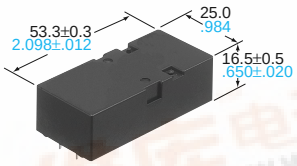
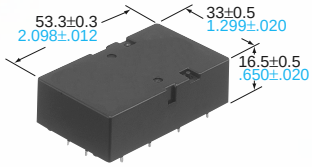


2 Form A 2 Form B



4 Form A 4 Form B

mm inch

FEATURES

• High contact reliability

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

• Forced operation contacts (2 Form A 2 Form B)

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.

• 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.

• Separated chamber structure (2 F A 2 Form B, 4 Form A 4 Form B)

N.O. and N.C. side contacts are put i each own space surrounded with a c and a body-separater. That prevents s circuit between contacts, which is cau by their springs welding or damaged.

• High breakdown voltage 2,500 Vr between contacts and coil

• High sensitivity

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

• Complies with safety standards

Standard products are UL, CSA, TÜV SEV certified. Comform to European standards. TÜV certified (945/EL, 178 88). Complies with SUVA European standard.

SPECIFICATIONS

Contact

Contact arrangement		2 Form A 2 Form B	4 Form A 4 Form B
Initial contact resistance, max. (By voltage drop 6 V DC 1 A)		30 mΩ	
Contact material		Gold-flashed silver alloy	
Rating (resistive)	Nominal switching capacity	6 A 250 V AC, 6 A 30 V DC	
	Max. switching power	1,500 VA, 180 W	
	Max. switching voltage	440 V AC, 30 V DC	
	Max. carrying current	6 A	
Expected life (min. operations)	Mechanical (at 180 cpm)	10^7	
	Electrical (at 20 cpm)	10^5	

Coil

Nominal operating power	500 mW

Remarks

* Specifications will vary with foreign standards certification ratings.
*1 Measurement at same location as “Initial breakdown voltage” section
*2 Detection current: 10mA
*3 Excluding contact bounce time
*4 Half-wave pulse of sine wave: 11ms; detection time: 10µs
*5 Half-wave pulse of sine wave: 6ms
*6 Detection time: 10µs
*7 Refer to 6. Usage, transport and storage mentioned in NOTES

Characteristics

Contact arrangement		2 Form A 2 Form B	4 Form 4 Form
Max. operating speed		180 cpm (at nominal volta	
Initial insulation resistance*1		Min. 1,000 MΩ at 500 V	
Initial breakdown voltage*2	Between open contacts	1,300 Vrms	
	Between contact sets	2,500 Vrms	
	Between contact and coil	2,500 Vrms	
Operate time*3 (at nominal voltage)		Approx. 17 ms	Approx. 18
Release time (without diode)*3 (at nominal voltage)		Approx. 7 ms	Approx. 6
Temperature rise (at nominal voltage) (at 20°C)		Max. 45°C with nominal coil voltage at 6 A carry current	
Shock resistance	Functional*4	Min. 294 m/s² {30 G}	
	Destructive*5	Min. 980 m/s² {100 G}	
Vibration resistance	Functional*6	10 to 55 Hz at double amplitude of 2 mm	
	Destructive	10 to 55 Hz at double amplitude of 2 mm	
Conditions for operation, transport and storage*7 (Not freezing and condensing at low temperature)	Ambient temp.	–40°C to +70°C –40°F to +158°F	
	Humidity	5 to 85% R.H.	
Unit weight		Approx. 38 g 1.34 oz	Approx 47 g 1.66

Contact arrangement	Coil voltage
2: 2 Form A 2 Form B 4: 4 Form A 4 Form B	DC 5, 12, 24, 48, 60 V

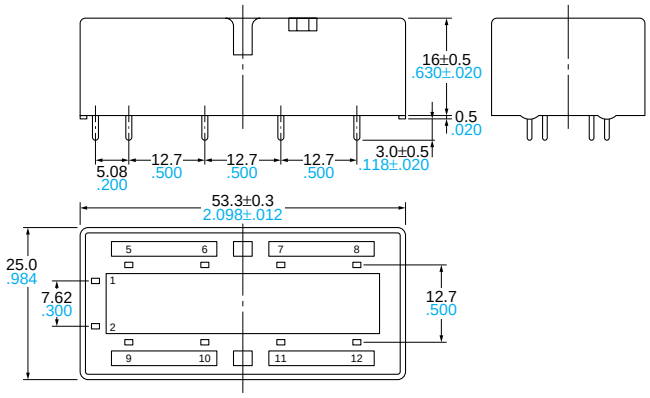
UL/CSA, TÜV, SEV approved type is standard

