



Taking advantage of the 4-gap balanced armature mechanism, S relays have met a number of relay needs and earned a reputation for the characteristics that they provide. Building on the same structure, the SP relay was introduced as a high-sensitivity power relay to provide nominal operating power of 300 mW and minimum operating power of 150 mW (single side stable and 2 coil latching types). Even so, with the nominal switching capacity for the 2 Form C at 15 A, and for the 4 Form C at 10 A, high-capacity switching is possible with small input. Moreover, taking full advantage of the excellence of the 4-gap balanced armature mechanism, we have realized a small, slim form factor that also has superior resistance to vibration and shock. This power relay is often chosen for NC machines and electrical power remote monitoring control panels, and for power supplies used in computers and other equipment. The SP also often provides power control for high-end business and industrial equipment.

RoHS compliant

## 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

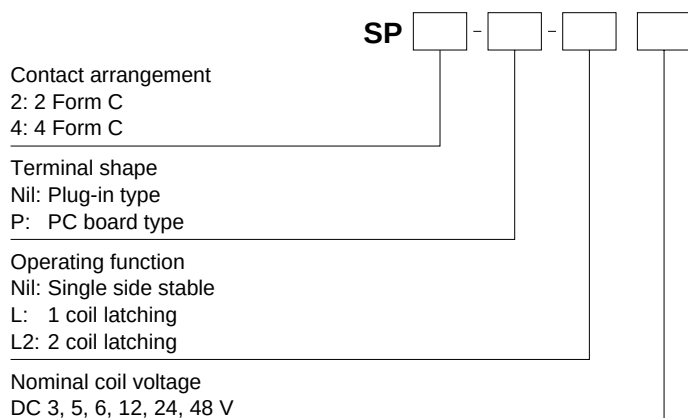
1 coil latching and 2 coil latching types are available. In cases where it was formerly unavoidable to use plural relays for large power memory, you can now use a single SP relay.

### 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.

## 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.  
\* For terminal sockets and mounting boards sockets, see page 152 and 153.

RATING

1. Coil data

1) Single side stable

| Nominal coil voltage | Pick-up voltage<br>(at 20°C 68°F)         | Drop-out voltage<br>(at 20°C 68°F)        | Nominal operating current<br>[±10%] (at 20°C 68°F) |  | Coil resistance<br>[±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) | 100mA                                              |  | 30Ω                                      | 300mW                   | 150%V of nominal voltage |
| 5V DC                |                                           |                                           | 60.2mA                                             |  | 83Ω                                      |                         |                          |
| 6V DC                |                                           |                                           | 50mA                                               |  | 120Ω                                     |                         |                          |
| 12V DC               |                                           |                                           | 25mA                                               |  | 480Ω                                     |                         |                          |
| 24V DC               |                                           |                                           | 12.5mA                                             |  | 1,920Ω                                   |                         |                          |
| 48V DC               |                                           |                                           | 6.2mA                                              |  | 7,700Ω                                   |                         |                          |

2) 2 coil latching

| Nominal coil voltage | Set voltage<br>(at 20°C 68°F)             | Reset voltage<br>(at 20°C 68°F)           | Nominal operating current<br>[±10%] (at 20°C 68°F) |            | Coil resistance<br>[±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      | 30Ω                                      | 30Ω        | 300mW                   | 300mW      | 150%V of nominal voltage |
| 5V DC                |                                           |                                           | 60.2mA                                             | 60.2mA     | 83Ω                                      | 83Ω        |                         |            |                          |
| 6V DC                |                                           |                                           | 50mA                                               | 50mA       | 120Ω                                     | 120Ω       |                         |            |                          |
| 12V DC               |                                           |                                           | 25mA                                               | 25mA       | 480Ω                                     | 480Ω       |                         |            |                          |
| 24V DC               |                                           |                                           | 12.5mA                                             | 12.5mA     | 1,920Ω                                   | 1,920Ω     |                         |            |                          |
| 48V DC               |                                           |                                           | 6.2mA                                              | 6.2mA      | 7,680Ω                                   | 7,680Ω     |                         |            |                          |

