RF1V Force Guided Relays/SF1V Relay Sockets

Key features:

- Compact and EN compliant RF1V force guided relays
- Force guided contact mechanism (EN50205 Type A TÜV approved)
- Contact configuration
  4-pole (2NO-2NC, 3NO-1NC)
  6-pole (4NO-2NC, 5NO-1NC, 3NO-3NC)
- Built-in LED indicator available.
- Fast response time (8 ms maximum).
- High shock resistance (200 m/s^2 minimum)
- Finger-safe DIN rail mount socket and PC board mount socket.

Applicable Standard	Marking	Certification Organization/ File Number
UL508 CSA C22.2 No.14	c UL us, CSA	UL/c-UL File No. E55996
EN50205 EN61810-1	TÜV	TÜV SÜD

Part Number Selection

Contact		Part Number		Rated Coil Voltage
		Without LED Indicator	With LED Indicator	
4-pole	2NO-2NC	RF1V-2A2B-D12	RF1V-2A2BL-D12	12V DC
		RF1V-2A2B-D24	RF1V-2A2BL-D24	24V DC
		RF1V-2A2B-D48	RF1V-2A2BL-D48	48V DC
	3NO-1NC	RF1V-3A1B-D12	RF1V-3A1BL-D12	12V DC
		RF1V-3A1B-D24	RF1V-3A1BL-D24	24V DC
		RF1V-3A1B-D48	RF1V-3A1BL-D48	48V DC
6-pole	4NO-2NC	RF1V-4A2B-D12	RF1V-4A2BL-D12	12V DC
		RF1V-4A2B-D24	RF1V-4A2BL-D24	24V DC
		RF1V-4A2B-D48	RF1V-4A2BL-D48	48V DC
	5NO-1NC	RF1V-5A1B-D12	RF1V-5A1BL-D12	12V DC
		RF1V-5A1B-D24	RF1V-5A1BL-D24	24V DC
		RF1V-5A1B-D48	RF1V-5A1BL-D48	48V DC
	3NO-3NC	RF1V-3A3B-D12	RF1V-3A3BL-D12	12V DC
		RF1V-3A3B-D24	RF1V-3A3BL-D24	24V DC
		RF1V-3A3B-D48	RF1V-3A3BL-D48	48V DC

Sockets

Style		No. of Poles	Ordering Type No.
	DIN Rail Mount Sockets	4	SF1V-4-07L
		6	SF1V-6-07L
	PC Board Mount Sockets	4	SF1V-4-61
		6	SF1V-6-61

Certification for Sockets

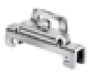
Applicable Standard	Marking	Certification Organization/ File Number
UL508 CSA C22.2 No.14	c UL us, CSA	UL/c-UL File No. E62437
EN147000 EN147100	TÜV	TÜV SÜD
	CE	EC Low Voltage Directive (DIN rail mount sockets only)

Coil Ratings

Contact		Rated Coil Voltage (V)	Rated Current (mA) ±10% (at 20°C) [1]	Coil Resistance (Ω) ±10% (at 20°C)	Operating Characteristics (at 20°C)			Power Consumption
					Pickup Voltage	Dropout Voltage	Maximum Continuous Applied Voltage [2]	
4-pole	2NO-2NC	12V DC	30	400	75% maximum	10% minimum	110%	Approx. 0.36W
		24V DC	15	1600				
		48V DC	7.5	6400				
	3NO-1NC	12V DC	30	400				
		24V DC	15	1600				
		48V DC	7.5	6400				
6-pole	4NO-2NC	12V DC	41.7	288				Approx. 0.5W
		24V DC	20.8	1152				
		48V DC	10.4	4608				
	5NO-1NC	12V DC	41.7	288				
		24V DC	20.8	1152				
		48V DC	10.4	4608				
	3NO-3NC	12V DC	41.7	288				
		24V DC	20.8	1152				
		48V DC	10.4	4608				

1. For relays with LED indicator, the rated current increases by approx. 2 mA.
2. Maximum continuous applied voltage is the maximum voltage that can be applied to relay coils.

