IDEC

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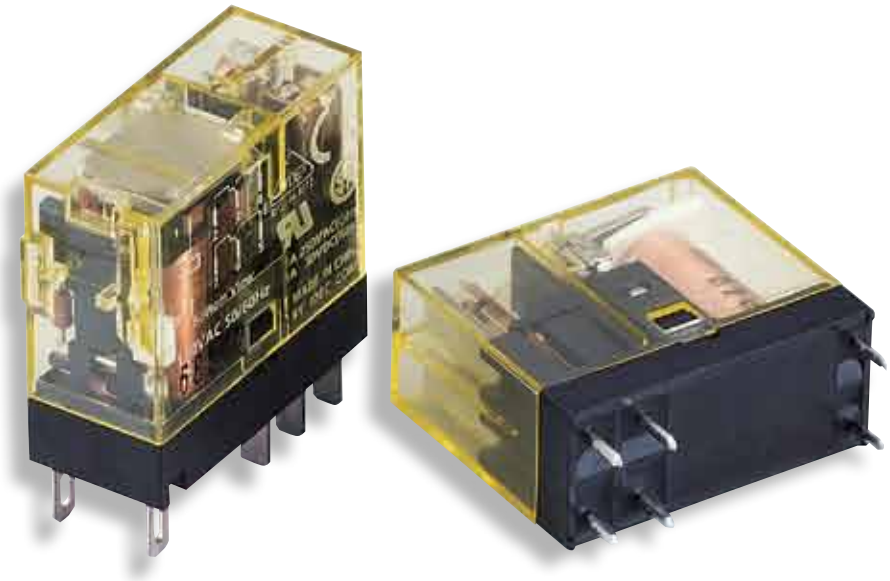

IDEC RJ22 Series

Slim Power Relays (Bifurcated Contacts)

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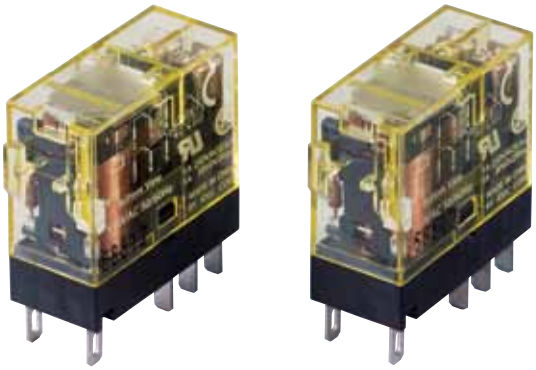
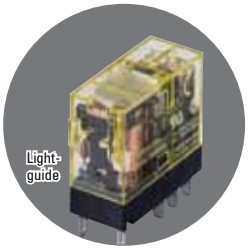
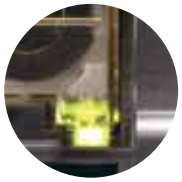
High contact reliability with bifurcated contacts (minimum applicable load: 1V DC, 100µA)

- The smallest width for 2-pole/bifurcated contacts relay
- Non-polarized green LED indicator available (except for simple type)
- IDEC's unique light-guide structure enables an RJ relay to be identified by the illuminating LED
- Diode, reverse polarity diode, and RC circuits are available
- Peak inverse voltage is 1000V
- UL recognized, CSA certified, VDE approved, CE marked



IDEC's unique light-guide structure





Green LED indicator compliant with IEC requirements.

Applicable Standards

Standards	Mark	File No. or Organization
UL508		UL Recognized File No. E55996
CSA C22.2 No.14		CSA File No. LR35144
EN61810-1	VDE REG.-Nr.B312	VDE No. 40015055
		EU Low Voltage Directive

Relays

Bifurcated Contacts

Type	2-pole (bifurcated contacts DPDT)	
	Part No.	Coil Voltage Code
Standard (with LED indicator)	RJ22S-CL-*	A12, A24, A120, A240, D5, D12, D24, D100
Simple (without LED indicator)	RJ22S-C-*	
With diode (with LED indicator)	RJ22S-CLD-*	D5, D12, D24, D48, D100
With diode (without LED indicator)	RJ22S-CD-*	

Coil Voltage Code

Code	Voltage
A12	12V AC
A24	24V AC
A120	120V AC
A240	240V AC
D5	5V DC
D12	12V DC
D24	24V DC
D48	48V DC
D100	100-110V DC

Contact Ratings

Allowable Contact Power		Rated Load			Allowable Switching Current	Allowable Switching Voltage	Minimum Applicable Load (Note)
Resistive Load	Inductive Load	Voltage	Resistive Load	Inductive Load cosø=0.4 L/R=7ms			
250VA AC 30W DC	100VA AC 15W DC	250V AC	1A	0.4A	1A	250V AC 125V DC	1V DC 100µA (reference value)
		30V DC	1A	0.5A			