TYPES AND COIL DATA (at 20°C 68°F)

Contact arrangement	Part No.	Nominal voltage, V DC	Pick-up voltage, VDC (max.)	Drop-out voltage, V DC (min.)	Coil resistance Ω (±10%)	Nominal operating current, mA (±10%)	Nominal operating power, mW	Ma vo
2 Form A 2 Form B	SF2D-DC5V	5	3.75	0.5	50	100	500	
	SF2D-DC12V	12	9	1.2	288	41.7	500	
	SF2D-DC24V	24	18	2.4	1.152	20.8	500	
	SF2D-DC48V	48	36	4.8	4.608	10.4	500	
	SF2D-DC60V	60	45	6.0	7.200	8.3	500	
4 Form A 4 Form B	SF4D-DC5V	5	3.75	0.75	50	100	500	
	SF4D-DC12V	12	9	1.8	288	41.7	500	
	SF4D-DC24V	24	18	3.6	1.152	20.8	500	
	SF4D-DC48V	48	36	7.2	4.608	10.4	500	
	SF4D-DC60V	60	45	9.0	7.200	8.3	500	

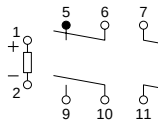
DIMENSIONS

1. 2 Form A 2 Form B

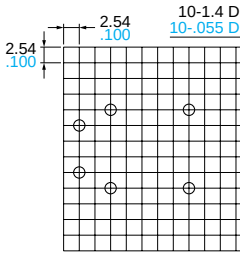


General tolerance: ±0.3 ±.012

Schematic (Bottom

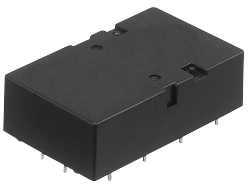


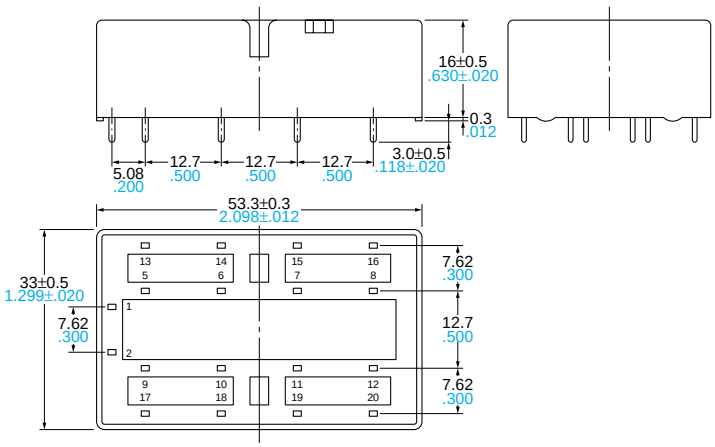
PC board pattern (Bot



Toleranc

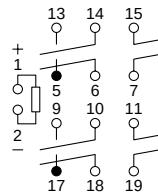
2. 4 Form A 4 Form B



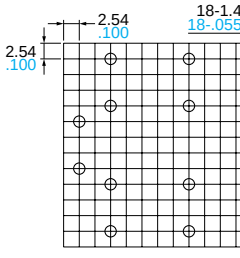


General tolerance: ±0.3 ±.012

Schematic (Bottom

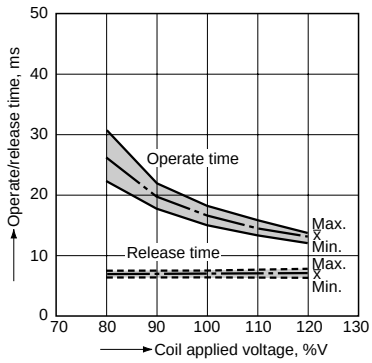


PC board pattern (Bot

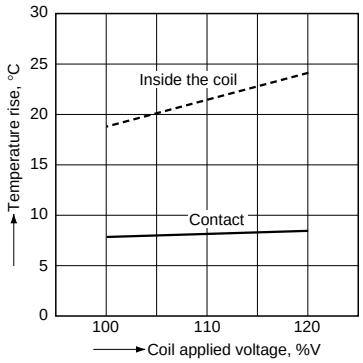


Toleranc

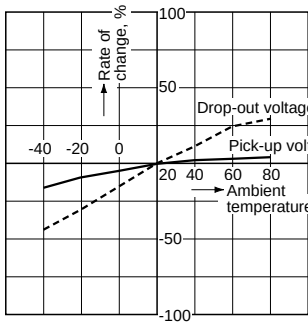
Quantity: n = 20



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

