Compact Relay Family with Forcibly Guided Contacts

SF-Y RELAYS

4-pole
(2 Form A 2 Form B, 3 Form A 1 Form B)

6-pole
(4 Form A 2 Form B, 5 Form A 1 Form B)

RoHS compliant

FEATURES

1. Forcibly guided contact structure
Relay complies with EN 50205, Type A
Equipped with forcibly guided contact structure that enables detection of contact welding and construction of safety circuit.

2. Small size

3. Different contact configurations:

Type	L × W × H (mm inch)
2 Form A 2 Form B, 3 Form A 1 Form B	31.0 × 28.6 × 14.5 1.220 × 1.126 × .571
4 Form A 2 Form B, 5 Form A 1 Form B	39.0 × 28.6 × 14.5 1.535 × 1.126 × .571

4. Low profile: 14.5 mm .571 inch

5. Insulation according to EN 60664-1:
Overvoltage category III, Pollution degree 2, 250V AC

• Reinforced insulation:
Clearance and creepage 5.5 mm .217 inch
(between all contacts and between contact NO4 and coil)

• Basic insulation:
Clearance 3 mm .118 inch and creepage 4 mm .157 inch
(between all contacts and between contact NC3 and coil)

TYPICAL APPLICATIONS

1. Emergency stop switches
2. Machine safety engineering
3. Safety control units
4. Automation technology
5. Elevators
6. Escalators
7. Overcurrent protection with monitor contact

ORDERING INFORMATION

SFY □ - □

Contact arrangement
2: 2 Form A 2 Form B
3: 3 Form A 1 Form B
4: 4 Form A 2 Form B
5: 5 Form A 1 Form B

Nominal coil voltage
DC 5, 12, 16, 18, 21, 24V

Notes: Please consult us about other coil voltages.
Gold-clad contact type available on request.

TYPES

Contact arrangement		Nominal coil voltage	Part No.
4-pole	2 Form A 2 Form B	5 V DC	SFY2-DC5V
		12 V DC	SFY2-DC12V
		16 V DC	SFY2-DC16V
		18 V DC	SFY2-DC18V
		21 V DC	SFY2-DC21V
		24 V DC	SFY2-DC24V
	3 Form A 1 Form B	5 V DC	SFY3-DC5V
		12 V DC	SFY3-DC12V
		16 V DC	SFY3-DC16V
		18 V DC	SFY3-DC18V
		21 V DC	SFY3-DC21V
		24 V DC	SFY3-DC24V
6-pole	4 Form A 2 Form B	5 V DC	SFY4-DC5V
		12 V DC	SFY4-DC12V
		16 V DC	SFY4-DC16V
		18 V DC	SFY4-DC18V
		21 V DC	SFY4-DC21V
		24 V DC	SFY4-DC24V
	5 Form A 1 Form B	5 V DC	SFY5-DC5V
		12 V DC	SFY5-DC12V
		16 V DC	SFY5-DC16V
		18 V DC	SFY5-DC18V
		21 V DC	SFY5-DC21V
		24 V DC	SFY5-DC24V

Standard packing: Tube 20 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 operating 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)
4-pole	2 Form A 2 Form B	5V DC	75%V or less of nominal voltage (Initial)	15%V or more of nominal voltage (Initial)	134mA	38Ω	670mW	120%V of nominal voltage
		12V DC			56mA	215Ω		
		16V DC			42mA	380Ω		
		18V DC			37mA	483Ω		
		21V DC			32mA	666Ω		
		24V DC			28mA	864Ω		
	3 Form A 1 Form B	5V DC			134mA	38Ω		
		12V DC			56mA	215Ω		
		16V DC			42mA	380Ω		
		18V DC			37mA	483Ω		
		21V DC			32mA	666Ω		
		24V DC			28mA	864Ω		
6-pole	4 Form A 2 Form B	5V DC			134mA	38Ω		
		12V DC			56mA	215Ω		
		16V DC			42mA	380Ω		
		18V DC			37mA	483Ω		
		21V DC			32mA	666Ω		
		24V DC			28mA	864Ω		
	5 Form A 1 Form B	5V DC			134mA	38Ω		
		12V DC			56mA	215Ω		
		16V DC			42mA	380Ω		
		18V DC			37mA	483Ω		
		21V DC			32mA	666Ω		
		24V DC			28mA	864Ω		

