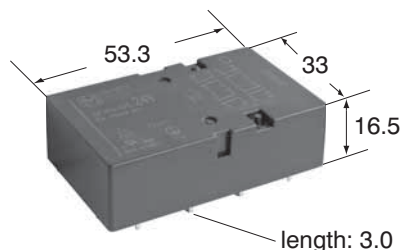


**Panasonic**  
ideas for life

**Polarized monostable  
safety relay with forcibly  
guided double contacts**

**SF4D  
RELAY**



Tolerance ± 0.3mm  
Weight approx. 47g

## FEATURES

- Relay complies with EN 50205, Type B and with IEC/EN 60335-1 (GWT)
- Overvoltage category as per IEC 60664-1 III / 4kV
- Rated voltage as per IEC 60664-1 basic insulation

|                 |                           | Pollution degree |           |          |
|-----------------|---------------------------|------------------|-----------|----------|
|                 |                           | 2 inside         | 2 outside | 3 inside |
| Coil-contact    |                           | 400V             | 400V      | 250V     |
| Contact-contact | forcibly linked pair only | 250V             | 250V      | 250V     |
|                 | all other contacts        | 400V             | 400V      | 400V     |

## SPECIFICATIONS

### Contact

|  |                                    |
|--|------------------------------------|
| Contact configuration (a = normally open / NO, b = normally closed / NC)   | 4a4b                               |
| Contact material   | AgSnO <sub>2</sub> , with Au flash |
| Contact resistance (initial at 6V DC, 1A)                                  | ≤30mΩ                              |
| Making and breaking capacities (breathing hole open) <sup>*1</sup>         | 6A 250V / 3A 24V                   |
| Max. switching voltage   | 400V                               |
| Min. switching voltage / min. switching current                            | 10V / 10mA                         |
| Pick-up / drop-out / bounce time (approx. values at U <sub>nominal</sub> ) | 18.5 / 7.5 / 3ms                   |
| Mechanical life  | 10 <sup>7</sup> ops                |

### Coil

|   |             |
|---|-------------|
| Operate / release voltage (% of U <sub>nominal</sub> at 20°C) | 75% / 15%   |
| Pick-up/nominal power consumption at 20°C                     | 280 / 500mW |

### Remarks:

- <sup>\*1</sup> According to EN 60947-5-1: 1997, table 4 AC15 / DC13  
<sup>\*2</sup> Contact interruption <10μs  
<sup>\*3</sup> Breathing hole open

### Characteristics

|   |                                    |
|---|------------------------------------|
| Max. switching frequency (without load)                                     | 10Hz                               |
| Permissible ambient temperature at nominal power consumption                | -40°C to +70°C                     |
| Upper temperature limit   | 105°C                              |
| Test voltage:<br>open contact / contact-contact / contact-coil              | 2500 / 2500 / 2500V <sub>rms</sub> |
| Insulation resistance at 500V DC (initial)                                  | 10 <sup>9</sup> Ω                  |
| Shock resistance (11ms) NO/NC <sup>*2</sup>                                 | 30G                                |
| Vibration resistance 10 – 200 Hz (10 – 55 Hz, amplitude 2 mm) <sup>*2</sup> | 10G                                |
| Degree of protection  | IP67 / IP30 <sup>*3</sup>          |
| Unit weight   | 47g                                |

### Important: Relay characteristics may be influenced by:

- strong external magnetic fields
- magnetic conductive materials near the relay
- narrow top-to-top mounting (printed surface to printed surface)

### Note:

Suitable for most common washing methods except ultrasonic cleaning.

## ORDERING INFORMATION

Ex. SF4D — DC12 V

|                                    |
|------------------------------------|
| Coil voltage (DC)                  |
| 5, 9, 12, 18, 21<br>24, 36, 48, 60 |

Note: Standard packing; Carton: 20 pcs. Case 200 pcs.