Accessories

Item	Appearance	Specifications	Type No.	Remarks
DIN Rail		Aluminum Weight: Approx. 250g	BNDN1000	Length: 1m Width: 35 mm
End Clip		Metal (zinc plated steel) Weight: Approx. 15g	BNL5	—
			BNL6	

Specifications

Number of Poles		4-pole		6-pole		
Contact Configuration		2NO-2NC	3NO-1NC	4NO-2NC	5NO-1NC	3NO-3NC
Contact Resistance (initial value) [1]		100 mΩ maximum				
Contact Material		$AgSnO_2$ (Au flashed)				
Rated Load (resistive load)		6A 250V AC, 6A 30V DC				
Allowable Switching Power (resistive load)		1500 VA, 180W				
Allowable Switching Voltage		250V AC, 30V DC				
Allowable Switching Current		6A				
Minimum Applicable Load [2]		5V DC, 1 mA (reference value)				
Power Consumption (approx.)		0.36W		0.5W		
Insulation Resistance		1000 MΩ minimum (500V DC megger, same measurement positions as the dielectric strength)				
Dielectric Strength	Between contact and coil	4000V AC, 1 minute				
	Between contacts of different poles	2500V AC, 1 minute Between contacts 7-8 and 9-10		2500V AC, 1 minute Between contacts 7-8 and 11-12 Between contacts 9-10 and 13-14 Between contacts 11-12 and 13-14		
		4000V AC, 1 min. Between contacts 3-4 and 5-6 Between contacts 3-4 and 7-8 Between contacts 5-6 and 9-10		4000V AC, 1 min. Between contacts 3-4 and 5-6 Between contacts 3-4 and 7-8 Between contacts 5-6 and 9-10 Between contacts 7-8 and 9-10		
	Between contacts of the same pole	1500V AC, 1 minute				
Operating Time (at 20°C)		20 ms maximum (at the rated coil voltage, excluding contact bounce time)				
Response Time (at 20°C) [3]		8 ms maximum (at the rated coil voltage, excluding contact bounce time)				
Release Time (at 20°C)		20 ms maximum (at the rated coil voltage, excluding contact bounce time)				
Vibration Resistance	Operating Extremes	10 to 55 Hz, amplitude 0.75 mm				
	Damage Limits	10 to 55 Hz, amplitude 0.75 mm				
Shock Resistance	Operating Extremes (half sine-wave pulse: 11 ms)	200 m/s^2, when mounted on DIN rail mount socket: 150 m/s^2				
	Damage Limits (half sine-wave pulse: 6 ms)	1000 m/s^2				
Electrical Life		250V AC 6A resistive load: 100,000 operations minimum (operating frequency 1200 per hour) 30V DC 6A resistive load: 100,000 operations minimum (operating frequency 1200 per hour) 250V AC 1A resistive load: 500,000 operations minimum (operating frequency 1800 per hour) 30V DC 1A resistive load: 500,000 operations minimum (operating frequency 1800 per hour) [AC 15] 240V AC 2A inductive load: 100,000 operations minimum (operating frequency 1200 per hour, cos ø = 0.3) [DC 13] 24V DC 1A inductive load: 100,000 operations minimum (operating frequency 1200 per hour, L/R = 48 ms)				
Mechanical Life		10 million operations minimum (operating frequency 10,800 operations per hour)				
Operating Temperature [4]		–40 to +85°C (no freezing)				
Operating Humidity		5 to 85%RH (no condensation)				
Storage Temperature		–40 to +85°C				
Operating Frequency (rated load)		1200 operations per hour				
Weight (approx.)		20g		23g		

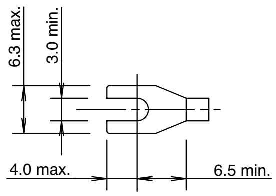
1. Measured using 6V DC,1A voltage drop method.
2. Failure rate level P (reference value)
3. Response time is the time until NO contact opens, after the coil voltage is turned off.
4. When using at 70 to 85°C, reduce the switching current by 0.1A/°C.

Socket Specifications

Part Number	SF1V-4-07L	SF1V-6-07L	SF1V-4-61	SF1V-6-61
Rated Current	6A			
Rated Voltage	250V AC/DC			
Insulation Resistance	1000 MΩ minimum (500V DC megger, between terminals)			
Dielectric Strength	2500V AC, 1 minute (between terminals)			
Screw Terminal Style	M3 slotted Phillips screw		—	
Applicable Wire	0.7 to 1.65 mm^2 (18 AWG to 14 AWG)		—	
Recommended Screw Tightening Torque	0.5 to 0.8 N·m		—	
Terminal Strength	Wire tensile strength: 50N min.		—	
Vibration Resistance	Damage limits: 10 to 55 Hz, amplitude 0.75 mm Resonance: 10 to 55 Hz, amplitude 0.75 mm			
Shock Resistance	1000 m/s^2			
Operating Temperature [1]	–40 to +85°C (no freezing)			
Operating Humidity	5 to 85% RH (no condensation)			
Storage Humidity	–40 to +85°C			
Degree of Protection	IP20 (finger-safe screw terminals)		—	
Weight (approx.)	40g	55g	9g	10g

