



Flat type safety relays

SF RELAYS



RoHS compliant

### FEATURES

- 1. Forced operation contacts**  
N.O. and N.C. side contacts are connected through a card so that one interacts with the other in movement. In case of a contact welding, the other keeps a min. 0.5mm .020inch contact gap.
- 2. Separated chamber structure**  
N.O. and N.C. side contacts are put in each own space surrounded with a card and a body-separator. That prevents short circuit between contacts, which is caused by their springs welding or damaged.
- 3. Contact arrangement of 3 Form A 1 Form B**  
Enables various forms of control circuit.
- 4. High breakdown voltage**  
High breakdown voltage 2,500 Vrms (between contact sets/ between contact and coil)

- 5. High sensitivity**  
Realizes thin shape and high sensitivity (500mW nominal operating power) by utilizing high-efficiency polarized magnetic circuit with 4-gap balanced armature.
- 6. Complies with safety standards**  
Standard products are UL, CSA, TÜV and SEV certified. Conform to European standards. TÜV certified. Complies with SUVA European standard.

### TYPICAL APPLICATIONS

- 1. Industrial equipment such as presses and machine tools**
- 2. Elevators and other kinds of hoisting mechanisms, conveyor equipment.**

### ORDERING INFORMATION



### TYPES

Contact arrangement	Nominal coil voltage	Part No.
3 Form A 1 Form B	5V DC	SF3-DC5V
	12V DC	SF3-DC12V
	24V DC	SF3-DC24V
	48V DC	SF3-DC48V
	60V DC	SF3-DC60V

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

### RATING

#### 1. Coil data

Contact arrangement	Nominal coil voltage	Pick-up voltage (at 20°C 68°F)	Drop-out voltage (at 20°C 68°F)	Nominal coil 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 20°C 68°F)
3 Form A 1 Form B	5V DC	80%V or less of nominal voltage (Initial)	10%V or more of nominal voltage (Initial)	100mA	50Ω	500mW	120%V of nominal voltage
	12V DC			41.7mA	288Ω		
	24V DC			20.8mA	1,152Ω		
	48V DC			10.4mA	4,608Ω		
	60V DC			8.3mA	7,200Ω		

2. Specifications

Characteristics	Item	Specifications	
Contact	Arrangement	3 Form A 1 Form B	
	Contact resistance (Initial)	Max. 30 mΩ (By voltage drop 6 V DC 1A)	
	Contact material	Au-flashed AgSnO <sub>2</sub> type	
Rating	Nominal switching capacity (resistive load)	6A 250V AC, 6A 30V DC	
	Max. switching power (resistive load)	1,500VA 180W	
	Max. switching voltage	250V AC, 30V DC	
	Max. switching current	6A	
	Nominal operating power	500mW	
	Min. switching capacity (Reference value)*1	100mA 5V DC	
	Electrical characteristics	Insulation resistance (Initial)	Min. 1,000MΩ (at 500V DC) Measurement at same location as "Breakdown voltage" section.
Breakdown voltage (Initial)		Between open contacts	2,500 Vrms for 1min. (Detection current: 10mA)
		Between contact sets	2,500 Vrms for 1min. (Detection current: 10mA)
		Between contact and coil	2,500 Vrms for 1min. (Detection current: 10mA)
Temperature rise (coil)		Max. 45°C 113°F (By resistive method, nominal voltage applied to the coil; contact carrying current: 6A)	
Surge breakdown voltage (between contact and coil)		—	
Operate time		Max. 30ms (Nominal voltage applied to the coil, excluding contact bounce time.)	
Release time		Max. 15ms (Nominal voltage applied to the coil, excluding contact bounce time.) (without diode)	
Mechanical characteristics	Shock resistance	Functional	Min. 294 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 2 mm (Detection time: 10μs)
		Destructive	10 to 55 Hz at double amplitude of 2 mm
Expected life	Mechanical	Min. 10 <sup>7</sup> : (at 180 times/min.)	
	Electrical	Min. 3×10 <sup>4</sup> : (at 20 times/min.)*2	
Conditions	Conditions for operation, transport and storage*3	Ambient temperature: -40°C to +70°C -40°F to +158°F Humidity: 5 to 85% R.H. (Not freezing and condensing at low temperature)	
	Max. Operating speed	180 times/min.	
Unit weight		38g 1.34oz	

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. More than 10<sup>5</sup> operations when applying the nominal switching capacity to one side of contact pairs of each Form A contact and Form B contact

\*3. 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.