# SF4D

## COIL DATA

| Part number | Coil nominal voltage<br>V DC | Operate voltage<br>V DC | Release voltage<br>V DC | Coil resistance<br>$\Omega$ ( $\pm 10\%$ , 20°C) | Coil inductance<br>(mH) |
|-------------|------------------------------|-------------------------|-------------------------|--|-------------------------|
| SF4D-DC5V   | 5                            | 3.75                    | 0.75                    | 50   | 47                      |
| SF4D-DC9V   | 9                            | 6.75                    | 1.35                    | 162  | 145                     |
| SF4D-DC12V  | 12                           | 9.00                    | 1.80                    | 288  | 252                     |
| SF4D-DC18V  | 18                           | 13.50                   | 2.70                    | 648  | 551                     |
| SF4D-DC21V  | 21                           | 15.75                   | 3.15                    | 882  | 742                     |
| SF4D-DC24V  | 24                           | 18.00                   | 3.60                    | 1152   | 959                     |
| SF4D-DC36V  | 36                           | 27.00                   | 5.40                    | 2592   | 2097                    |
| SF4D-DC48V  | 48                           | 36.00                   | 7.20                    | 4608   | 3654                    |
| SF4D-DC60V  | 60                           | 45.00                   | 9.00                    | 7200   | 5612                    |

## ELECTRICAL LIFE

| Voltage | Current | Load type           | Frequency | Duty cycle | No. of contacts                   | No. of ops.              |
|---------|---------|---------------------|-----------|------------|-----------------------------------|--------------------------|
| 230V AC | 8A      | AC 1                | 0.25Hz    | 25%        | 4 <sup>*2</sup>                   | 85,000 <sup>*5</sup>     |
| 250V AC | 6A      | AC 1                | 0.33Hz    | 50%        | 4 <sup>*2</sup> / 8 <sup>*3</sup> | 100,000 <sup>*5</sup>    |
| 230V AC | 6A      | AC 1                | 0.33Hz    | 10%        | 2 <sup>*3</sup>                   | 200,000 <sup>*4,*5</sup> |
| 230V AC | 30 / 3A | AC 15 <sup>*1</sup> | 0.33Hz    | 10%        | 1 <sup>*3</sup>                   | 200,000 <sup>*4,*5</sup> |
| 24V DC  | 8A      | DC 1                | 0.33Hz    | 10%        | 2 <sup>*3</sup>                   | 200,000 <sup>*4,*5</sup> |
| 24V DC  | 3A      | DC 13 <sup>*1</sup> | 0.33Hz    | 10%        | 1 <sup>*3</sup>                   | 50,000 <sup>*4,*5</sup>  |
| 24V DC  | 3A      | L/R = 40ms          | 0.33Hz    | 10%        | 1 <sup>*3</sup>                   | 100,000 <sup>*4,*5</sup> |

\*1 EN 60947-5-1: 1997; table C.1

\*2 Breathing hole closed

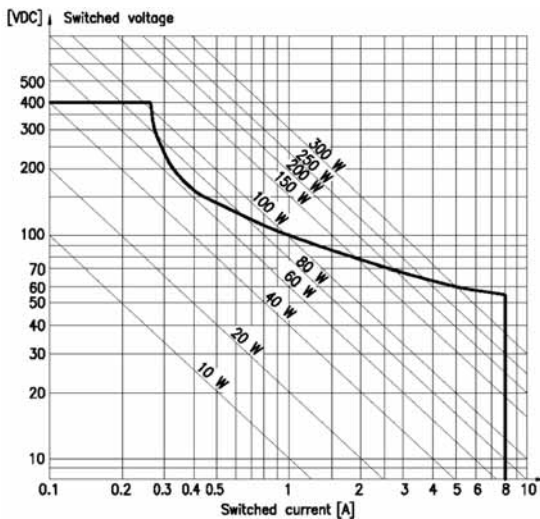
\*3 Breathing hole open

\*4 Ambient temperature +70°C

\*5 Dielectric strength according to EN61810-1:2004.