1. When using at 70 to 85°C, reduce the switching current by 0.1A/°C.

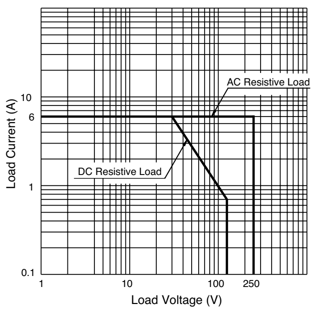
Applicable Crimping Terminals Specifications



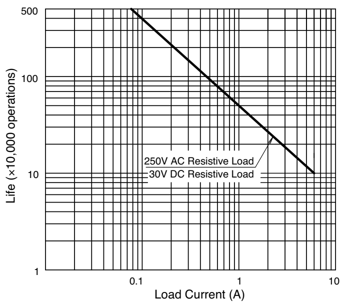
Note: Ring tongue terminals cannot be used.

Characteristics

Maximum Switching Capacity

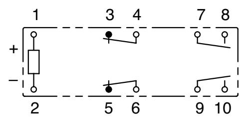


Electrical Life Curve



Notes on Contact Gaps except Welded Contacts

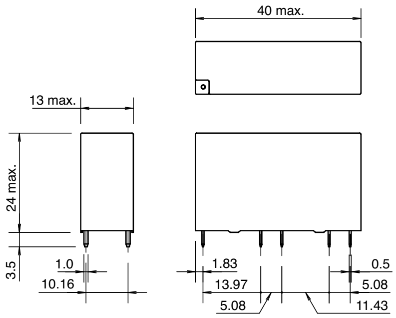
Example: RF1V-2A2B-D24



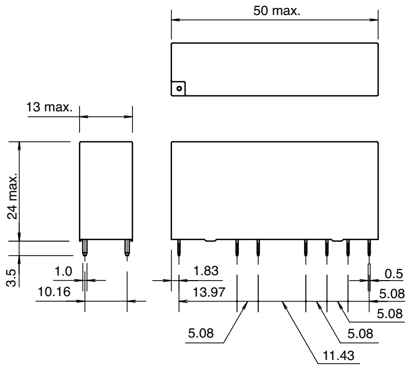
- If the NO contact (7-8 or 9-10) welds, the NC contact (3-4 or 5-6) remains open even when the relay coil is de-energized, maintaining a gap of 0.5 mm. The remaining unwelded NO contact (9-10 or 7-8) is either open or closed.
- If the NC contact (3-4 or 5-6) welds, the NO contact (7-8 or 9-10) remains open even when the relay coil is energized, maintaining a gap of 0.5 mm. The remaining unwelded NC contact (5-6 or 3-4) is either open or closed.

RF1V Dimensions (mm)

RF1V (4-pole)

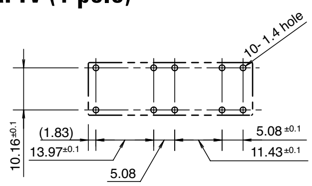


RF1V (6-pole)

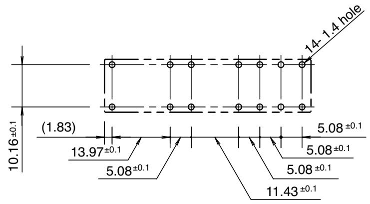


PC Board Terminal type Mounting Hole Layout (Bottom View)

RF1V (4-pole)



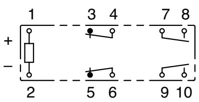
RF1V (6-pole)



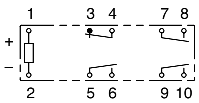
Internal Connection (View from Bottom) With Indicator and Diode (-LD type)

RF1V (4-pole)

Without LED Indicator

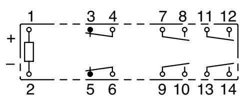


2NO-2NC Contact

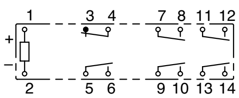


3NO-1NC Contact

With LED Indicator



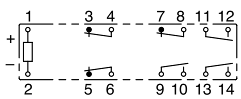
2NO-2NC Contact



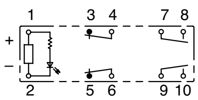
3NO1NC Contact

RF1V (6-pole)