Note: Measured at operating frequency of 120 operations per minute (failure rate level P, reference value)

High contact reliability with bifurcated contacts

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RJ Series Slim Power Relay Plug-in Terminal (Bifurcated Contacts)

Ratings

Voltage	UL Ratings				CSA Ratings						VDE Ratings	
	Resistive		General Use		Resistive		Inductive		General Use		Resistive	
	NO	NC	NO	NC	NO	NC	NO	NC	NO	NC	NO	NC
250V AC	—	—	1A	1A	—	—	—	—	1A	1A	1A	1A
30V DC	1A	1A	—	—	1A	1A	1A	1A	—	—	1A	1A

Coil Ratings

Rated Voltage (V)		Coil Voltage Code	Without LED Indicator			With LED Indicator			Operating Characteristics (against rated values at 20°C)			Power Consumption
			Rated Current (mA) ±15% (at 20°C)		Coil Resistance (Ω) ±10% (at 20°C)	Rated Current (mA) ±15%, (at 20°C)		Coil Resistance (Ω) ±10% (at 20°C)	Pickup Voltage (initial value)	Dropout Voltage (initial value)	Maximum Continuous Applied Voltage (Note)	
			50Hz	60Hz		50Hz	60Hz					
AC 50/60 Hz	12V	A12	87.3	75.0	62.5	91.1	78.8	62.5	80% maximum	30% minimum	140%	Approx. 1.1VA (50Hz) 0.9 to 1.2VA (60Hz)
	24V	A24	43.9	37.5	243	47.5	41.1	243				
	120V	A120	8.8	7.5	6,400	8.7	7.4	6,400				
	240V	A240	4.3	3.7	25,570	4.3	3.7	25,570				
DC	5V	D5	106		47.2	110		47.2	70% maximum	10% minimum	170%	Approx. 0.53 to 0.64W
	12V	D12	44.2		271	48.0		271				
	24V	D24	22.1		1,080	25.7		1,080				
	48V	D48	11.0		4,340	10.7		4,340				
	100-110V	D100	5.3-5.8		18,870	5.2-5.7		18,870			160%	

Note: Maximum continuous applied voltage is the maximum voltage that can be applied to relay coils.

Specifications

Relay		RJ22S
Number of Poles		2-pole
Contact Configuration		DPDT (bifurcated contacts)
Contact Material		AgNi (gold clad)
Degree of Protection		IP40
Contact Resistance (initial value)		50mΩ maximum (measured using 5V DC, 1A voltage drop method)
Operating Time (at 20°C)		15ms maximum (at the rated coil voltage, excluding contact bounce time) With diode or RC: 20 ms maximum
Release Time (at 20°C)		10ms maximum (at the rated coil voltage, excluding contact bounce time) With diode or RC: 20 ms maximum
Impulse Withstand Voltage		10,000V AC (between contact and coil)
Insulation Resistance		100MΩ minimum (500V DC megger)
Dielectric Strength	Between contact and coil	5,000V AC, 1 minute
	Between contacts of the same pole	1,000V AC, 1 minute
	Between contacts of the different poles	3,000V AC, 1 minute
Vibration Resistance	Operating Extremes	10 to 55Hz, amplitude 0.75mm
	Damage Limits	10 to 55Hz, amplitude 0.75mm
Shock Resistance	Operating Extremes	NO contact: 200 m/s^2, NC contact: 100 m/s^2
	Damage Limits	1,000 m/s^2
Electrical Life		AC load: 100,000 operations minimum (operating frequency 1,800 per hour) DC load: 200,000 operations minimum (operating frequency 1,800 per hour)
Mechanical Life		AC load: 10 million operations minimum (operating frequency 18,000 operations per hour) DC load: 20 million operations minimum (operating frequency 18,000 operations per hour)
Operating Temperature (100% rated voltage)		–40 to +70°C (no freezing)
Operating Humidity		5 to 85%RH (no condensation)
Storage Temperature		–40 to +85°C (no freezing)
Storage Humidity		5 to 85%RH (no condensation)
Weight (approx.)		19g

Applicable Sockets

Style	Part No.
Standard Screw Terminal	SJ2S-05B
Finger-safe Screw Terminal	SJ2S-07L
PC Board Terminal	SJ2S-61