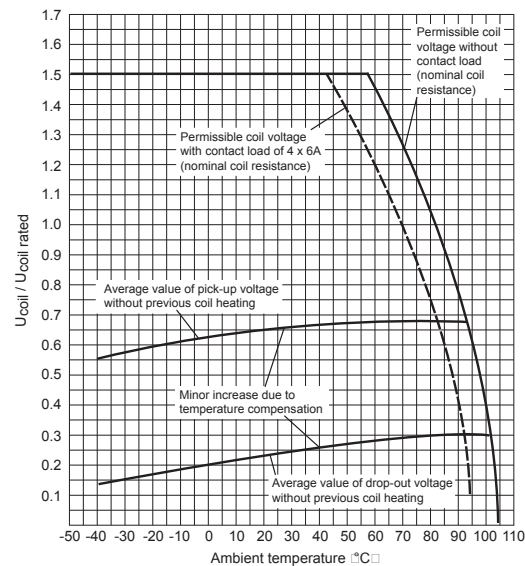
## REFERENCE DATA

### Load limit curve



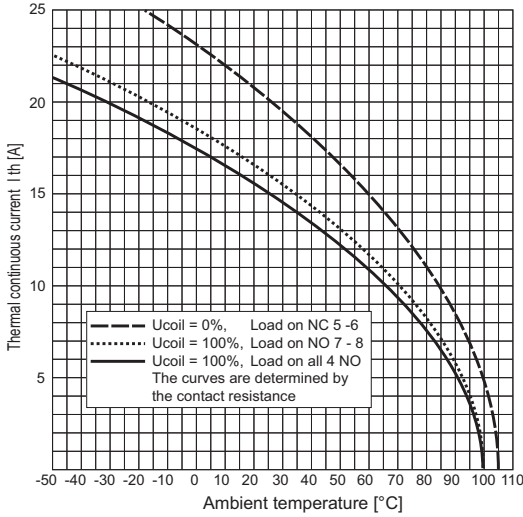
Loads in the range under the curve can be switched safely. The arc will extinguish before the opposite contact makes.

### Coil voltage characteristics



Permissible coil voltages and pick-up and drop-out characteristics at various ambient temperatures.

Contact current characteristics



DIMENSIONS (mm inch)

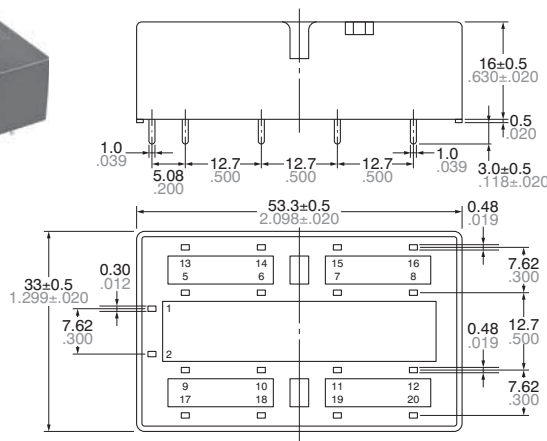
Download [CAD Data](#) from our Web site.

4 Form A 4 Form B

[CAD Data](#)

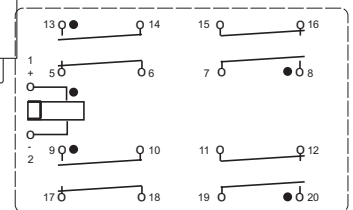


External dimensions



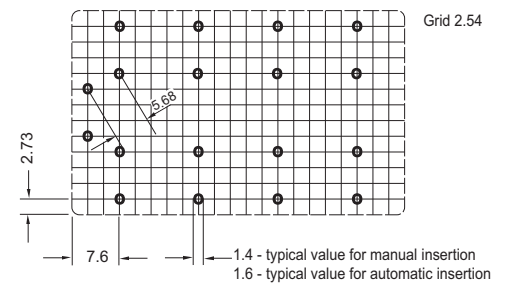
General tolerance:  $\pm 0.3 \pm 0.12$

Schematic (Bottom view)



The contacts are shown in the deenergized condition.