## 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                                                                                    |
|                            | Minimum operating power                                          |                                                                                                                                                                                                                                                              | 150mW (Single side stable, 2 coil latching)                                                                                      |
|                            | Nominal operating power                                          |                                                                                                                                                                                                                                                              | 300mW (Single side stable, 2 coil latching)                                                                                      |
| Electrical characteristics | Min. switching capacity (Reference value)*1                      |                                                                                                                                                                                                                                                              | 100 mA 5V DC                                                                                                                     |
|                            | Insulation resistance (Initial)<br>(25°C, 50% relative humidity) |                                                                                                                                                                                                                                                              | Min. 1,000MΩ (at 500V DC)<br>Measurement at same location as "Breakdown voltage" section.                                        |
|                            | Breakdown voltage<br>(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)                           |                                                                                                                                                                                                                                                              | Max. 30 ms [Max. 30 ms]<br>(Nominal coil voltage applied to the coil, excluding contact bounce time.)                            |
|                            | Release time [Reset time] (at 20°C 68°F)                         |                                                                                                                                                                                                                                                              | Max. 20 ms [Max. 30 ms]<br>(Nominal coil voltage applied to the coil, excluding contact bounce time.) (without diode)            |
|                            | Temperature rise (coil) (at 20°C 68°F)                           |                                                                                                                                                                                                                                                              | Max. 40°C<br>(By resistive method, nominal voltage applied to the coil; nominal switching capacity.)                             |
| 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:<br>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.])<br>4 Form C:<br>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;<br>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.

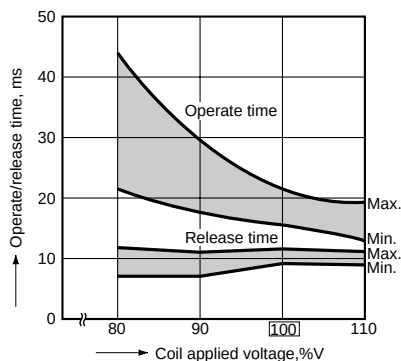
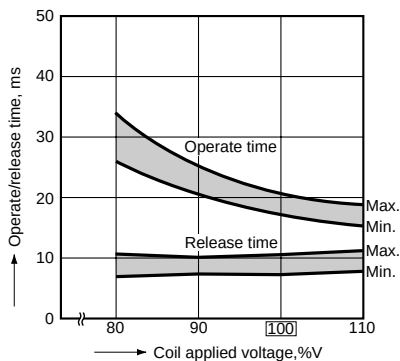
\*2. The upper limit of the ambient temperature is the maximum temperature that can satisfy the coil temperature rise value. Refer to Usage, transport and storage conditions in NOTES.

## REFERENCE DATA

Operate and release time (Single side stable)

