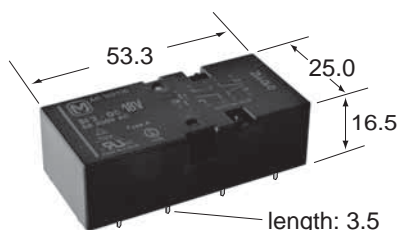


**Panasonic**  
ideas for life

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

**SF3 RELAY**



Tolerance ± 0.3mm  
Weight approx. 47g

## FEATURES

- Relay complies with EN 50205, Type A
- 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 outside
Coil-contact	400V	400V	250V
Contact-contact	400V	400V	400V

- Relay complies with IEC/EN 60335-1 (GWT)
- For applications according to EN 50155\*

\* For details, please contact your local Panasonic Electric Works representative.

## SPECIFICATIONS

### Contact

Contact configuration (a = normally open / NO, b = normally closed / NC)	3a1b
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, *3</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> )	16.5 / 7 / 3ms
Mechanical life	10 <sup>7</sup> ops

### Coil

Operate / release voltage (% of U <sub>nominal</sub> at 20°C)	75% / 10%
Pick-up/nominal power consumption at 20°C	280 / 500mW

### Remarks:

\*1 According to EN 60947-5-1: 1997, table 4 AC15 / DC13

\*2 Contact interruption <10μs

\*3 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: 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
Solder bath temperature, maximum duration	260°C, 5s
Degree of protection	IP67 / IP30 <sup>*3</sup>
Unit weight	37g

### 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. SF3 — DC12 V

Coil voltage (DC)
5, 9, 12, 18, 21 24, 36, 48, 60

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

## COIL DATA

Part number	Coil nominal voltage V DC	Operate voltage V DC	Release voltage V DC	Coil resistance $\Omega$ ( $\pm 10\%$ , 20°C)	Coil inductance (mH)
SF3-5V	5	3.75	0.5	50	47
SF3-9V	9	6.75	0.9	162	145
SF3-12V	12	9.00	1.2	288	252
SF3-18V	18	13.50	1.8	648	551
SF3-21V	21	15.75	2.1	882	742
SF3-24V	24	18.00	2.4	1152	959
SF3-36V	36	27.00	3.6	2592	2097
SF3-48V	48	36.00	4.8	4608	3654
SF3-60V	60	45.00	6.0	7200	5612

## ELECTRICAL LIFE

Voltage	Current	Load type	Frequency	Duty cycle	No. of contacts	No. of ops.
250V AC	8A	$\cos \varphi = 1$	0.33Hz	50%	2 <sup>*2,*6</sup>	30,000 <sup>*4,*5</sup>
250V AC	6A	$\cos \varphi = 1$	0.33Hz	50%	4 <sup>*2</sup>	100,000 <sup>*4,*5</sup>
250V AC	2A	$\cos \varphi = 1$	0.33Hz	50%	4 <sup>*2</sup>	500,000 <sup>*4,*5</sup>
220V AC	30 / 3A	AC 15 <sup>*1</sup>	0.10Hz	10%	1 <sup>*3</sup>	200,000 <sup>*4,*5</sup>
220V AC	5.10A	$\cos \varphi = 0.60$	0.20Hz	10%	1 <sup>*3</sup>	100,000 <sup>*4,*5</sup>
220V AC	4.43A	$\cos \varphi = 0.35$	0.20Hz	50%	1 <sup>*3</sup>	100,000 <sup>*4,*5</sup>
220V AC	1.45A	$\cos \varphi = 0.35$	0.20Hz	50%	1 <sup>*3</sup>	300,000 <sup>*4,*5</sup>
24V DC	6A	resistive	0.33Hz	50%	4 <sup>*2</sup>	400,000 <sup>*4,*5</sup>
24V DC	2A	resistive	0.50Hz	50%	4 <sup>*2</sup>	2,000,000 <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

