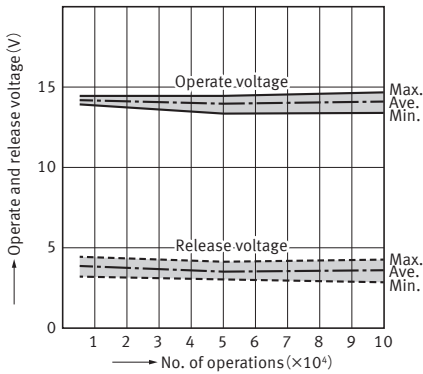


Change of contact resistance

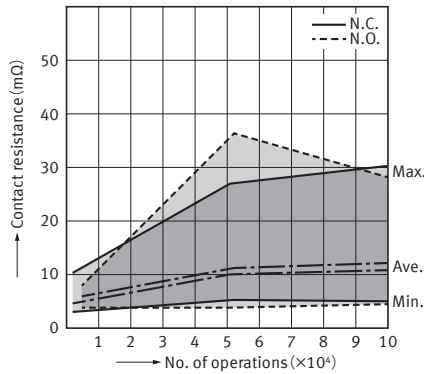


3. Electrical life (SP4, 10 A 250 V AC resistive load)

Change of operate and release voltage



Change of contact resistance

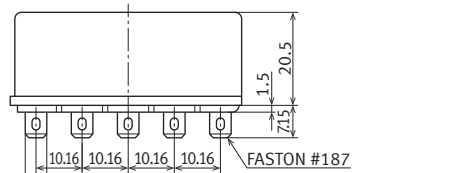
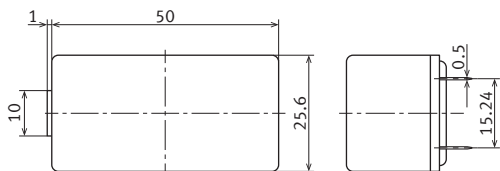


**DIMENSIONS** (mm)

**2 Form C**

1) Plug-in terminal

**CAD** External dimensions

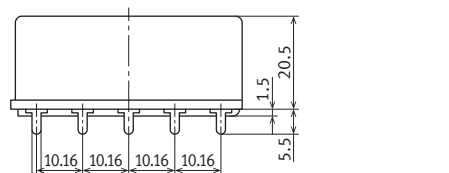
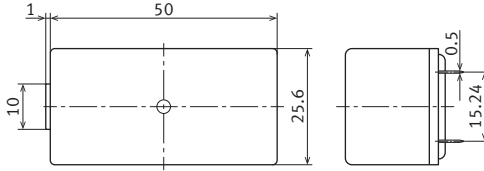


General tolerance  $\pm 0.3$

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

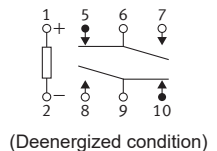
2) PC board type

**CAD** External dimensions

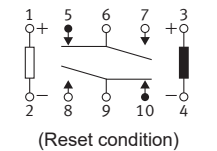


General tolerance  $\pm 0.3$

Schematic (Bottom view)  
Single side stable type

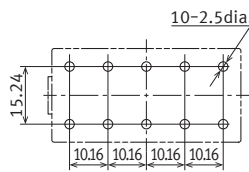


2 coil latching type



Note : Diagram shows the "reset" position when terminals 3 and 4 are energized.  
Energize terminals 1 and 2 to transfer contacts.

PC board pattern (Bottom view)



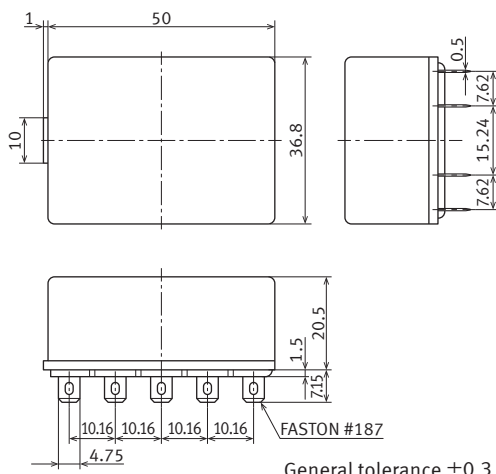
Tolerance  $\pm 0.1$

4 Form C

1) Plug-in terminal

CAD

External dimensions



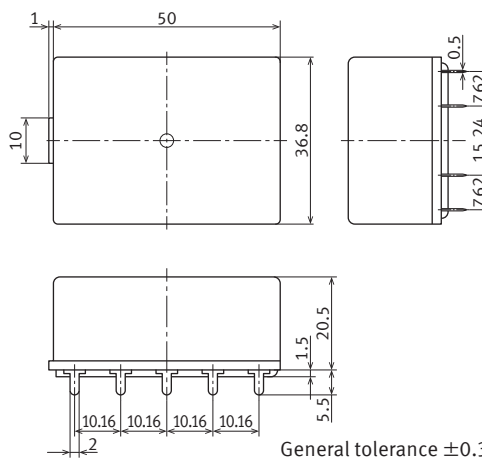
General tolerance  $\pm 0.3$

Note : Diagram shows the "reset" position when terminals 3 and 4 are energized. Energize terminals 1 and 2 to transfer contacts.