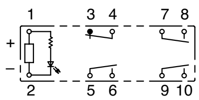
Without LED Indicator



4NO-2NC Contact

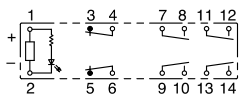


5NO-1NC Contact

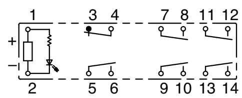


3NO-3NC Contact

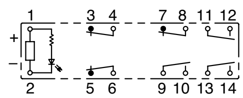
With LED Indicator



4NO-2NC Contact



5NO-1NC Contact

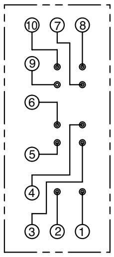


3NO-3NC Contact

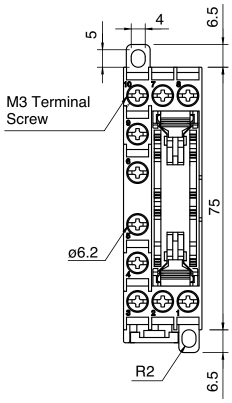
SF1V DIN Rail Mount Socket Dimensions (mm)

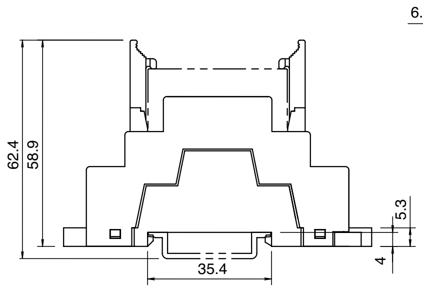
SF1V-4-07L (4-pole)

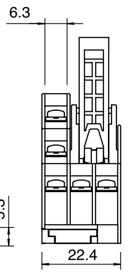
(Internal Connection)



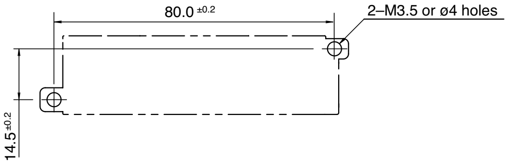
(Top View)







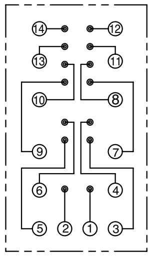
(Panel Mounting Hole Layout)



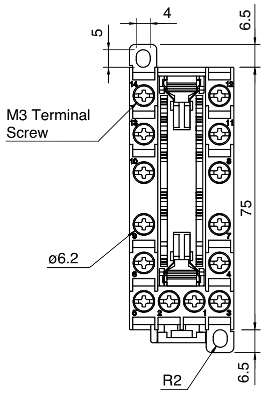
(Top View)

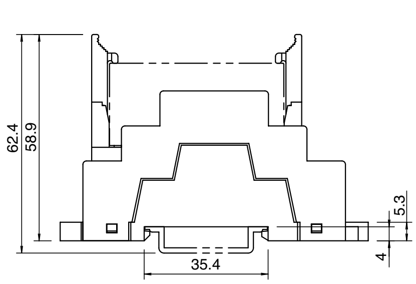
SF1V-6-07L (6-pole)

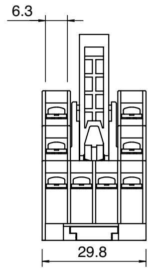
(Internal Connection)



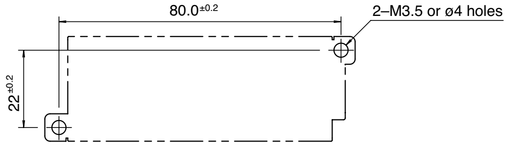
(Top View)