SP2

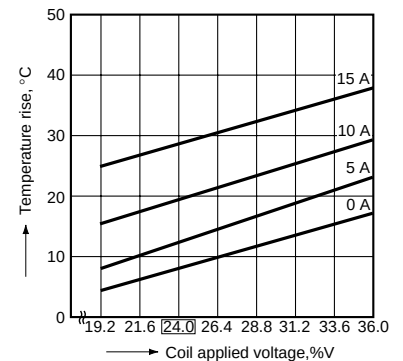
SP4



Coil temperature rise

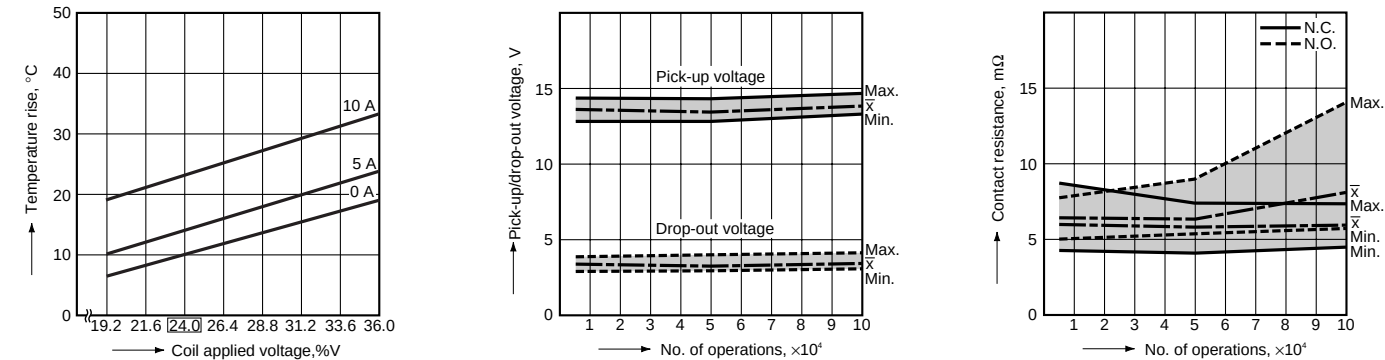
Tested sample: SP2-DC24V

Ambient temperature: 20 to 22°C 68 to 72°F

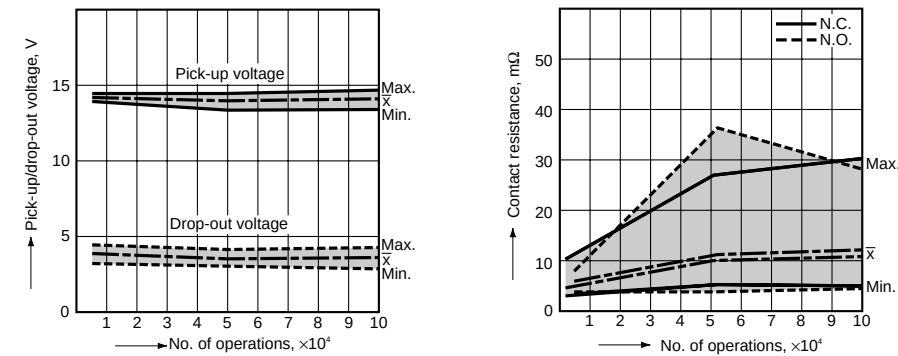


Tested sample: SP4-DC24V  
Ambient temperature: 27 to 29°C 81 to 84°F

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



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

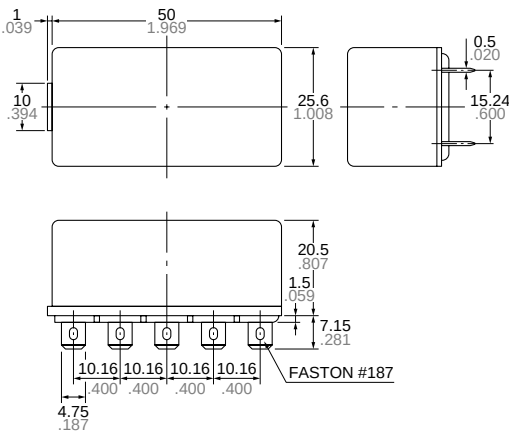


DIMENSIONS (mm inch)

2 Form C

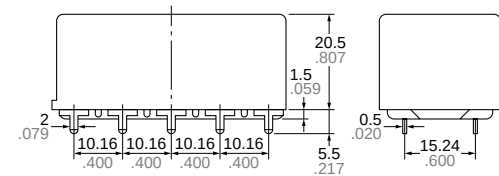
Plug-in terminal

**CAD Data** External dimensions

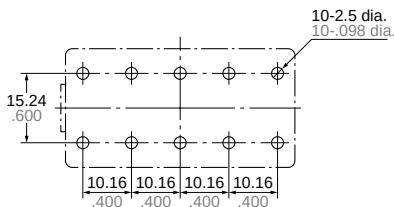


PC board type

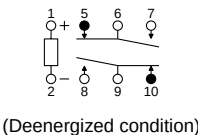
**CAD Data** External dimensions



PC board pattern (Bottom view)