2) PC board type

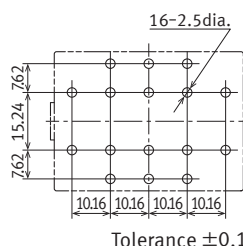
CAD

External dimensions



General tolerance  $\pm 0.3$

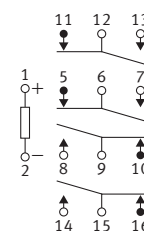
PC board pattern (Bottom view)



Tolerance  $\pm 0.1$

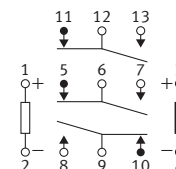
Schematic (Bottom view)

Single side stable type



(Deenergized condition)

2 coil latching type



(Reset condition)

SAFETY STANDARDS

Item	UL (Recognized)		CSA (Certified)		TÜV (Certified)		
	File No.	Contact rating	File No.	Contact rating	File No.	Contact rating	Cycles
2 FormC	E43028	15A 250V AC General Use	LR26550	15A 250V AC General Use	B 11 08 13461 308	15A 250V AC ( $\cos\phi = 1.0$ )	$10^5$
		1/2HP 125, 250V AC		1/2HP 125, 250V AC		10A 30V DC (0ms)	$10^5$
		10A 30V DC		10A 30V DC	—	—	
4 FormC	E43028	10A 250V AC General Use	LR26550	10A 250V AC General Use	B 11 08 13461 308	10A 250V AC ( $\cos\phi = 1.0$ )	$10^5$
		1/3HP 125, 250V AC		1/3HP 125, 250V AC		10A 30V DC (0ms)	$10^5$
		10A 30V DC		10A 30V DC	—	—	

NOTES

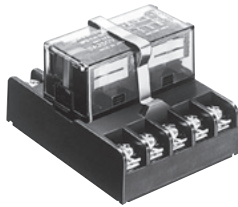
1. For cautions for use, please read "GENERAL APPLICATION GUIDELINES".

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

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

ACCESSORIES

SP RELAYS  
TERMINAL SOCKETS



TYPES

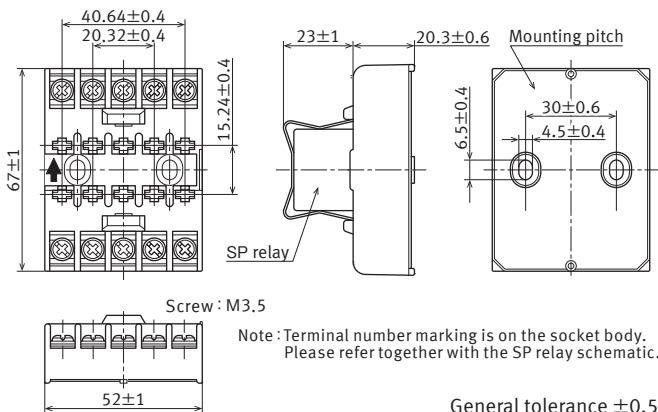
Product name	Part No.
SP2 Terminal socket	SP2-SF
SP4 Terminal socket	SP4-SF

DIMENSIONS (mm)

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

SP2 Terminal socket

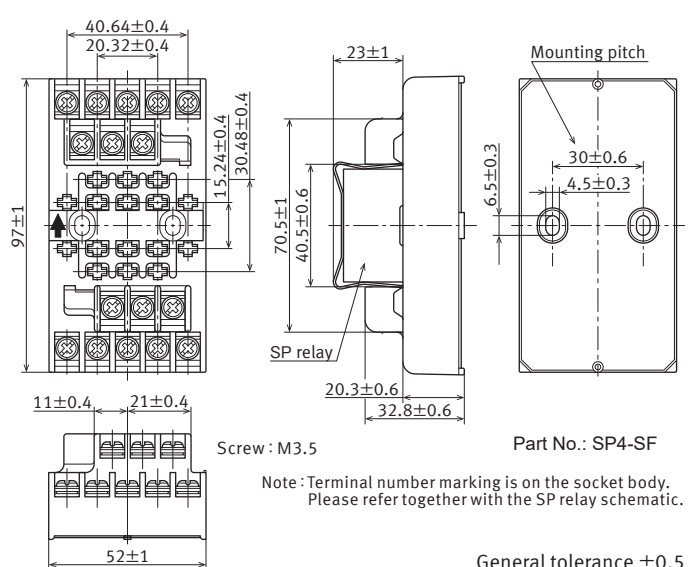
**CAD**



General tolerance ±0.5  
Part No.: SP2-SF

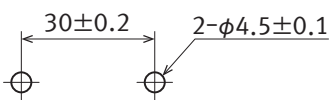
SP4 Terminal socket

**CAD**



General tolerance ±0.5  
Part No.: SP4-SF

Mounting hole diagram



Notes:

1. Mounting screws and the fastening bracket are included in the package.
2. Mount the relay with the proper mounting direction — i.e. with the direction of the (M) mark on top of the relay case matching the direction of the (M) mark on the terminal block. (The ↑ direction of the terminal block is the upward direction of the relay.)