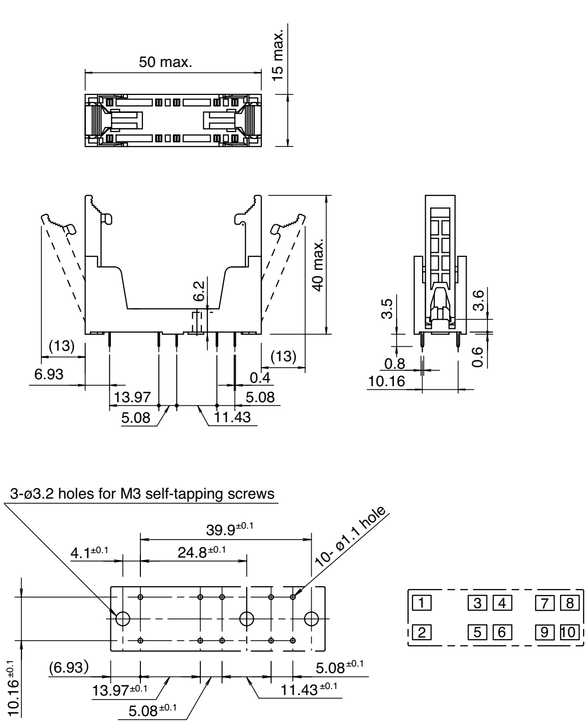
(Panel Mounting Hole Layout)



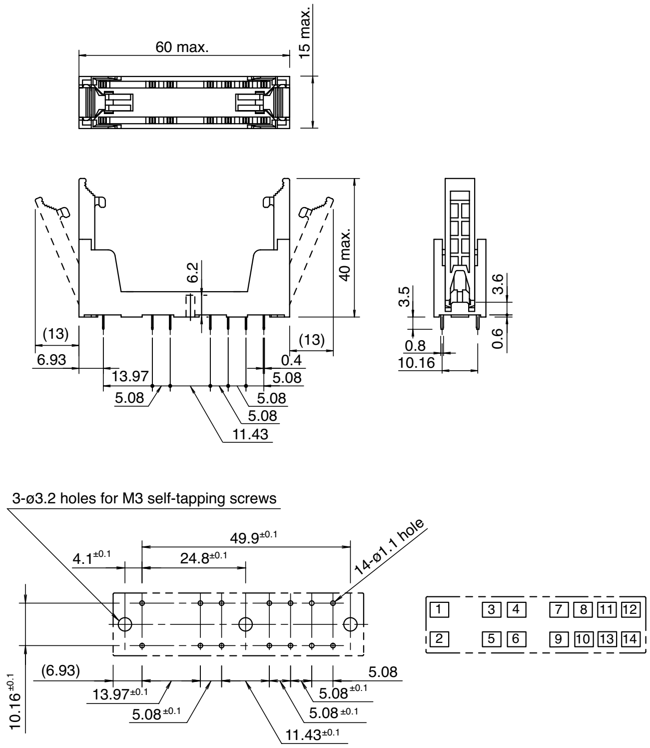
(Top View)

SF1V PC Board Mount Sockets

SF1V-4-07L (4-pole)



SF1V-6-07L (6-pole)

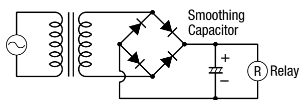


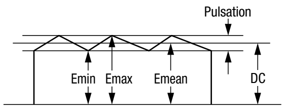
Operating Instructions

Driving Circuit for Relays

1. To ensure correct relay operation, apply rated voltage to the relay coil.

2. Input voltage for the DC coil:
   A complete DC voltage is best for the coil power to make sure of stable relay operation. When using a power supply containing a ripple voltage, suppress the ripple factor within 5%. When power is supplied through a rectification circuit, the relay operating characteristics, such as pickup voltage and dropout voltage, depend on the ripple factor. Connect a smoothing capacitor for better operating characteristics as shown below.



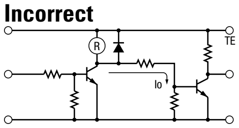


Ripple Factor (%) $\frac{Emax - Emin}{Emean}$ ¥ 100%

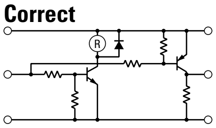
Emax = Maximum of pulsating current
Emin = Minimum of pulsating current
Emean = DC mean value

3. Leakage current while relay is off:
   When driving an element at the same time as the relay operation, special consideration is needed for the circuit design. As shown in the incorrect circuit below, leakage current (Io) flows through the relay coil while the relay is off. Leakage current causes coil release failure or adversely affects the vibration resistance and shock resistance. Design a circuit as shown in the correct example.

