Panasonic
ideas for life

Polarized monostable safety relay with forcibly guided double contacts

SF2D RELAY

53.3
25.0
16.5
length: 3.0
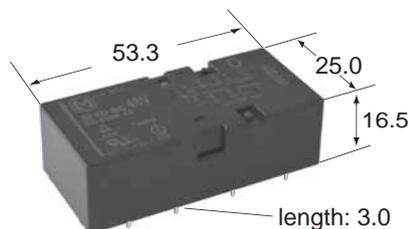
Tolerance ± 0.3mm
Weight approx. 47g

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**

	Polution degree		
	2 inside	2 outside	3 inside
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)	2a2b
Contact material	AgSnO$_2$, with Au flash
Contact resistance (initial at 6V DC, 1A)	30mΩ
Making and breaking capacities (breathing hole open)[*1]	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$_{nominal}$)	17.5 / 7 / 2ms
Mechanical life	10^{7}ops

Coil

Operate / release voltage (% of U$_{nominal}$ 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$_{rms}$
Insulation resistance at 500V DC (initial)	10$^9\Omega$
Shock resistance (11ms) NO/NC[*2]	30G
Vibration resistance 10 – 200 Hz (10 – 55 Hz, amplitude 2 mm)[*2]	10G
Degree of protection	IP67 / IP30[*3]
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. SF2D — DC12 V

Coil voltage (DC)

5, 9, 12, 18, 21
24, 36, 48, 60

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

SF2D
COIL DATA

Part number	Coil nominal voltage V DC	Operate voltage V DC	Release voltage V DC	Coil resistance Ω (±10%, 20°C)	Coil inductance (mH)
SF2D-DC5V	5	3.75	0.5	50	47
SF2D-DC9V	9	6.75	0.9	162	145
SF2D-DC12V	12	9.00	1.2	288	252
SF2D-DC18V	18	13.50	1.8	648	551
SF2D-DC21V	21	15.75	2.1	882	742
SF2D-DC24V	24	18.00	2.4	1152	959
SF2D-DC36V	36	27.00	3.6	2592	2097
SF2D-DC48V	48	36.00	4.8	4608	3654
SF2D-DC60V	60	45.00	6.0	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%	2[*2]	85,000[*5]
250V AC	6A	AC 1	0.33Hz	50%	4[*2]	100,000[*5]
230V AC	6A	AC 1	0.33Hz	10%	2[*3]	200,000[*4,*5]
230V AC	30 / 3A	AC 15[*1]	0.33Hz	10%	1[*3]	150,000[*4,*5]
24V DC	8A	DC 1	0.33Hz	10%	2[*3]	200,000[*4,*5]
24V DC	3A	DC 13[*1]	0.33Hz	10%	1[*3]	50,000[*4,*5]
24V DC	3A	L/R = 40ms	0.33Hz	10%	1[*3]	100,000[*4,*5]

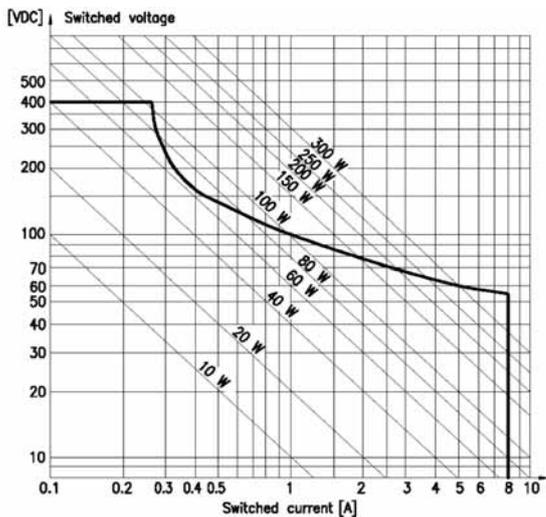*1 EN 60947-5-1: 1997; table C.1
*2 Breathing hole closed
*3 Breathing hole open
*4 Ambient temperature +70°C
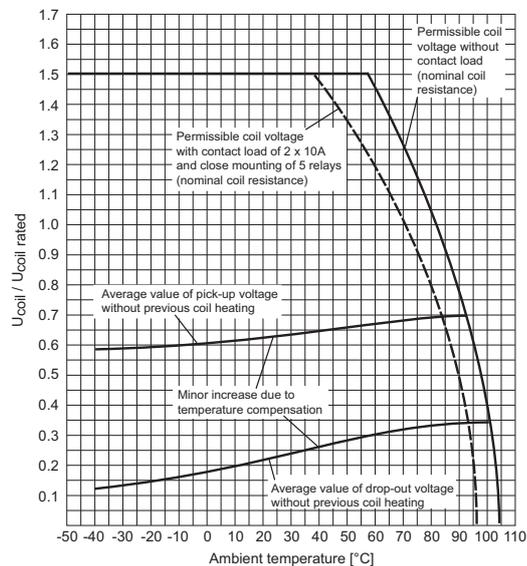*5 Dielectric strength according to EN61810-1:2004.