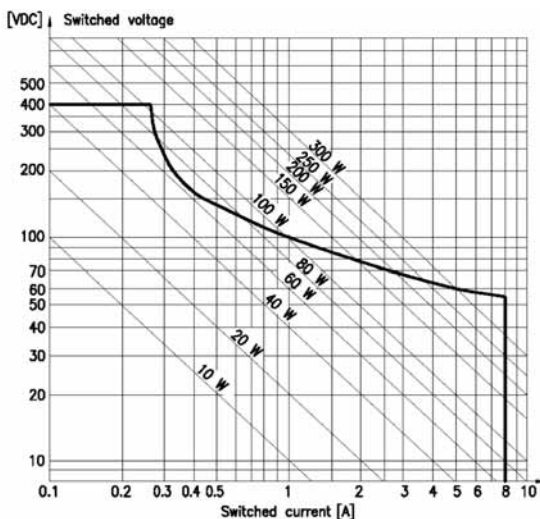
\*4 Ambient temperature +70°C

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

\*6 Normally open contacts

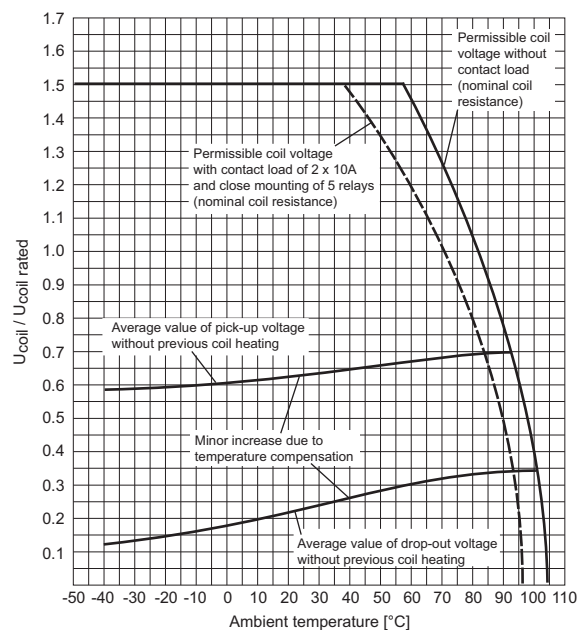
## REFERENCE DATA

Load limit curve



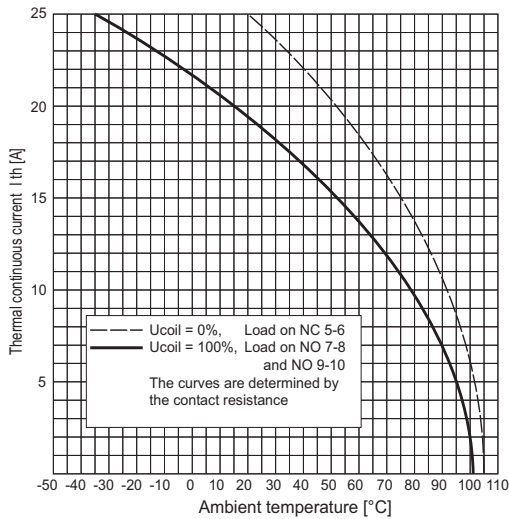
Loads in the range under the curve can be switched safely. The arc will extinguish before the opposite contact makes.

Coil voltage characteristics



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

Contact current characteristics



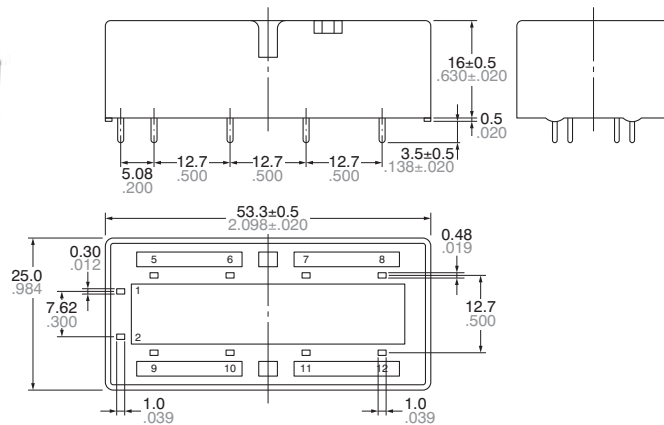
DIMENSIONS (mm inch)

