

RC Series PCB Relays

High capacity and compact, low-profile relays. SPDT, 16A and DPDT, 8A



See website for details on approvals and standards.

RC series

Package quantity: 20

Contact configuration	Contact capacity	Coil voltage	Part No.
SPST-NO	Basic	5V DC	RC1V-A-D5
		12V DC	RC1V-A-D12
		24V DC	RC1V-A-D24
		48V DC	RC1V-A-D48
		110V DC	RC1V-A-D110
SPDT		5V DC	RC1V-C-D5
		12V DC	RC1V-C-D12
		24V DC	RC1V-C-D24
		48V DC	RC1V-C-D48
		110V DC	RC1V-C-D110
SPST-NO	High capacity	5V DC	RC1V-AH-D5
		12V DC	RC1V-AH-D12
		24V DC	RC1V-AH-D24
		48V DC	RC1V-AH-D48
		110V DC	RC1V-AH-D110
SPDT		5V DC	RC1V-CH-D5
		12V DC	RC1V-CH-D12
		24V DC	RC1V-CH-D24
		48V DC	RC1V-CH-D48
		110V DC	RC1V-CH-D110
DPST-NO	Basic	5V DC	RC2V-A-D5
		12V DC	RC2V-A-D12
		24V DC	RC2V-A-D24
		48V DC	RC2V-A-D48
		DPDT	5V DC
12V DC			RC2V-C-D12
24V DC			RC2V-C-D24
48V DC			RC2V-C-D48
110V DC			RC2V-C-D110

Characteristics

Part No.	RC1V Basic	RC1V High capacity	RC2V Basic
No. of Poles	1-pole		2-pole
Contact configuration	SPST-NO, SPDT		DPST-NO, DPDT
Contact material	AgSnO ₂		Movable: AgSnO ₂ +Au-plated Stationary: AgSnO ₂
Degree of protection	Flux-resistant type (RTII)		
Contact resistance (*1)	100mΩ maximum		
Operating time (*2)	15ms maximum		
Release time (*2)	5ms maximum		
Insulation resistance	1000MΩ minimum (500V DC megger)		
Impulse withstand voltage	Between contact circuit and coil	10,000V	
Dielectric strength	Between contact circuit and coil	5000V AC, 1 minute	
	Between contacts of different poles	-	
	Between contacts of the same pole	1000V AC, 1 minute	
Vibration resistance	Operating extremes	Frequency: 10 to 55Hz Amplitude: 0.35mm	Frequency: 10 to 55Hz, Amplitude 0.825mm
	Damage limits	Frequency: 10 to 55Hz Amplitude: 0.75mm	Frequency: 10 to 55Hz, Amplitude 1.65mm
Shock resistance	Operating extremes	100m/s ²	
	Damage limits	1000m/s ²	
Electrical life (rated load)	100,000 times min. (250V AC/24V DC, 12A)	RC1V-AH: 100,000 times min. (250V AC/24V DC, 16A) RC1V-CH: 5 million times min. (250V AC, 16A) 3 million times min. (24V DC, 16A)	5 million times min. (250V AC/24V DC, 8A)
Mechanical life (no load)	20 million times min. (operating frequency: 18,000 times per hour)		
Operating temperature	-40 to +85°C (no freezing)		-40 to +75°C (no freezing)
Operating humidity	5 to 85%RH (no condensation)		
Storage temperature	-40 to +85°C (no freezing)		
Operating humidity	5 to 85%RH (no condensation)		
Weight (approx.)	13g		12g

• Above values are initial values.

*1) Measured using 6V DC, 1A voltage drop method

*2) Measured at the rated voltage (at 20°C), excluding contact bounce time.

Contact ratings

Type		Allowable contact power		Rated load		Allowable contact current	Allowable contact voltage	Minimum applicable load (Reference value) (*3)
		Resistive load		Voltage	Resistive load			
RC1V	Basic	3000VA AC 288W DC		250V AC 24V DC	12A 12A	12A	440V AC 300V DC	5V DC 100mA
	High capacity	4000VA AC 384W DC		250V AC 24V DC	16A 16A			
RC2V	Basic	2000VA AC 192W DC		250V AC 24V DC	8A 8A	8A	400V AC 300V DC	5V DC 10mA

*3) Minimum switching loads mentioned above are reference values. Reference values may vary according to switching frequencies, environmental conditions and expected reliability levels. Perform the confirmation test with the actual load before use.