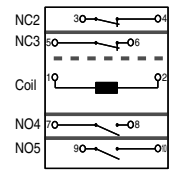
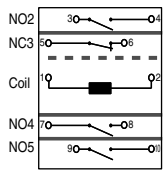
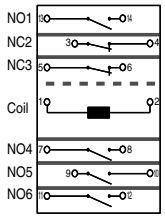
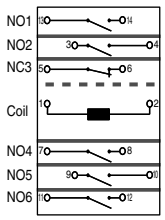
2. Specifications

Characteristics	Item		Specifications	
			4-pole	6-pole
Contact	Contact arrangement		2 Form A 2 Form B, 3 Form A 1 Form B	4 Form A 2 Form B, 5 Form A 1 Form B
	Forcibly guided contacts		All contacts: Type A, EN 50205	
	Contact resistance (Initial)		Max. 100 mΩ (By voltage drop 6 V DC 1A)	
	Contact material		Au-flashed AgNi alloy 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		6 A	
	Min. switching capacity (Reference value)*1		10mA 10V 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	1,500 Vrms for 1 min. (Detection current: 10mA)	
		Between contact sets	4,000 Vrms for 1 min. (Detection current: 10mA)	
		Between contact and coil	NC3: 2,500 Vrms for 1min; NO4: 4,000 Vrms for 1min (Detection current: 10mA)	
	Coil holding voltage*4		Min. 60%V (Initial, at 20°C 68°F)	
	Operate time (at 20°C 68°F)		Max. 20ms (Nominal coil voltage applied to the coil, excluding contact bounce time)	
	Release time (at 20°C 68°F)		Max. 10ms (Nominal coil voltage applied to the coil, excluding contact bounce time) (without diode)	
Mechanical characteristics	Shock resistance	Functional	200 m/s² (Half-wave pulse of sine wave: 11 ms; detection time: 10μs)	
		Destructive	1,000 m/s² (Half-wave pulse of sine wave: 6 ms)	
	Vibration resistance	Functional	10 to 55 Hz at double amplitude of 1.5 mm .059 inch (Detection time: 10μs)	
		Destructive	10 to 55 Hz at double amplitude of 1.5 mm .059 inch	
Expected life	Mechanical		Min. 10^7 (at 180 times/min.)	
	Electrical		250 V AC 6 A resistive load: Min. 10^5 (at 20 times/min.)	
Degree of protection			RT III*3	
Conditions	Conditions for operation, transport and storage*2		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		20 times/min. (at nominal voltage)	
Unit weight			Approx. 19 g .67 oz	Approx. 23 g .81 oz

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.
*3. According to EN 61810-1:2010, table 2. Characteristic is sealed construction with terminals, case and base sealed shut with sealing resin. Construction is designed to prevent seeping of flux when soldering and cleaning fluid when cleaning. Harmful substances on the contacts are removed by gas purging before sealing with.
*4. Coil holding voltage is the coil voltage after 100 ms from the applied nominal voltage.

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)

Insulation

2 Form A 2 Form B	3 Form A 1 Form B	4 Form A 2 Form B	5 Form A 1 Form B
			

——— = Reinforced insulation: overvoltage category III, pollution degree 2, 250V AC
(Clearance and creepage distance is 5.5 mm .217 inch or more between contact sets shown by “———”. Also, there is 5.5 mm .217 inch or more clearance and creepage distance even between contact NO4 and coil.)
- - - - = Basic insulation: overvoltage category III, pollution degree 3, 250V AC
(Between contact NC3 and coil shown by “- - - -”, the clearance is 3 mm .118 inch or more and the creepage distance is 4 mm .157 inch or more.)

Other contact gaps when contacts are welded

The table below shows the state of the other contacts.
In case of form “NO” contact weld the coil applied voltage is 0 V.
In case of form “NC” contact weld the coil applied voltage is nominal.

<2 Form A 2 Form B>

		State of other contacts			
		3-4 (NC)	5-6 (NC)	7-8 (NO)	9-10 (NO)
Welded terminal No.	3-4 (NC)			>0.5	>0.5
	5-6 (NC)			>0.5	>0.5
	7-8 (NO)	>0.5	>0.5		
	9-10 (NO)	>0.5	>0.5		

<3 Form A 1 Form B>

		State of other contacts			
		3-4 (NC)	5-6 (NO)	7-8 (NO)	9-10 (NO)
Welded terminal No.	3-4 (NC)		>0.5	>0.5	>0.5
	5-6 (NO)	>0.5			
	7-8 (NO)	>0.5			
	9-10 (NO)	>0.5			