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

CAD Data

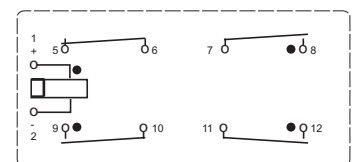


External dimensions



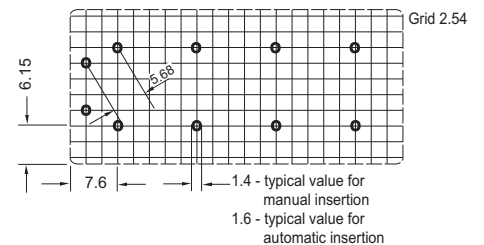
General tolerance:  $\pm 0.3 \pm 0.12$

Schematic (Bottom view)



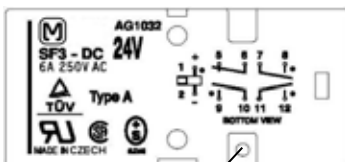
The contacts are shown in the deenergized condition.

PC board pattern (Bottom view)



Tolerance:  $\pm 0.1 \pm 0.04$

APPLICATION NOTES



Nipple

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!

## SAFETY STANDARDS

UL/C-UL (Recognized)		CSA (Certified)		TÜV (Certified)		SEV	
File No.	Contact rating	File No.	Contact rating	File No.	Rating	File No.	Contact rating
E43149	6A 250V AC	LR26550 etc.	6A 250V AC	R9919003 (SF3)	6A 250V AC	97.1 10376 99.1 10197.01	6A 250V AC

## 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

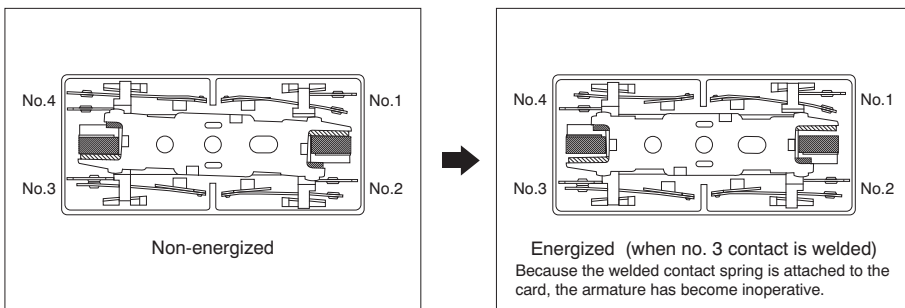
(unforeseen externally caused circuit or device breakdowns, end of life incidents, and noise, surge, and environmental influences) owing to contact welding, spring fusion or, in the worst-case

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

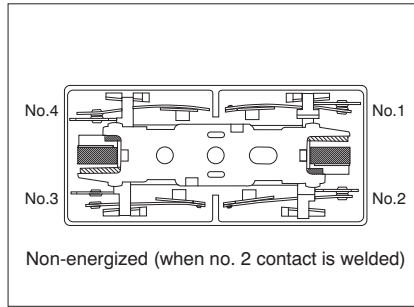
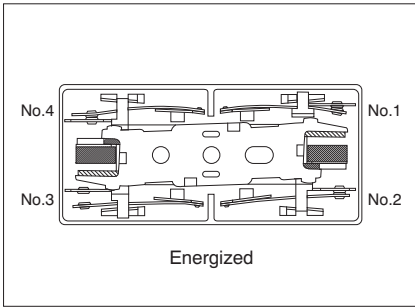
If the form "b" contact (No. 3) welds, the armature becomes non-operational, the contact gaps at the three form "a" contacts are maintained at greater than 0.5 mm .020 inch. Reliable isolation is thus ensured.



**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.

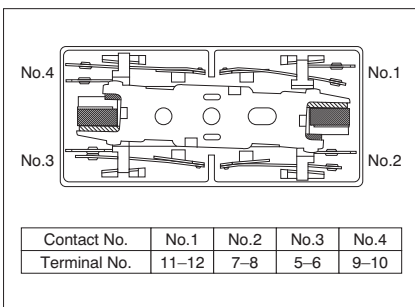
**Form "a" Contact Weld**

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.

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

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