Panasonic





SF RELAYS Double contact type





4 Form A 4 Form B

FEATURES

1. High contact reliability

High contact reliability is achieved through the use of a double contact.

2. 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.

3. Independent operation contacts (4 Form A 4 Form B)

There are 4 points of forced operation contacts.

Each pair of contacts is free from the main armature and is independent from each other. So if a N.O. pair of contacts are welded, the other 3 N.O. contacts are not effected (operate properly) That enables to plan a circuit to detect welding or go back to the beginning condition.

4. Separated chamber structure
N.O. and N.C. side contacts are put in
each own space surrounded with a card
and a body-separater. That prevents
short circuit between contacts, which is
caused by their springs welding or
damaged.

5. High breakdown voltage

High breakdown voltage 2,500 Vrms between contacts and coil.

6. High sensitivity

Realizes thin shape and high sensitivity (500 mW nominal operating power) by utilizing high-efficiency polarized magnetic circuit with 4-gap balanced armature.

7. Complies with safety standardsStandard 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.

RoHS compliant

ORDERING INFORMATION

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

Nominal coil voltage
DC 5, 12, 24, 48, 60V

Note: Certified by UL, CSA, TÜV and SEV

TYPES

Contact arrangement	Nominal coil voltage	Part No.				
	5V DC	SF2D-DC5V				
	12V DC	SF2D-DC12V				
2 Form A 2 Form B	24V DC	SF2D-DC24V				
	48V DC	SF2D-DC48V				
	60V DC	SF2D-DC60V				
	5V DC	SF4D-DC5V				
	12V DC	SF4D-DC12V				
4 Form A 4 Form B	24V DC	SF4D-DC24V				
	48V DC	SF4D-DC48V				
	60V DC	SF4D-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)
2 Form A 2 Form B	5V DC	75%V or less of nominal voltage (Initial)	10%V or more of nominal voltage (Initial)	100mA	50Ω		120%V of nominal voltage
	12V DC			41.7mA	288Ω		
	24V DC			20.8mA	1,152 Ω	500mW	
	48V DC			10.4mA	$4,608\Omega$		
	60V DC			8.3mA	7,200Ω		
4 Form A 4 Form B	5V DC		15%V or more of nominal voltage (Initial)	100mA	50Ω		
	12V DC	75%V or less of nominal voltage (Initial)		41.7mA	288Ω		
	24V DC			20.8mA	1,152Ω	500mW	
	48V DC			10.4mA	4,608Ω		
	60V DC			8.3mA	7,200Ω		

2. Specifications

Characteristics		Item	Specifications					
	Arrangement		2 Form A 2 Form B	4 Form A 4 Form B				
Contact Conta	Contact resistance (I	nitial)	Max. 30 mΩ (By voltage drop 6 V DC 1A)					
	Contact material		Au-flashed AgSnO₂ type					
	Nominal switching ca	pacity (resistive load)	6A 250V AC, 6A 30V DC					
Ma	Max. switching powe	r (resistive load)	1,500VA 180W	1,500VA 180W				
Rating	Max. switching voltage	je	440V AC, 30V DC					
nating	Max. switching currer	nt	6A					
	Nominal operating po	ower	500mW					
	Min. switching capac	ity (Reference value)*1	100mA 5V DC					
	Insulation resistance	(Initial)	Min. 1,000M Ω (at 500V DC) Measurement at same location as "Breakdown voltage" section.					
	D 11	Between open contacts	1,300 Vrms for 1min. (Detection current: 10mA)					
	Breakdown voltage (Initial)	Between contact sets	2,500 Vrms for 1min. (Detection current: 10mA)					
Electrical	(midal)	Between contact and coil	2,500 Vrms for 1min. (Detection current: 10mA)					
characteristics	Temperature rise (co	il) (at 20° 68°F)	Max. 45°C 113°F (By resistive method, nominal voltage applied to the coil; contact carrying current: 6A)					
	Operate time		Max. 30ms (Nominal voltage app	blied to the coil, excluding contact bounce time.)				
R	Release time		Max. 15ms (Nominal voltage applied to the coil, excluding contact bounce time.) (without diode)					
	Shock resistance	Functional	Min. 294 m/s 2 (Half-wave pulse of sine wave: 11 ms; detection time: $10\mu s$)					
Mechanical	SHOCK TESISTATICE	Destructive	Min. 980 m/s² (Half-wave pulse of sine wave: 6 ms)					
characteristics	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 ⁷ (at 180 times/min.)					
Expected file	Electrical		Min. 10 ⁵ (at 20 times/min.)					
Conditions	Conditions for operation, transp		Ambient temperature: –40°C to - Humidity: 5 to 85% R.H. (Not free	+70°C -40°F to +158°F ezing and condensing at low temperature)				
	Max. Operating spee	d	180 times/min.					
Unit weight			Approx. 38g 1.34oz	Approx. 47g 1.66oz				