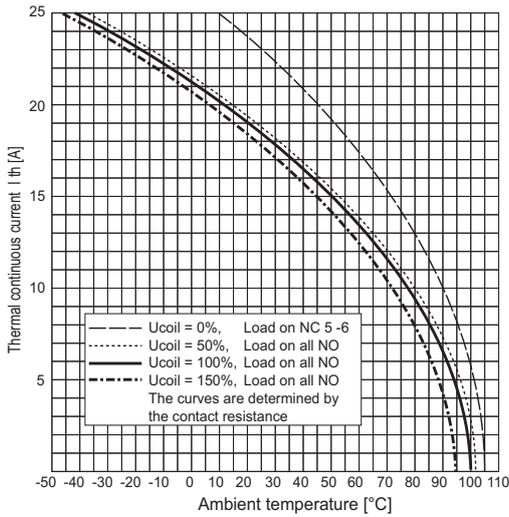## REFERENCE DATA

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

Permissable coil voltages and pick-up and drop-out characteristics at various ambient temperatures.
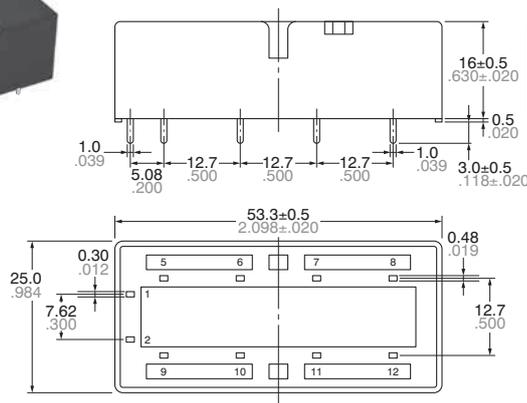
Contact current characteristics

Ucoil = 0%, Load on NC 5 -6
Ucoil = 50%, Load on all NO
Ucoil = 100%, Load on all NO
Ucoil = 150%, Load on all NO
The curves are determined by
the contact resistance

Thermal continuous current I th [A]

Ambient temperature [°C]

DIMENSIONS (mm inch)

Download **CAD Data** from our Web site.

2 Form A 2 Form B
CAD Data

External dimensions

16±0.5
.630±.020

0.5
.020

1.0
.039

12.7
.500

12.7
.500

12.7
.500

1.0
.039

5.08
.200

3.0±0.5
.118±.020

53.3±0.5
2.098±.020

0.48
.019

0.30
.012

25.0
.984

7.62
.300

12.7
.500

General tolerance: ±0.3 ±.012
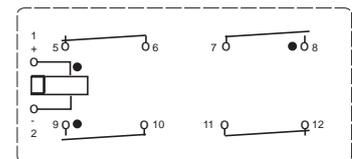
Schematic (Bottom view)

The contacts are shown in the deenergized condition.

PC board pattern (Bottom view)

Grid 2.54

6.15

5.68

7.6

1.4 - typical value for manual insertion
1.6 - typical value for automatic insertion

Tolerance: ±0.1 ±.004

APPLICATION NOTES
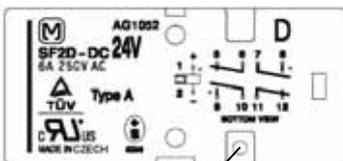
Nipple

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

SF2D

SAFETY STANDARDS

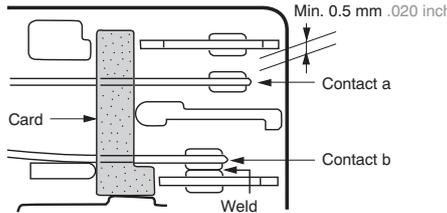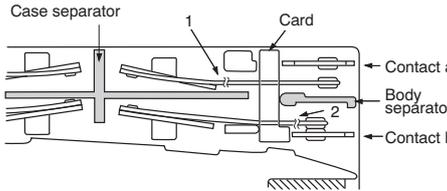| UL/C-UL (Recognized)		TÜV (Certified)		SEV	
File No.	Contact rating	File No.	Rating	File No.	Contact rating
E120782*	6A 250V AC 6A 24V DC	968 EZ 116.00 01 (SF2D) 968 EZ 113.00 01 (SF4D)	8A 24V DC 6A 230V AC	01, 1851	6A 230V AC 6A 24V DC

* 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.