Standard Screw Terminals

Finger-safe Screw Terminals (IP20)

PC Board Terminals

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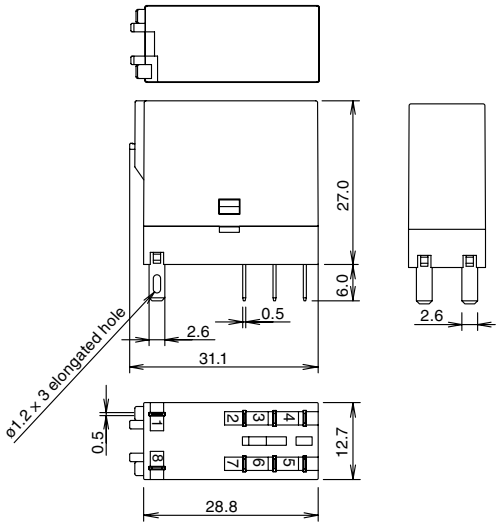
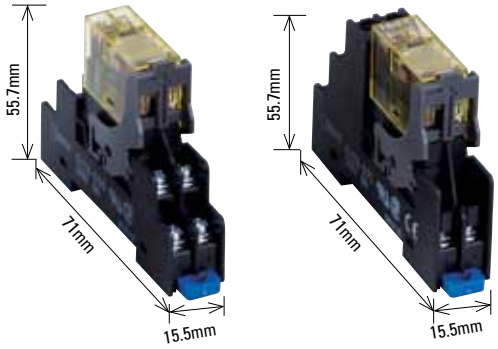
Dimensions (mm)

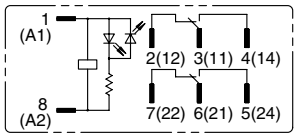


When mounted in a socket

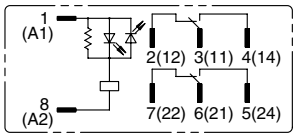


Internal Connection (bottom view)

RJ22S-CL-* Standard (with LED indicator)

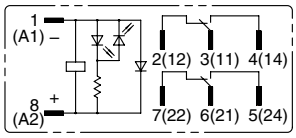


24V AC/DC or less

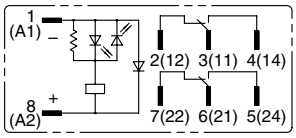


Over 24V AC/DC

RJ22S-CLD-* With diode (with LED indicator)

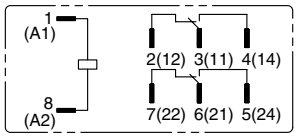


24V AC/DC or less

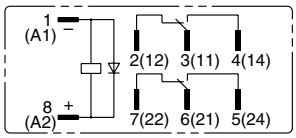


Over 24V AC/DC

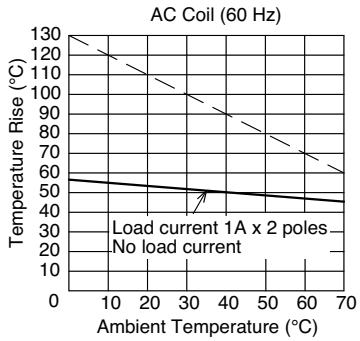
RJ22S-C-* Simple

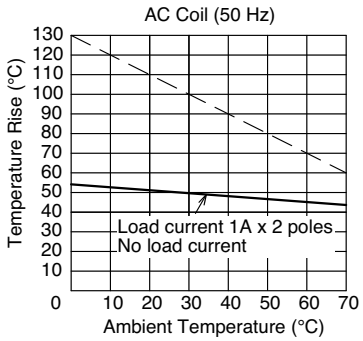


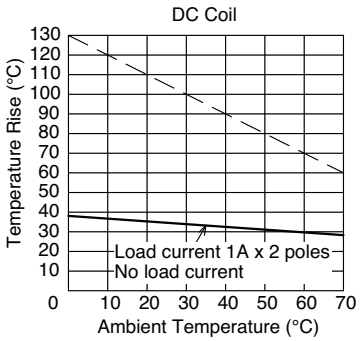
RJ22S-CD-* With diode



Operating Temperature and Coil Temperature Rise







- The slanted dashed line indicates the allowable temperature rise for the coil at different ambient temperatures.
- The above temperature rise curves show the characteristics when 100% of the rated coil voltage is applied.