<4 Form A 2 Form B>

		State of other contacts					
		3-4 (NC)	5-6 (NC)	7-8 (NO)	9-10 (NO)	11-12 (NO)	13-14 (NO)
Welded terminal No.	3-4 (NC)			>0.5	>0.5	>0.5	>0.5
	5-6 (NC)			>0.5	>0.5	>0.5	>0.5
	7-8 (NO)	>0.5	>0.5				
	9-10 (NO)	>0.5	>0.5				
	11-12 (NO)	>0.5	>0.5				
	13-14 (NO)	>0.5	>0.5				

<5 Form A 1 Form B>

		State of other contacts					
		3-4 (NC)	5-6 (NO)	7-8 (NO)	9-10 (NO)	11-12 (NO)	13-14 (NO)
Welded terminal No.	3-4 (NC)		>0.5	>0.5	>0.5	>0.5	>0.5
	5-6 (NO)	>0.5					
	7-8 (NO)	>0.5					
	9-10 (NO)	>0.5					
	11-12 (NO)	>0.5					
	13-14 (NO)	>0.5					

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

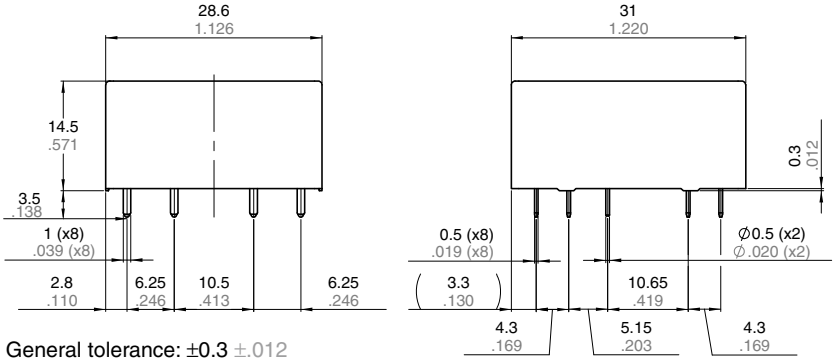
DIMENSIONS (mm inch)

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

1. 4-pole (2 Form A 2 Form B, 3 Form A 1 Form B)

CAD Data

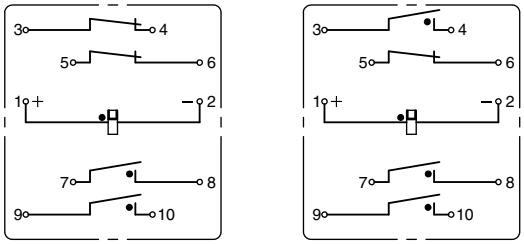
External dimensions



General tolerance: ±0.3 ±.012

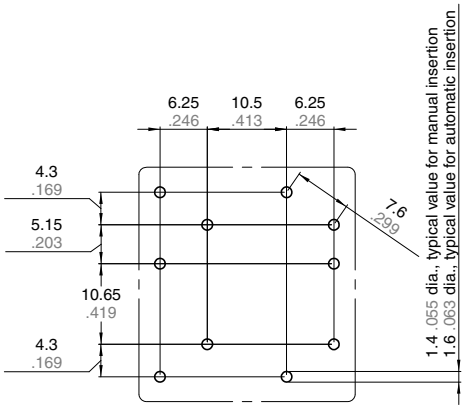
Projection mode:

Schematic (Bottom view)



(2 Form A 2 Form B) (3 Form A 1 Form B)

PC board pattern (Bottom view)

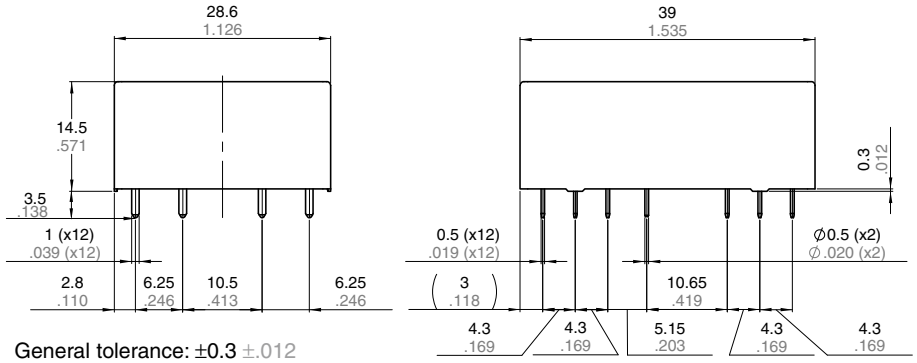


Tolerance: ±0.1 ±.004

2. 6-pole (4 Form A 2 Form B, 5 Form A 1 Form B)