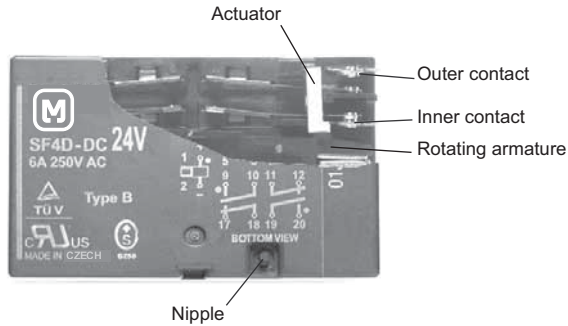
PC board pattern (Bottom view)



Tolerance:  $\pm 0.1 \pm 0.004$

# SF4D

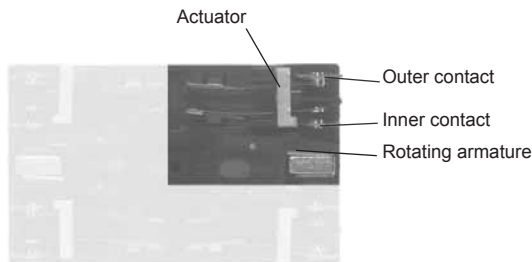
## APPLICATION NOTES



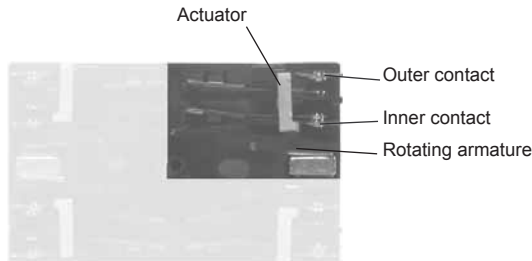
If required a breathing hole can be made in the cover by removing the nipple.  
However be aware that the degree of protection will reduce from IP67 to IP30!

### Operation of forcibly guided contacts, Type B

**If an outer contact should weld**, then the forced operated inner contacts driven by the actuator remain open.  
The rotating armature remains free to move.  
The unaffected contact pairs can operate normally, i.e. their function to make or break remains unaffected.



**If an inner contact should weld**, then the movement of the rotating armature is blocked via the actuator.  
Open contacts of all four contact pairs remain open.  
This arrangement corresponds to a conventional forcibly guided contact operation.



## SAFETY STANDARDS

| UL/C-UL (Recognized) |                         | TÜV (Certified)                                    |                         | SEV      |                         |
|----------------------|-------------------------|--|-------------------------|----------|-------------------------|
| File No.             | Contact rating          | File No.   | Rating                  | File No. | Contact rating          |
| E120782*             | 6A 250V AC<br>6A 24V DC | 968 EZ 116.00 01 (SF2D)<br>968 EZ 113.00 01 (SF4D) | 8A 24V DC<br>6A 230V AC | 01, 1851 | 6A 230V AC<br>6A 24V DC |

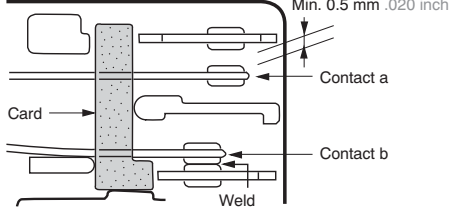
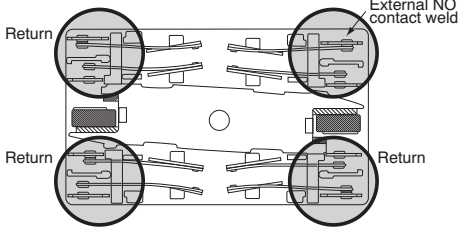
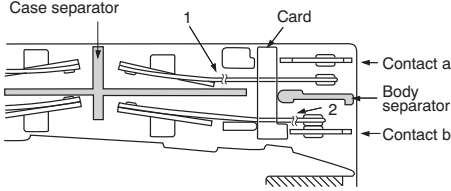
\* CSA standard: Certified by C-UL