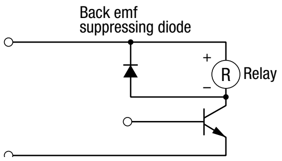
Incorrect



Correct



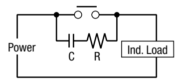
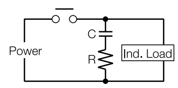
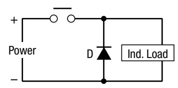
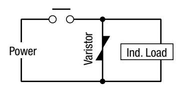
4. Surge suppression for transistor driving circuits:
   When the relay coil is turned off, a high-voltage pulse is generated, causing a transistor to deteriorate and sometimes to break. Be sure to connect a diode to suppress the back electromotive force. Then, the coil release time becomes slightly longer. To shorten the coil release time, connect a Zener diode between the collector and emitter of the transistor. Select a Zener diode with a Zener voltage slightly higher than the power voltage.



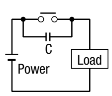
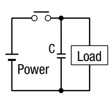
Protection for Relay Contacts

1. The contact ratings show maximum values. Make sure that these values are not exceeded. When an inrush current flows through the load, the contact may become welded. If this is the case, connect a contact protection circuit, such as a current limiting resistor.

2. Contact protection circuit:
   When switching an inductive load, arcing causes carbides to form on the contacts, resulting in increased contact resistance. In consideration of contact reliability, contact life, and noise suppression, use of a surge absorbing circuit is recommended. Note that the release time of the load becomes slightly longer. Check the operation using the actual load. Incorrect use of a contact protection circuit will adversely affect switching characteristics. Four typical examples of contact protection circuits are shown in the following table:

RC		This protection circuit can be used when the load impedance is smaller than the RC impedance in an AC load power circuit. • R: Resistor of approximately the same resistance value as the load • C:0.1 to 1 µF
		This protection circuit can be used for both AC and DC load power circuits. R: Resistor of approximately the same resistance value as the load C: 0.1 to 1 µF
Diode		This protection circuit can be used for DC load power circuits. Use a diode with the following ratings. Reverse withstand voltage: Power voltage of the load circuit x 10 Forward current: More than the load current
Varistor		This protection circuit can be used for both AC and DC load power circuits. For a best result, when using a power voltage of 24 to 48V AC/DC, connect a varistor across the load. When using a power voltage of 100 to 240V AC/DC, connect a varistor across the contacts.

3. Do not use a contact protection circuit as shown below:

	This protection circuit is very effective in arc suppression when opening the contacts. But, the capacitor is charged while the contacts are opened. When the contacts are closed, the capacitor is discharged through the contacts, increasing the possibility of contact welding.
	This protection circuit is very effective in arc suppression when opening the contacts. But, when the contacts are closed, a current flows to charge the capacitor, causing contact welding.

Generally, switching a DC inductive load is more difficult than switching a DC resistive load. Using an appropriate arc suppressor, however, will improve the switching characteristics of a DC inductive load.

Soldering

1. When soldering the relay terminals, use a soldering iron of 30 to 60W, and quickly complete soldering (within approximately 3 seconds).

2. Use a non-corrosive rosin flux.

Operating Instructions con't

Other Precautions

1. General notice:
   To maintain the initial characteristics, do not drop or shock the relay.

   The relay cover cannot be removed from the base during normal operation. To maintain the initial characteristics, do not remove the relay cover.

   Use the relay in environments free from condensation, dust, sulfur dioxide (SO_2), and hydrogen sulfide (H_2S).

   Make sure that the coil voltage does not exceed applicable coil voltage range.

2. UL and CSA ratings may differ from product rated values determined by IDEC.

3. Do not use relays in the vicinity of strong magnetic field, as this may affect relay operation.

Safety Precautions

- Turn off the power to the relay before starting installation, removal, wiring, maintenance, and inspection of the relays. Failure to turn power off may cause electrical shock or fire hazard.
- Observe specifications and rated values, otherwise electrical shock or fire hazard may be caused.
- Use wires of the proper size to meet voltage and current requirements. Tighten the terminal screws on the relay socket to the proper tightening torque.
- Surge absorbing elements on AC relays with RC or DC relays with diode are provided to absorb the back electromotive force generated by the coil. When the relay is subject to an excessive external surge voltage, the surge absorbing element may be damaged. Add another surge absorbing provision to the relay to prevent damage.

Precautions for the RU Relays

- Before operating the latching lever of the RU relay, turn off the power to the RU relay. After checking the circuit, return the latching lever to the original position.
- Do not use the latching lever as a switch. The durability of the latching lever is a minimum of 100 operations.
- When using DC loads on 4PDT relays, apply a positive voltage to terminals of neighboring poles and a negative voltage to the other terminals of neighboring poles to prevent the possibility of short circuits.
- DC relays with a diode have a polarity in the coil terminals. Apply the DC voltage to the correct terminals.