CAD Data

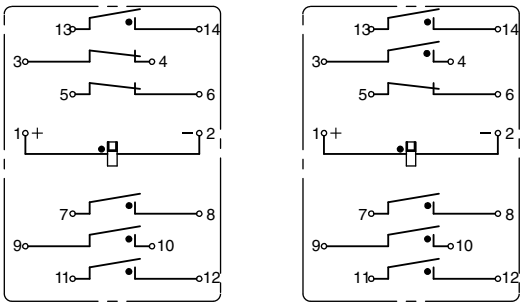
External dimensions



General tolerance: ±0.3 ±.012

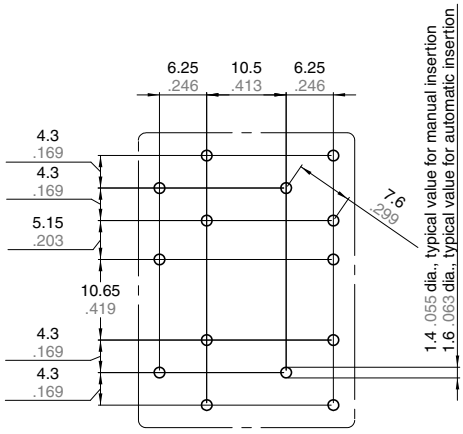
Projection mode:

Schematic (Bottom view)



(4 Form A 2 Form B) (5 Form A 1 Form B)

PC board pattern (Bottom view)



Tolerance: ±0.1 ±.004

SAFETY STANDARDS

Certification authority	File No.	Rating
UL/C-UL	E120782*	6A 250V AC, general use, 100Kops 6A 30V DC, general use, 100Kops, B300, R300 (pilot duty)
TÜV	Cert. no: 968/EZ 535. 00/12	6A 230V AC (cosϕ=1.0) 70°C 158°F resistive, 6A 24V DC (cosϕ=1.0) resistive

* CSA standard certified by C-UL

NOTES

1. For cautions for use, please read "General Application Guidelines" on page B-1.

2. Coil operating power

Pure DC current should be applied to the 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.

3. Coil connection

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

4. Soldering

When using automatic soldering, the following conditions are recommended

1) Preheating: 120°C 248°F, within 120 sec (PC board solder surface)

2) Soldering: 260°C±5°C 500°F±41°F, within 6 sec

GUIDELINES FOR POWER, HIGH-CAPACITY DC CUT OFF AND SAFETY RELAYS USAGE

For cautions for use, please read "GUIDELINES FOR RELAY USAGE".
https://industrial.panasonic.com/ac/e/control/relay/cautions_use/index.jsp

Precautions for Coil Input

■Long term current carrying

A circuit that will be carrying a current continuously for long periods without relay switching operation. (circuits for emergency lamps, alarm devices and error inspection that, for example, revert only during malfunction and output warnings with form B contacts) Continuous, long-term current to the coil will facilitate deterioration of coil insulation and characteristics due to heating of the coil itself.
For circuits such as these, please use a magnetic-hold type latching relay. If you need to use a single stable relay, use a sealed type relay that is not easily affected by ambient conditions and make a failsafe circuit design that considers the possibility of contact failure or disconnection.

■DC Coil operating power

Steady state DC current should be applied to the coil. The wave form should be rectangular. If it includes ripple, the ripple factor should be less than 5%.
However, please check with the actual circuit since the electrical characteristics may vary. The rated coil voltage should be applied to the coil and the set/reset pulse time of latching type relay differs for each relays, please refer to the relay's individual specifications.

■Coil connection

When connecting coils of polarized relays, please check coil polarity (+,-) at the internal connection diagram (Schematic). If any wrong connection is made, it may cause unexpected malfunction, like abnormal heat, fire and so on, and circuit do not work. Avoid impressing voltages to the set coil and reset coil at the same time.

■Maximum allowable voltage and temperature rise

Proper usage requires that the rated coil voltage be impressed on the coil. Note, however, that if a voltage greater than or equal to the maximum continuous voltage is impressed on the coil, the coil may burn or its layers short due to the temperature rise. Furthermore, do not exceed the usable ambient temperature range listed in the catalog.

■Operate voltage change due to coil temperature rise (Hot start)

In DC relays, after continuous passage of current in the coil, if the current is turned OFF, then immediately turned ON again, due to the temperature rise in the coil, the pick-up voltage will become somewhat higher. Also, it will be the same as using it in a higher temperature atmosphere. The resistance/temperature relationship for copper wire is about 0.4% for 1°C, and with this ratio the coil resistance increases. That is, in order to operate of the relay, it is necessary that the voltage be higher than the pick-up voltage and the pick-up voltage rises in accordance with the increase in the resistance value. However, for some polarized relays, this rate of change is considerably smaller.