# SAFETY STRUCTURE OF SF RELAYS

This SF relay design ensures that subsequent operations shut down and can automatically return to a safe state when the SF relay suffers overloading and other circuit abnormalities

(unforeseen externally caused circuit or device breakdowns, end of life incidents, and noise, surge, and environmental influences) owing to contact welding, spring fusion or, in the worst-case

scenario, relay breakdown (coil rupture, faulty operation, faulty return, and fatigue and breakage of the operating spring and return spring), and even in the event of end of life.

|  | Structure   | Operation   |
|--|---|---|
| <p>1. Forced operation method<br/>(2 Form A 2 Form B,<br/>4 Form A 4 Form B types)</p> |  <p>The two contacts "a" and "b" are coupled with the same card. The operation of each contact is regulated by the movement of the other contact.</p>  | <p>Even when one contact is welded closed, the other maintains a gap of greater than 0.5 mm .020 inch.</p> <p>In the diagram on the left, the lower contact "b" have welded but the upper contact "a" maintain at a gap of greater than 0.5 mm .020 inch. Subsequent contact movement is suspended and the weld can be detected</p> |
| <p>2. Independent operation method<br/>(4 Form A 4 Form B type)</p>                    |  <p>None of four contacts are held in position by the armature. Even though one of the external N.O. contacts has welded, the other three contacts have returned owing to the de-energizing of the coil.</p> | <p>Enables design of safety circuits that allow weld detection and return at an early stage.</p> <p>As shown at the top right of the diagram on the left, if the external N.O. contact welds, a 0.5 mm .020 inch gap is maintained. Each of the other contacts returns to N.O. because the coil is no longer energized.</p>         |
| <p>3. Separate chamber method<br/>(2 Form A 2 Form B,<br/>4 Form A 4 Form B types)</p> |  <p>In independent chambers, the contacts "a" and "b" are kept apart by a body/ case separator or by the card itself.</p>  | <p>Prevents shorting and fusing of springs and spring failure owing to short-circuit current.</p> <p>As shown on the diagram on the left, even if the operating springs numbered 1 and 2 there is no shorting between "a" and "b" contacts.</p>   |
| <p>4. 2 Form A 2 Form B contact<br/>4 Form A 4 Form B contact</p>                      | <p>Structure with independent COM contact of 2 Form A 2 Form B and 4 Form A 4 Form B contacts.</p>  | <p>Independent COM enables differing pole circuit configurations. This makes it possible to design various kinds of control circuits and safety circuits.</p>   |

# SF4D

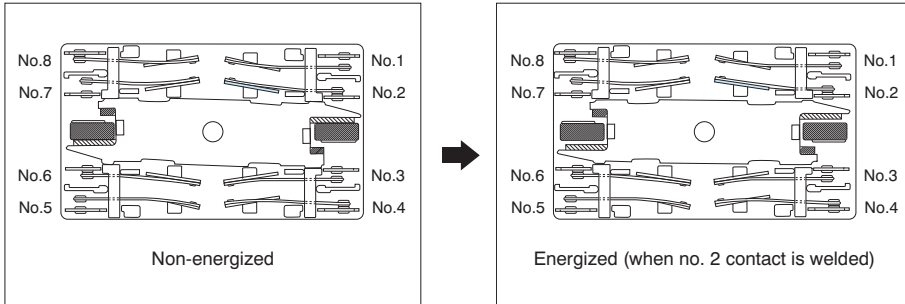
## THE OPERATION OF SF RELAYS (when contacts are welded)

SF relays work to maintain a normal operating state even when the contact welding occur by overloading or short-circuit currents. It is easy to make weld detection circuits and safety circuits in the design to ensure safety even if contacts weld.