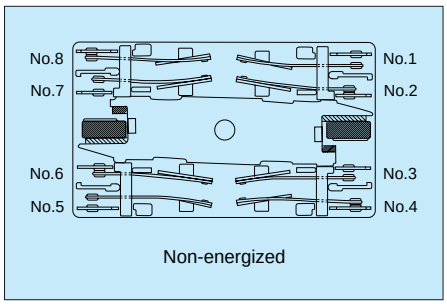


Quantity: n = 6

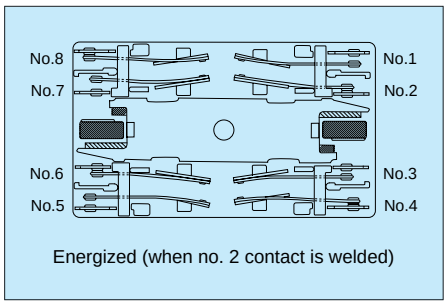


Internal Contacts Weld

If the internal contacts (No. 2, 3, 6, and 7) weld of 4a4b type, the armature becomes non-operational and the contact gaps the four form “a” contacts are maintained at greater than 0.5 mm .020 inch. Reliable isolation is thus ensured. The 2a2b typ in the same way.



Non-energized

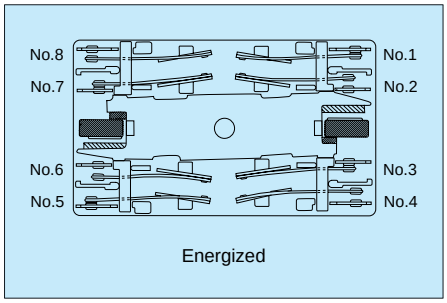


Energized (when no. 2 contact is welded)

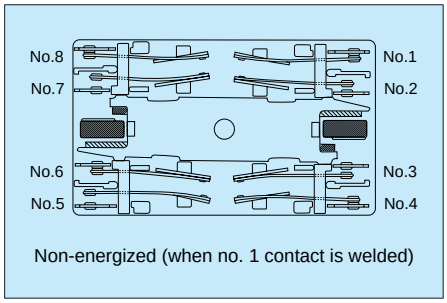
If the No. 2 contact welds.
Each of the four form “a” contacts and 7) maintains a gap of greater .020 inch.

External Contacts Weld

If the external contacts (No. 1, 4, 5, and 8) weld of 4a4b type, gaps of greater than 0.5 mm .020 inch are maintained betwee contacts and the other contacts return by an non-energized.



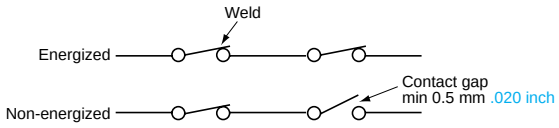
Energized



Non-energized (when no. 1 contact is welded)

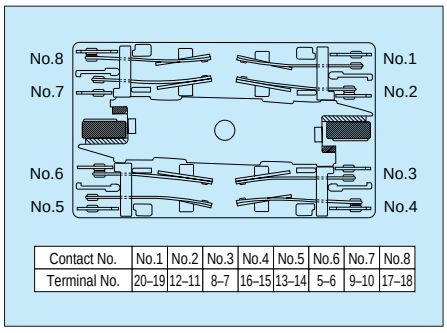
If the No. 1 contact welds.
The adjacent No. 2 contact mainta greater than 0.5 mm .020 inch. Th contacts, because the coil is not e return to their normal return state form “a” contacts (No. 3, 5, and 7) contact gap of greater than 0.5 m each of the form “b” contacts (No. return to a closed state.