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High contact reliability with bifurcated contacts (minimum applicable load: 1V DC, 100 µA)

- DPDT, DPST-NO contacts are available.
- The smallest width for 2-pole/bifurcated contacts relay
- IDEC's unique spring return mechanism ensures long life.
- Flux-tight structure

DPST-NO contact (bifurcated)

DPDT contact (bifurcated)

Applicable Standards

Standards	Mark	File No. or Organization
UL508		UL Recognition File No. E55996
CSA C22.2 No.14		CSA File No. LR35144
EN61810-1	VDE REG.-Nr.B312	VDE No. 40015055
		EU Low Voltage Directive

Relays

Bifurcated Contacts

Type	Contact	2-pole (bifurcated contacts DPDT)	
		Part No. (Ordering Part No.)	Coil Voltage Code
Plain	DPDT	RJ22V-C-*	A12, A24, A120, A240, D5, D12, D24, D48, D100
	DPST-NO	RJ22V-A-*	

Coil Voltage Code

Code	Voltage
A12	12V AC
A24	24V AC
A120	120V AC
A240	240V AC
D5	5V DC
D12	12V DC
D24	24V DC
D48	48V DC
D100	100-110V DC

Contact Ratings

Allowable Contact Power		Rated Load			Allowable Switching Current	Allowable Switching Voltage	Minimum Applicable Load (Note)
Resistive Load	Inductive Load	Voltage	Resistive Load	Inductive Load cosø=0.4 L/R=7ms			
250VA AC 30W DC	100VA AC 15W DC	250V AC	1A	0.4A	1A	250V AC 125V DC	1V DC 100µA (reference value)
		30V DC	1A	0.5A			

Note: Measured at operating frequency of 120 operations per minute (failure rate level P, reference value)

Ratings

Voltage	UL ratings				CSA Ratings						VDE Ratings	
	Resistive		General Use		Resistive		Inductive		General Use		Resistive	
	NO	NC	NO	NC	NO	NC	NO	NC	NO	NC	NO	NC
250V AC	—	—	1A	1A	—	—	—	—	1A	1A	1A	1A
30V DC	1A	1A	—	—	1A	1A	1A	1A	—	—	1A	1A

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Coil Ratings

Rated Voltage (V)		Coil Voltage Code	Rated Current (mA) ±15% (at 20°C)		Coil Resistance (Ω) ±10% (at 20°C)	Operating Characteristics (against rated values at 20°C)			Power Consumption
			50Hz	60Hz		Pickup Voltage (initial value)	Dropout Voltage (initial value)	Maximum Continuous Applied Voltage (Note)	
AC 50/60 Hz	12V	A12	87.3	75.0	62.5	80% maximum	30% minimum	140%	Approx. 1.1VA (50Hz) 0.9 to 1.2VA (60Hz)
	24V	A24	43.9	37.5	243				
	120V	A120	8.8	7.5	6,400				
	240V	A240	4.3	3.7	25,570				
DC	5V	D5	106		47.2	70% maximum	10% minimum	170% 160%	Approx. 0.53 to 0.64W
	12V	D12	44.2		271				
	24V	D24	22.1		1,080				
	48V	D48	11.0		4,340				
	100-110V	D100	5.3-5.8		18,870				

Note: Maximum continuous applied voltage is the maximum voltage that can be applied to relay coils.

Specifications

Relay		RJ22V
Number of Poles		2-pole
Contact Configuration		DPDT (bifurcated), DPST-NO (bifurcated)
Contact Material		AgNi (gold clad)
Degree of Protection		Flux-tight structure
Contact Resistance (initial value)		50 mΩ maximum (measured using 5V DC, 1A voltage drop method)
Operating Time (at 20°C)		15 ms maximum (at the rated coil voltage, excluding contact bounce time)
Release Time (at 20°C)		10 ms maximum (at the rated coil voltage, excluding contact bounce time)
Insulation Resistance		100 MΩ minimum (500V DC megger)
Impulse Withstand Voltage		10,000V AC (between contact and coil)
Dielectric Strength	Between contact and coil	5,000V AC, 1 minute
	Between contacts of the same pole	1,000V AC, 1 minute
	Between contacts of the different poles	3,000V AC, 1 minute
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	NO contact: 200 m/s^2, NC contact: 100 m/s^2
	Damage Limits	1,000 m/s^2
Electrical Life		AC load: 100,000 operations minimum (operating frequency 1,800 per hour) DC load: 200,000 operations minimum (operating frequency 1,800 per hour)
Mechanical Life		AC load: 10 million operations minimum (operating frequency 18,000 operations per hour) DC load: 20 million operations minimum (operating frequency 18,000 operations per hour)
Operating Temperature (100% rated voltage)		–40 to +70°C (no freezing)
Operating Humidity		5 to 85%RH (no condensation)
Storage Temperature		–40 to +85°C (no freezing)
Storage Humidity		5 to 85%RH (no condensation)
Weight (approx.)		DPDT: 17g, DPST-NO: 16g