### 4 Form A 4 Form B type

#### Internal Contacts Weld

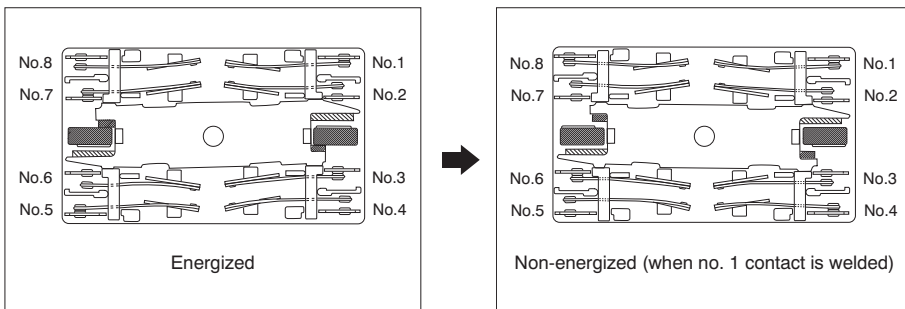
When internal contacts (No. 2, No. 3, No. 6 or No. 7) are welded, the armature becomes non-operational and the four form "a" contact gaps are maintained at 0.5 mm .020inch or greater. Reliable cut-off is thus ensured.



**Example:** If the No. 2 contact welds. Each of the four form "a" contacts (No. 1, 3, 5, and 7) maintains a gap of greater than 0.5 mm .020 inch.

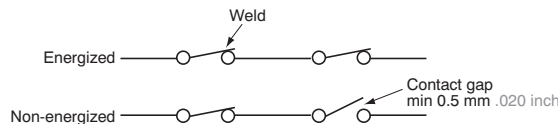
#### External Contacts Weld

When external contacts (No. 1, No. 4, No. 5 or No. 8) are welded, gaps of 0.5 mm .020inch and greater are maintained between adjacent contacts and other contacts operate normally by the coil being non-energized.

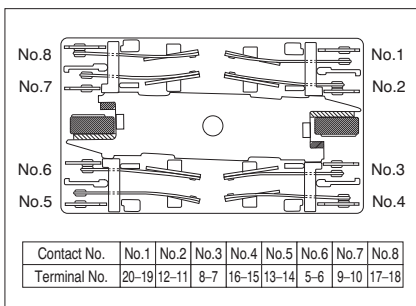


**Example 1:** If the No. 1 contact welds. The adjacent No. 2 contact maintains a gap of greater than 0.5 mm .020 inch. The other contacts, because the coil is not energized, return to their normal return state; each of form "a" contacts (No. 3, 5, and 7) maintains a contact gap of greater than 0.5 mm .020 inch; each of the form "b" contacts (No. 4, 6, and 8) return to a closed state.

**Example 2:**  
If external connections are made in series. Even if one of the contacts welds, the other contacts operate independently and the contact gaps are maintained at greater than 0.5 mm .020 inch.



#### Contact Operation Table



The table below shows the state of the other contacts when the current through the welded form "a" contact is 0 V and the rated voltage is applied through the form "b" contact.

| Contact No. | State of other contacts |      |      |      |      |      |      |      |
|-------------|-------------------------|------|------|------|------|------|------|------|
|             | 1                       | 2    | 3    | 4    | 5    | 6    | 7    | 8    |
| 1           |                         | >0.5 | >0.5 |      | >0.5 |      | >0.5 |      |
| 2           | >0.5                    |      | >0.5 |      | >0.5 |      | >0.5 |      |
| 3           |                         | >0.5 |      | >0.5 |      | >0.5 |      | >0.5 |
| 4           |                         | >0.5 | >0.5 |      |      | >0.5 |      | >0.5 |
| 5           | >0.5                    |      | >0.5 |      |      | >0.5 | >0.5 |      |
| 6           | >0.5                    |      | >0.5 |      | >0.5 |      | >0.5 |      |
| 7           |                         | >0.5 |      | >0.5 |      | >0.5 |      | >0.5 |
| 8           | >0.5                    | >0.5 |      | >0.5 |      | >0.5 | >0.5 |      |

>0.5: contact gap is kept at min. 0.5 mm .020 inch  
|: contact closed  
Empty cells: either closed or open

\* Contact gaps are shown at the initial state. If the contacts change state owing to loading/breaking it is necessary to check the actual loading.

For Cautions for Use, see [Relay Technical Information](#).