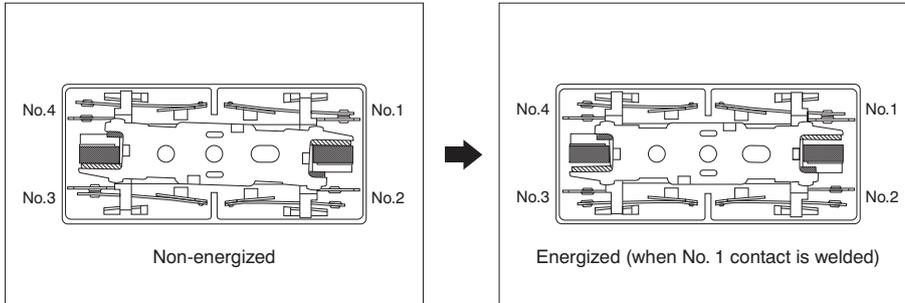|	Structure	Operation
1. Forced operation method (2 Form A 2 Form B, 4 Form A 4 Form B types)	 The two contacts "a" and "b" are coupled with the same card. The operation of each contact is regulated by the movement of the other contact.	Even when one contact is welded closed, the other maintains a gap of greater than 0.5 mm .020 inch. 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
2. Separate chamber method (2 Form A 2 Form B, 4 Form A 4 Form B types)	 In independent chambers, the contacts "a" and "b" are kept apart by a body/case separator or by the card itself.	Prevents shorting and fusing of springs and spring failure owing to short-circuit current. 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.
3. 2 Form A 2 Form B contact 4 Form A 4 Form B contact	Structure with independent COM contact of 2 Form A 2 Form B and 4 Form A 4 Form B contacts.	Independent COM enables differing pole circuit configurations. This makes it possible to design various kinds of control circuits and safety circuits.

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.

### 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.

No.4   No.1

No.3   No.2

Non-energized

No.4   No.1

No.3   No.2

Energized (when No. 1 contact is welded)

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 inch.
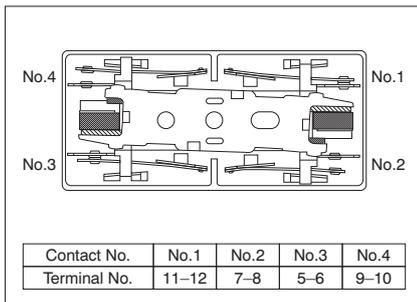
Form "a" Contact Weld

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.

No.4   No.1

No.3   No.2

Energized

No.4   No.1

No.3   No.2

Non-energized (when No. 2 contact is welded)
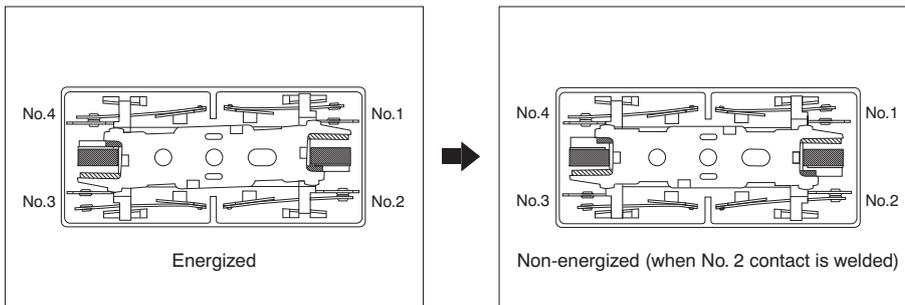
Example: If the No. 2 contact welds.
The two form "b" contact (No. 1 or 3) maintains a gap of greater than 0.5 mm .020 inch.

Contact Operation Table

No.4   No.1

No.3   No.2

Contact No.	No.1	No.2	No.3	No.4
Terminal No.	11–12	7–8	5–6	9–10

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		>0.5
	2	>0.5		>0.5	
	3		>0.5		>0.5
	4	>0.5		>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.**