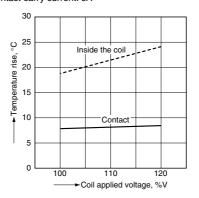
Notes: *1. This value can change due to the switching frequency, environmental conditions and desired reliability level, therefore it is recommended to check this with the actual load.

^{*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.

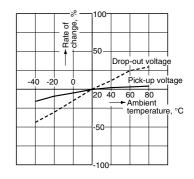
REFERENCE DATA

- 1. Operate/release time (without diode) Tested sample: SF2D-DC24V (2 Form A 2 Form B) Quantity: n = 20
 - 50 ms 40 →Operate/release time, 30 Operate time 20 10 0 <u>L</u> 80 90 100 110 120 -Coil applied voltage, %V
- 2. Temperature rise Tested sample: SF4D-DC24V (4 Form A 4 Form B) Quantity: n = 6

Coil applied voltage: 100%V, 120%V Contact carry current: 6A



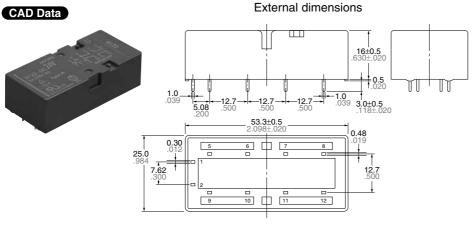
3. Ambient temperature characteristics Tested sample: SF4D-DC24V (4 Form A 4 Form B) Quantity: n = 6



DIMENSIONS (mm inch)

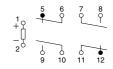
The CAD data of the products with a CAD Data mark can be downloaded from: http://industrial.panasonic.com/ac/e/

1. 2 Form A 2 Form B

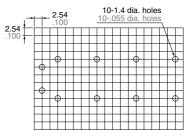


General tolerance: ±0.3 ±.012

Schematic (Bottom view)

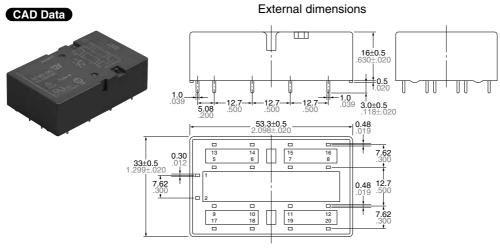


PC board pattern (Bottom view)



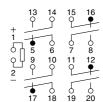
Tolerance: ±0.1 ±.004

2. 4 Form A 4 Form B

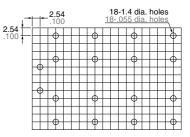


General tolerance: ±0.3 ±.012

Schematic (Bottom view)



PC board pattern (Bottom view)