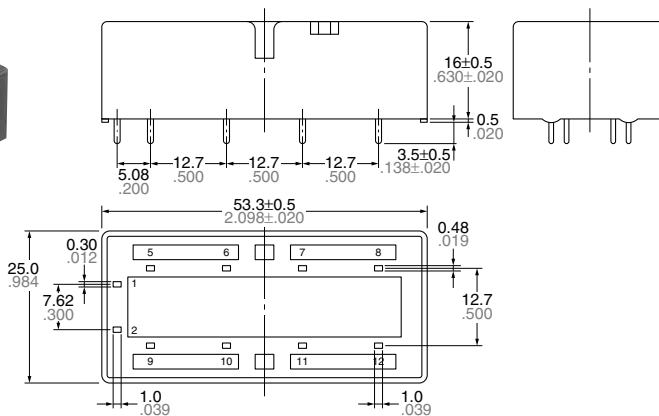
DIMENSIONS (mm inch)

The CAD data of the products with a **CAD Data** mark can be downloaded from: <http://industrial.panasonic.com/ac/e/>

CAD Data

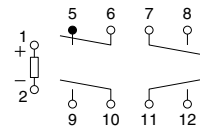


External dimensions

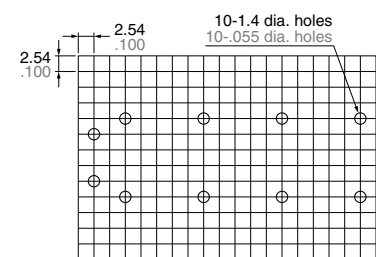


General tolerance: ±0.3 ±.012

Schematic (Bottom view)



PC board pattern (Bottom view)



Tolerance: ±0.1 ±.004

SAFETY STANDARDS

UL/C-UL (Recognized)		TÜV (Certified)		SEV	
File No.	Contact rating	File No.	Rating	File No.	Contact rating
E120782	6A 250V AC	968/EZ 312.01/09	6A 250V AC	12.0193	6A 250V AC

\* 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

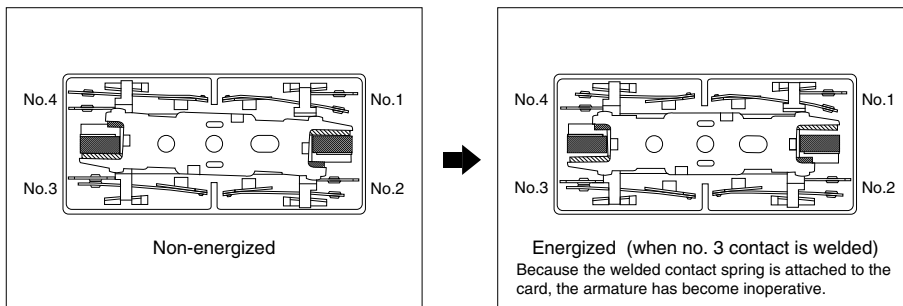
(unforeseen externally caused circuit or device breakdowns, end of life incidents, and noise, surge, and environmental influences) owing to contact welding, spring fusion or, in the worst-case

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
1. Forced operation method (3 Form A 1 Form B types)	<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 a gap of greater than 0.5 mm .020 inch. Subsequent contact movement is suspended and the weld can be detected</p>
2. Separate chamber method (3 Form A 1 Form B types)	<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>
3. 3 Form A 1 Form B contact	Structure with independent COM contact of (3 Form A 1 Form B), contacts.	Independent COM enables differing pole circuit configurations. This makes it possible to design various kinds of control circuits and safety circuits.

### Form "b" Contact Weld

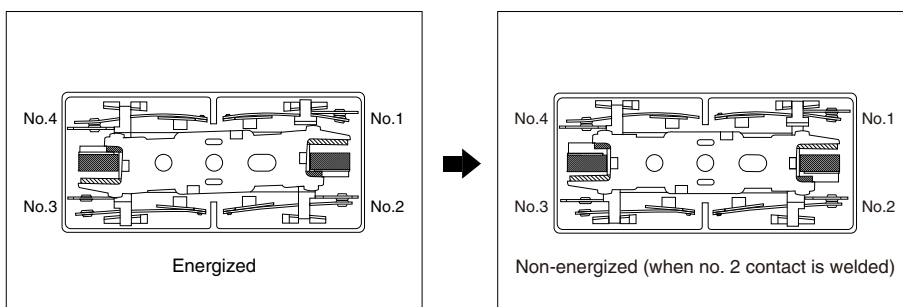
If the form "b" contact (No. 3) welds, the armature becomes non-operational, the contact gaps at the three form "a" contacts are maintained at greater than 0.5 mm .020 inch. Reliable isolation is thus ensured.



**If the No. 3 contact welds.**  
Each of the three form "a" contacts (No. 1, 2, and 4) maintain a gap of greater than 0.5 mm .020 inch.

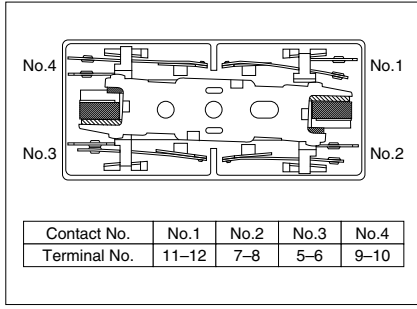
### Form "a" Contact Weld

When the form "a" contacts (No. 1, 2, or 4) weld, the armature remains in a non-returned state and the contact gap at the single form "b" contact is maintained at greater than 0.5 mm .020 inch. Reliable isolation is thus ensured.



**If the No. 2 contact welds.**  
The single form "b" contact (No. 3) maintains a gap of 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.

		State of other contacts			
		1	2	3	4
Welded terminal No.	1			>0.5	
	2			>0.5	
	3	>0.5	>0.5		>0.5
	4			>0.5	

>0.5: contact gap is kept at min. 0.5 mm .020 inch  
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.

NOTES

1. For cautions for use, please read "General Application Guidelines".