• When the maximum current flow exceeds 10A, take into consideration the heat generated by the PCB wiring. Check the operation using the actual load.

Coil ratings

Type	Coil rated voltage	Code □	Rated current (mA) ±10% (at 20°C)	Coil resistance (Ω) ±10% (at 20°C)	Operating characteristics (against rated values at 20°C)			Power consumption (approx.)
					Maximum allowable voltage (*1)	Minimum pickup voltage (initial value)	Dropout voltage (initial value)	
RC1V	5V DC	D5	81	62	12.3V	70% maximum	10% minimum	400mW
	12V DC	D12	33	360	29.4V			
	24V DC	D24	17	1440	58.8V			
	48V DC	D48	9	5360	117.6V			
	110V DC	D110	4	28,800	269.5V			
RC2V-A	5V DC	D5	81	62	9.87V	75% maximum	10% minimum	400mW
	12V DC	D12	33	360	23.7V			
	24V DC	D24	17	1440	47.4V			
	48V DC	D48	9	5760	94.8V			
	110V DC	D110	-	-	-			
RC2V-C	5V DC	D5	106	47	8.7V	70% maximum	10% minimum	530mW
	12V DC	D12	44	270	21.0V			
	24V DC	D24	22	1100	42.0V			
	48V DC	D48	11	4400	84.0V			
	110V DC	D110	5	22,000	192.5V			

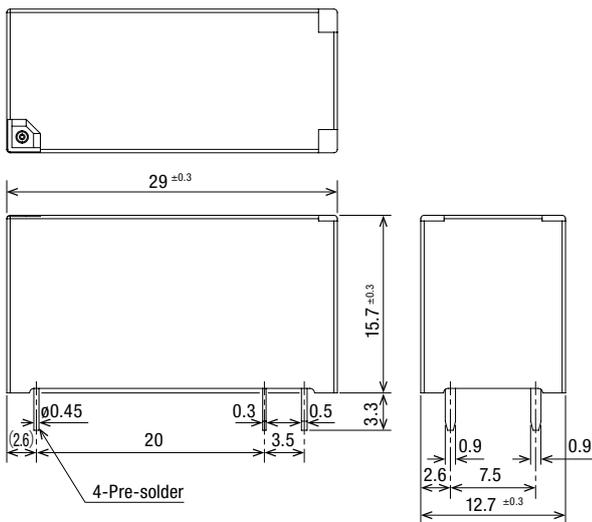
*1) The maximum allowable voltage is the maximum value of voltage that can be applied to the relay coil and not the continuous allowable value.

Dimensions

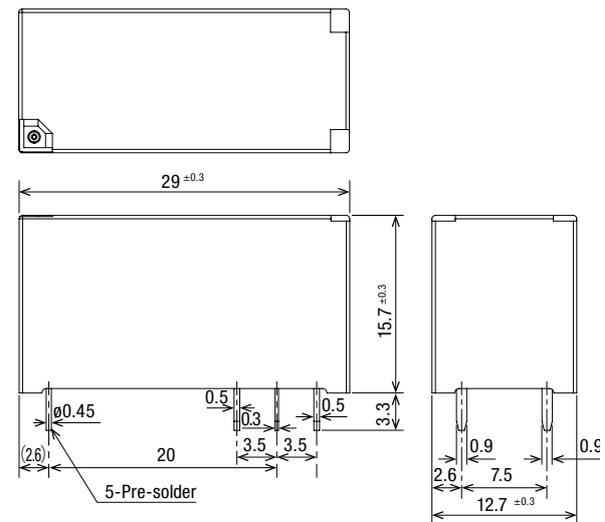
Note: Terminal dimensions are dimensions before pre-soldering.

All dimensions in mm.