Tolerance: ±0.1 ±.004

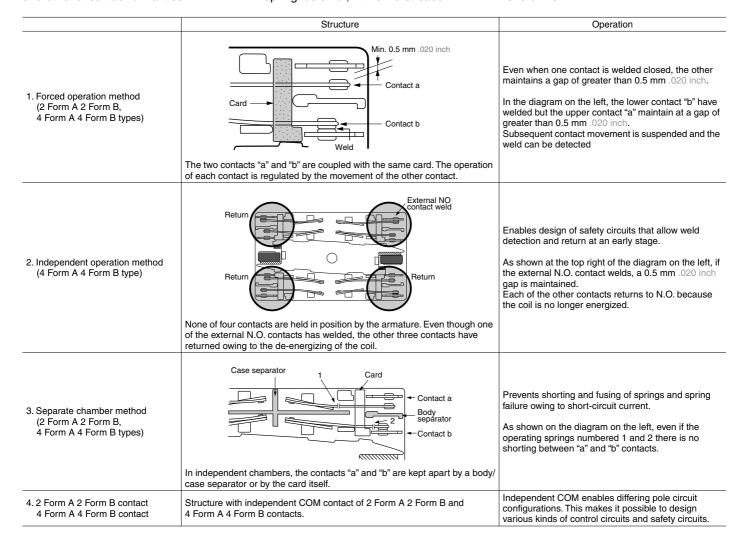
SAFETY STANDARDS

UL/C-UL (Recognized)		TÜV (C	ertified)	SEV		
File No.	File No. Contact rating		Rating	File No.	Contact rating	
E120782* 6A 250V AC 6A 24V DC		968 EZ 116.03/10 (SF2D) 968 EZ 116.02/09 (SF4D)		1	6A 24V DC 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.



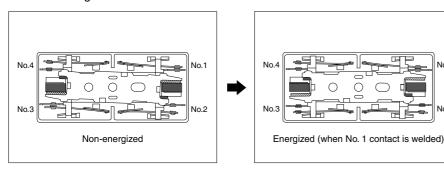
THE OPERATION OF SF RELAYS (when contacts are welded)

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.

1) 2 Form A 2 Form B type

Form "b" Contact Weld

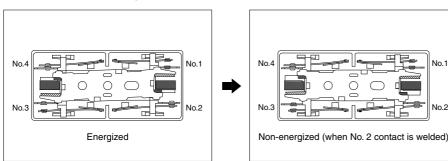
If the form "b" contact (No. 1 and 3) welds, the armature becomes non-operational, the contact gaps at the three form "a" contacts are maintained at greater than 0.5 mm .020 inch. Reliable isolation is thus ensured.



Example: If the No. 1 contact welds Each of the three form "a" contacts (No. 2 and 4) maintain a gap of greater than 0.5 mm .020 inc

Form "a" Contact Weld

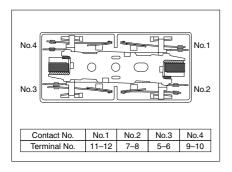
When the form "a" contacts (No. 2 or 4) weld, the armature remains in a non-returned state and the contact gap at the two form "b" contact is maintained at greater than 0.5 mm .020 inch. Reliable isolation is thus ensured.



Example: If the No. 2 contact welds.

The two form "b" contact (No. 1 or 3) maintains a gap of greater than 0.5 mm .020

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.

No 1

No.2

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

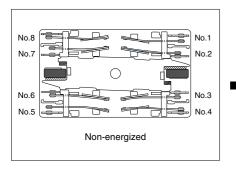
* Contact gaps are shown at the initial state. If the contacts change state owing to loading/breaking it is necessary to check the actual loading.

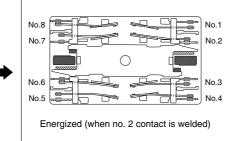
>0.5: contact gap is kept at min. 0.5 mm .020 inch Empty cells: either closed or open

2) 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.



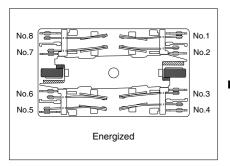


Example: If the No. 2 contact welds.

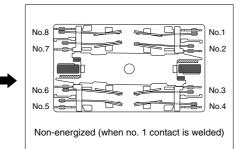
Each of the four form "a" contacts (No. 1, 3, 5, and 7) maintains a gap of greater than 0.5 mm .020 inch.

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.

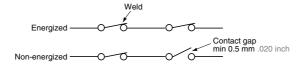


Example 2: If external connections are made in series. Even if one of the contacts welds, the other contacts operate independently and the contact gaps are maintained at greater than 0.5 mm .020 inch.

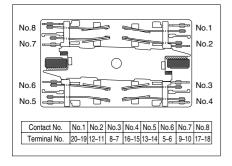


Example 1: If the No. 1 contact welds.

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.



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							
Contact No.		1	2	3	4	5	6	7	8
Welded terminal No.	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.

NOTES

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

-6-