Ambient Environment

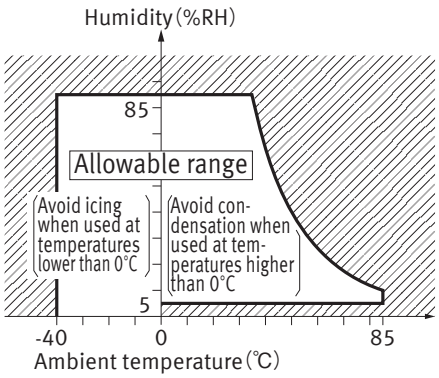
●Usage, Transport, and Storage Conditions

During usage, storage, or transportation, avoid locations subjected to direct sunlight and maintain normal temperature, humidity and pressure conditions.

●Temperature/Humidity/Pressure

When transporting or storing relays while they are tube packaged, there are cases the temperature may differ from the allowable range. In this case be sure to check the individual specifications.
Also allowable humidity level is influenced by temperature, please check charts shown below and use relays within mentioned conditions. (Allowable temperature values differ for each relays, please refer to the relay's individual specifications.)

1) Temperature:
   The tolerance temperature range differs for each relays, please refer to the relay's individual specifications
2) Humidity: 5 to 85 % RH
3) Pressure: 86 to 106 kPa



●Dew condensation

Condensation occurs when the ambient temperature drops suddenly from a high temperature and humidity, or the relay is suddenly transferred from a low ambient temperature to a high temperature and humidity. Condensation causes the failures like insulation deterioration, wire disconnection and rust etc.
Panasonic Corporation does not guarantee the failures caused by condensation.
The heat conduction by the equipment may accelerate the cooling of device itself, and the condensation may occur.
Please conduct product evaluations in the worst condition of the actual usage. (Special attention should be paid when high temperature heating parts are close to the device. Also please consider the condensation may occur inside of the device.)

●Icing

Condensation or other moisture may freeze on relays when the temperature become lower than 0°C.This icing causes the sticking of movable portion, the operation delay and the contact conduction failure etc. Panasonic Corporation does not guarantee the failures caused by the icing.
The heat conduction by the equipment may accelerate the cooling of relay itself and the icing may occur. Please conduct product evaluations in the worst condition of the actual usage.

●Low temperature and low humidity

The plastic becomes brittle if the switch is exposed to a low temperature, low humidity environment for long periods of time.

●High temperature and high humidity

Storage for extended periods of time (including transportation periods) at high temperature or high humidity levels or in atmospheres with organic gases or sulfide gases may cause a sulfide film or oxide film to form on the surfaces of the contacts and/or it may interfere with the functions. Check out the atmosphere in which the units are to be stored and transported.

●Package

In terms of the packing format used, make every effort to keep the effects of moisture, organic gases and sulfide gases to the absolute minimum.

●Silicon

When a source of silicone substances (silicone rubber, silicone oil, silicone coating materials and silicone filling materials etc.) is used around the relay, the silicone gas (low molecular siloxane etc.) may be produced.

This silicone gas may penetrate into the inside of the relay. When the relay is kept and used in this condition, silicone compound may adhere to the relay contacts which may cause the contact failure. Do not use any sources of silicone gas around the relay (Including plastic seal types).

●NOx Generation

When relay is used in an atmosphere high in humidity to switch a load which easily produces an arc, the NOx created by the arc and the water absorbed from outside the relay combine to produce nitric acid. This corrodes the internal metal parts and adversely affects operation. Avoid use at an ambient humidity of 85%RH or higher (at 20°C). If use at high humidity is unavoidable, please contact our sales representative.

Others

■Cleaning

1) Although the environmentally sealed type relay (plastic sealed type, etc.) can be cleaned, avoid immersing the relay into cold liquid (such as cleaning solvent) immediately after soldering. Doing so may deteriorate the sealing performance.
2) Cleaning with the boiling method is recommended(The temperature of cleaning liquid should be 40°C or lower).
   Avoid ultrasonic cleaning on relays. Use of ultrasonic cleaning may cause breaks in the coil or slight sticking of the contacts due to ultrasonic energy.

Please refer to **"the latest product specifications"** when designing your product.
•Requests to customers:
https://industrial.panasonic.com/ac/e/salespolicies/

Please contact .....

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