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. In case of form “a” contact weld the coil applied voltage is 0 V.
In case of form “b” contact weld the coil applied voltage is nominal.



Contact No.	No.1	No.2	No.3	No.4	No.5	No.6	No.7	No.8
Terminal No.	20–19	12–11	8–7	16–15	13–14	5–6	9–10	17–18

Contact No. / Contact No.		State of other contacts							
		1	2	3	4	5	6	7	8
Welded contact 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:
is kep
mm .0
≠: cor
Empt
close

Note: Contact gaps are shown at the initial state.
If the contact transfer is caused by load switching, it is necessary to check the actual loading.

coil. The wave form should be rectangular. If it includes ripple, the ripple factor should be less than 5%. However, check it with the actual circuit since the characteristics may be slightly different.

2. Coil connection

When connecting coils, refer to the wiring diagram to prevent mis-operation or malfunction.

3. Cleaning

For automatic cleaning, the boiling method is recommended. Avoid ultrasonic cleaning which subjects the relays to high frequency vibrations, which may cause the contacts to stick.

It is recommended that a fluorinated hydrocarbon or other alcoholic solvents be used.

4. Soldering

We recommend the following soldering conditions

1) Automatic soldering

1) Preheating: 100°C 212°F, max. 60 s

2) Soldering: 250°C 482°F, max. 5 s

5. Others

1) If the relay has been dropped, the appearance and characteristics should always be checked before use.

2) The cycle lifetime is defined under the standard test condition specified in the JIS* C 5442-1986 standard (temperature 15 to 35°C 59 to 95°F, humidity 25 to 85%). Check this with the real device as it is affected by coil driving circuit, load type, activation frequency, activation phase,ambient conditions and other factors.

Also, be especially careful of loads such as those listed below.

(1) When used for AC load-operating and the operating phase is synchronous. Rocking and fusing can easily occur due to contact shifting.

closing of the relay is performed with a load that causes arcs at the contacts, nitrogen and oxygen in the air is fused by the arc energy and HNO_3 is formed. This can corrode metal materials.

Three countermeasures for these are listed here.

1. Incorporate an arc-extinguishing circuit.

2. Lower the operating frequency

3. Lower the ambient humidity

3) For secure operations, the voltage applied to the coil should be nominal voltage. In addition, please note that pick-up and drop-out voltage will vary according to the ambient temperature and operation conditions.

4) Heat, smoke, and even a fire may occur if the relay is used in conditions outside of the allowable ranges for the coil ratings, contact ratings, operating cycle lifetime, and other specifications. Therefore, do not use the relay if these ratings are exceeded. Also, make sure that the relay is wired correctly.

5) Incorrect wiring may cause unexpected events or the generation of heat or flames.

6) Check the ambient conditions when storing or transporting the relays and devices containing the relays. Freezing or condensation may occur in the relay, causing functional damage. Avoid subjecting the relays to heavy loads, or strong vibration and shocks.

6. Usage, transport and storage conditions

1) Ambient temperature, humidity, and atmospheric pressure during usage, transport, and storage of the relay:

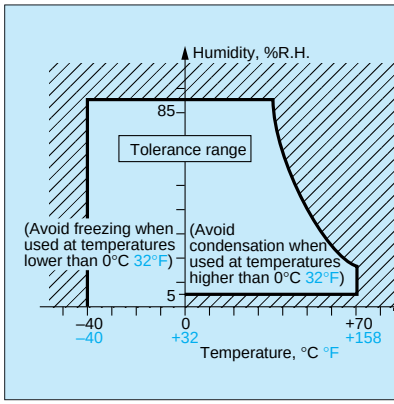
(1) Temperature:

–40 to +70°C –40 to +158°F

(2) Humidity: 5 to 85% RH

(Avoid freezing and condensation.)

indicated in the graph below.



(3) Atmospheric pressure: 86 to 106

Temperature and humidity range for usage, transport, and storage:

2) Condensation

Condensation forms when there is a sudden change in temperature under temperature and high humidity conditi

Condensation will cause deterioration the relay insulation.

3) Freezing

Condensation or other moisture may freeze on the relay when the temperatures is lower than 0°C 32°F. causes problems such as sticking of movable parts or operational time lag

4) Low temperature, low humidity environments

The plastic becomes brittle if the rela exposed to a low temperature, low humidity environment for long period time.

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