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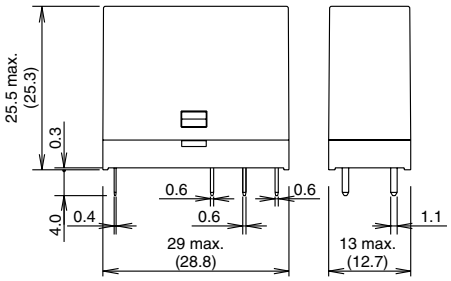
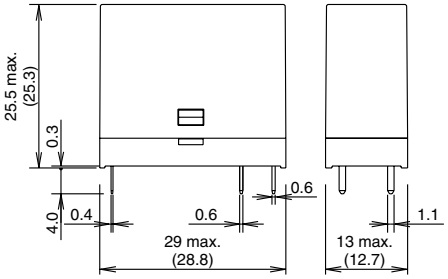
Dimensions (mm)

RJ22V-C-*

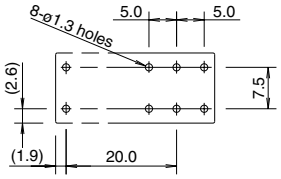


RJ22V-A-*

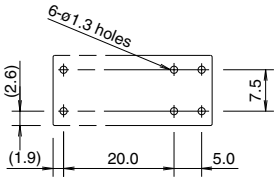


Mounting Hole Layout

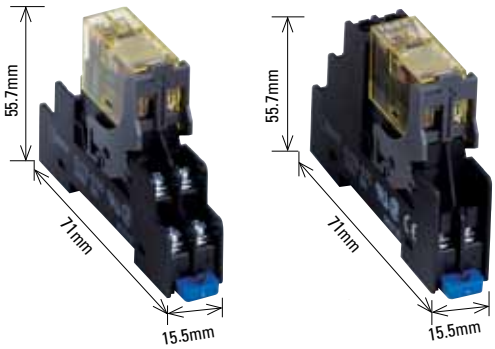
RJ22V-C-*



RJ22V-A-*

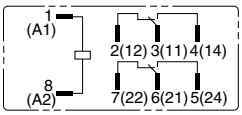


When mounted in a socket

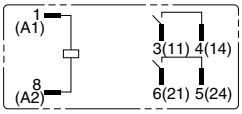


Internal Circuit Diagram (Bottom View)

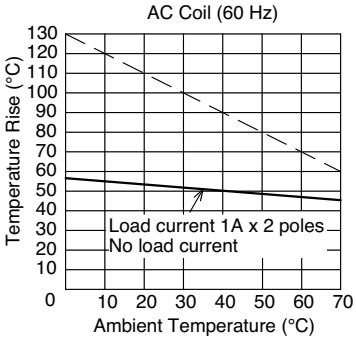
RJ22V-C-*

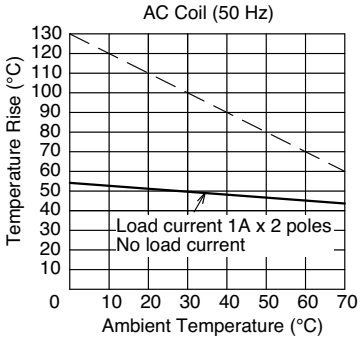


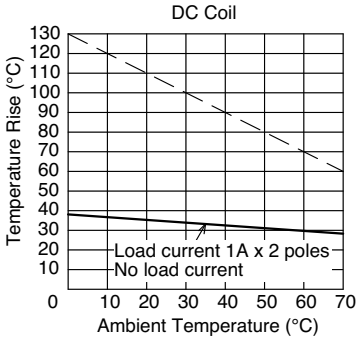
RJ22V-A-*



Operating Temperature and Coil Temperature Rise







- The slanted dashed line indicates the allowable temperature rise for the coil at different ambient temperatures.
- The above temperature rise curves show the characteristics when 100% of the rated coil voltage is applied.

⚠ Safety Precautions

- Turn off the power to the RJ relay prior to installation, removal, wiring, maintenance, and inspection. Failure to turn power off may cause electrical shock or fire.
- Observe the specifications and rated values, otherwise electrical shock or fire may occur.
- Use wires of the proper size to meet the voltage and current requirements.
- Tighten terminal screws to a proper tightening torque.