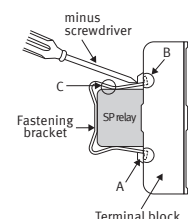
Fastening bracket mounting and removal

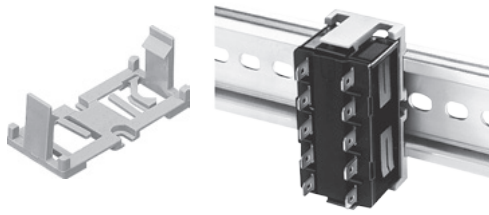
1. Mounting

Insert the A part of the fastening bracket into the mounting groove of the terminal block, and then fit the B part into groove, while pressing with the tip of a minus screwdriver.

2. Removal

Slide the B part of the fastening bracket from the groove in the terminal block, while pressing with the tip of a minus screwdriver. While the bracket is in this position, keep pressing the C part of the bracket to the relay side with your finger, and lift up to the left side and remove from the groove, as in the diagram at right.





TYPES

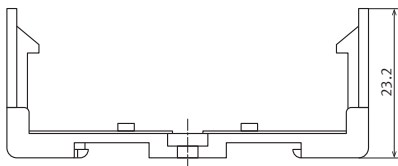
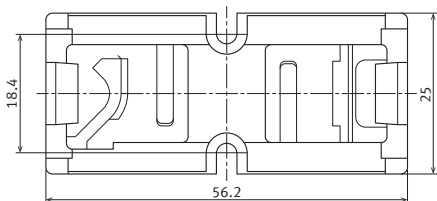
Product name	Part No.
Mounting board	SP-MA

Direct chassis mounting possible, and applicable to DIN rail.

DIMENSIONS (mm)

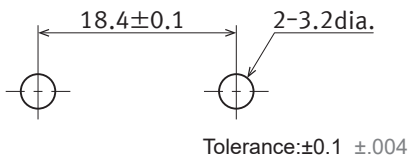
**CAD** The CAD data of the products with a "CAD" mark can be downloaded from our Website.

**CAD**



General tolerance  $\pm 0.5$

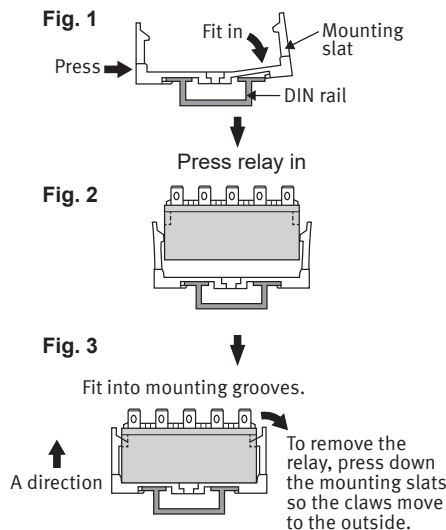
Mounting hole diagram



Use method

- Both the SP relay 2 Form C and 4 Form C can be mounted to the mounting slats.
- Use the mounting slats either by attaching them directly to the chassis, or by mounting with a DIN rail.
  - When attaching directly to chassis
    - Use two M3 screws.
    - For the mounting pitch, refer to the specification diagram.
  - When mounting on a DIN rail
    - Use a 35mm 1.378inch wide DIN rail (DIN46277).
    - The mounting method should be as indicated in the diagram at right.

Method for mounting on DIN rail



- First fit the arc shaped claw of the mounting slat into the DIN rail.
- Press on the side as shown in the diagram below.
- Fit in the claw part on the opposite side.

Precautions for use

When mounting to a DIN rail, use a commercially available fastening bracket if there is a need to stop sliding of the mounting slat in the rail direction.

# 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](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:

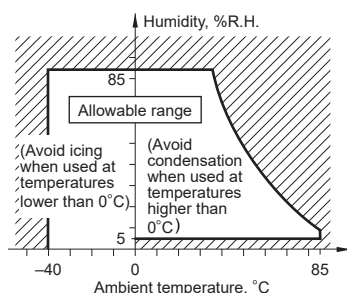
The tolerance temperature range differs for each relays, please refer to the relay's individual specifications

#### 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/>

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Please contact .....

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