Schematic (Bottom view)  
Single side stable



2 coil latching

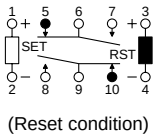
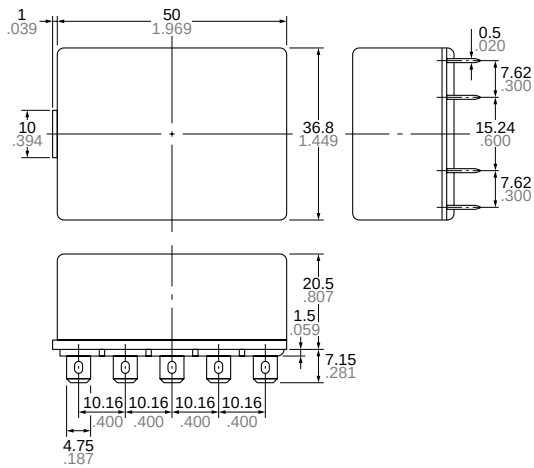


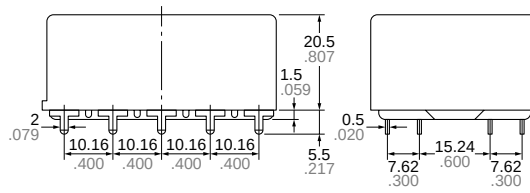
Diagram shows the "reset" position when terminals 3 and 4 are energized. Energize terminals 1 and 2 to transfer contacts.

**4 Form C**

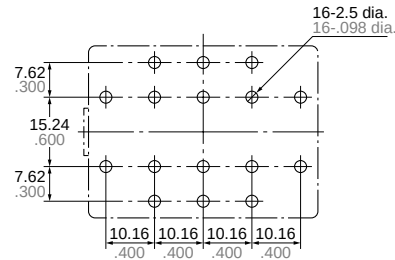
Plug-in terminal

**CAD Data** External dimensionsGeneral tolerance:  $\pm 0.3 \pm 0.12$ 

PC board type

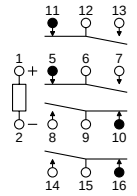
**CAD Data** External dimensionsGeneral tolerance:  $\pm 0.3 \pm 0.12$ 

## PC board pattern (Bottom view)

Tolerance:  $\pm 0.1 \pm 0.004$ 

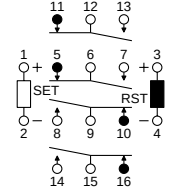
## Schematic (Bottom view)

Single side stable



(Deenergized condition)

## 2 coil latching



(Reset condition)

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

**SAFETY STANDARDS**

| Item     | UL/C-UL (Recognized) |                                                 | CSA (Certified) |                                                 | TÜV (Certified)     |                                              |
|----------|----------------------|-------------------------------------------------|-----------------|-------------------------------------------------|---------------------|----------------------------------------------|
|          | File No.             | Contact rating                                  | File No.        | Contact rating                                  | File No.            | Rating                                       |
| 2 Form C | E43028               | 15A 250V AC<br>1/2HP 125, 250V AC<br>10A 30V DC | LR26550<br>etc. | 15A 250V AC<br>1/2HP 125, 250V AC<br>10A 30V DC | B 0303<br>13461 010 | 15A 250V AC ( $\cos\phi=1.0$ )<br>10A 30V DC |
| 4 Form C | E43028               | 10A 250V AC<br>1/3HP 125, 250V AC<br>10A 30V DC | LR26550<br>etc. | 10A 250V AC<br>1/3HP 125, 250V AC<br>10A 30V DC | B 0303<br>13461 010 | 10A 250V AC ( $\cos\phi=1.0$ )<br>10A 30V DC |

**For Cautions for Use.**