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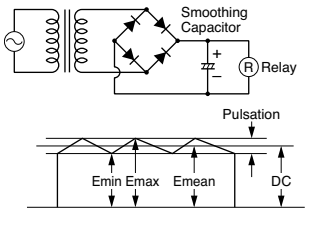
Instructions

1. Driving Circuit for Relays

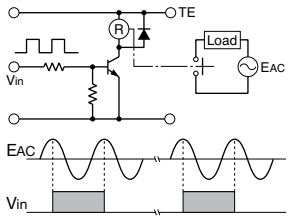
1. To make sure of correct relay operation, apply rated voltage to the relay coil.
2. Input voltage for DC coil:
   Complete DC voltage is best for stable operation of the coil power. When using a power supply containing a ripple voltage, suppress the ripple factor within 5%. When power is supplied through a rectification circuit, 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.



$$\text{Ripple Factor (\%)} \quad \frac{\text{Emax} - \text{Emin}}{\text{Emean}} \times 100\%$$

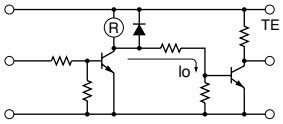
Emax = Maximum of pulsating current
Emin = Minimum of pulsating current
Emean = DC mean value

3. Operating the relay in sync with an AC load:
   If the relay operates in sync with the AC power voltage of the load, the relay life may be reduced. If this is the case, select a relay with the required load reliability. Or, make the relay turn on and off irrespective of the AC power phase or near the point where the AC phase crosses zero voltage.

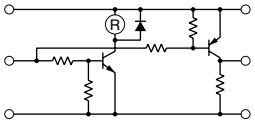


4. Leakage current while relay is off:

Incorrect

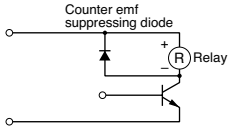


Correct



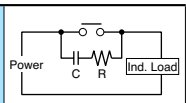
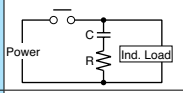
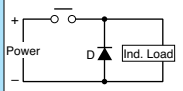
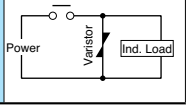
When driving an element at the same time as the relay is operating, special consideration is needed when designing the circuit. As shown in the incorrect circuit example above, leakage current (Io) flows through the relay coil while the relay is off. Leakage current causes coil release failure or adversely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

5. Surge suppression for transistor driving circuits:
   When the relay coil is turned off, a high-voltage pulse is generated. Be sure to connect a diode to suppress the counter 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 controlling transistor. Select a Zener diode with a Zener voltage slightly higher than the power voltage.

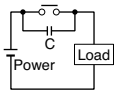


2. Protection for Relay Contacts

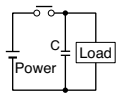
1. The contact ratings show maximum values. Make sure that these values are not exceeded. When an inrush current flows through the load, the contact may become welded. If this is the case, connect a contact protection circuit, such as a current limiting resistor.
2. Contact protection circuit:
   When 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 an 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 × 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 on a power voltage of 24 to 48V AC/DC, connect a varistor across the load. When using on 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 will improve the switching characteristics of a DC inductive load.

3. Notes on PC Board Mounting

- When mounting 2 or more relays on a PC board, keep a minimum spacing of 5mm in each direction.
- Manual soldering: Solder the terminals at 350°C within 3 sec. Using a soldering iron of 60W (Sn-Ag-Cu type) is recommended.
- Auto-soldering: Solder at 250°C within 4 to 5 sec.
- Because the terminal is filled with epoxy resin, do not excessively solder or bend the terminal. Otherwise, air tightness will degrade.
- Avoid touching the relay cover or the epoxy filled terminal with the soldering iron.
- Use a non-corrosive resin flux.

4. Others

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 dust, sulfur dioxide (SO_2), hydrogen sulfide (H_2S), or organic gases.
   - Make sure that the coil voltage does not exceed the applicable coil voltage range.
2. Connecting outputs to electronic circuits:
   When the output is connected to a load which responds very quickly, such as an electronic circuit, contact bouncing causes incorrect operation of the load. Take the following measures into consideration.
   a. Connect an integration circuit.
   b. Suppress the pulse voltage due to bouncing within the noise margin of the load.
3. Do not use relays in the vicinity of strong magnetic fields, as this may affect relay operation.

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