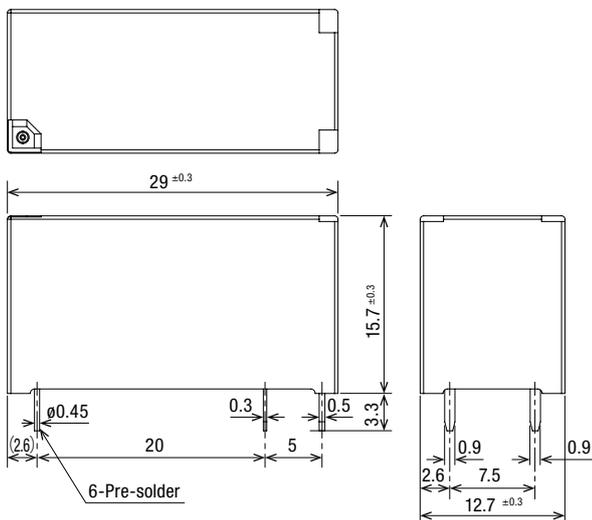
RC1V-A-D



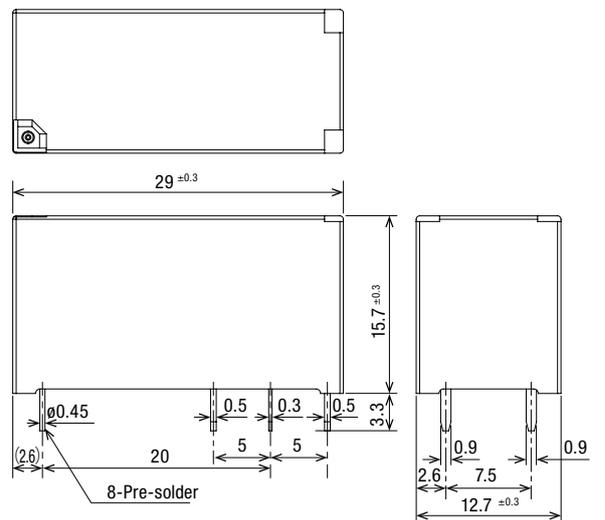
RC1V-C-D



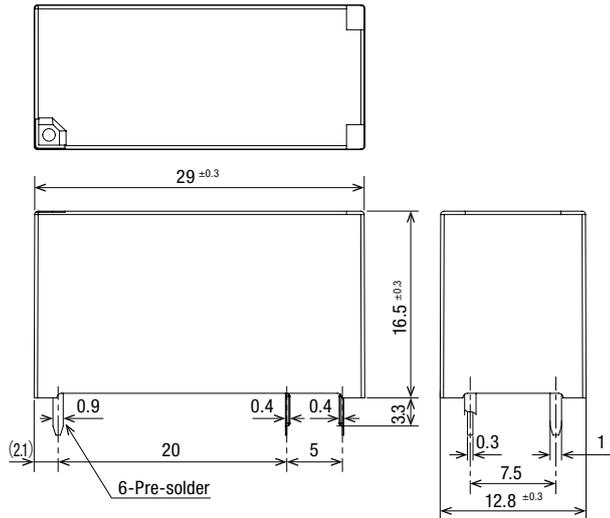
RC1V-AH-D



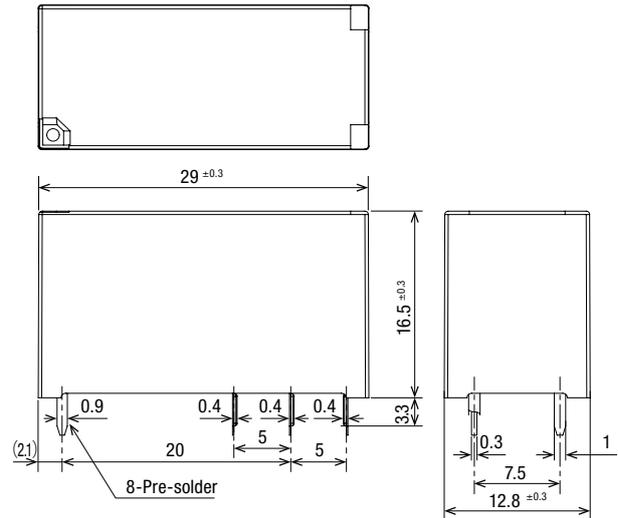
RC1V-CH-D



RC2V-A-D



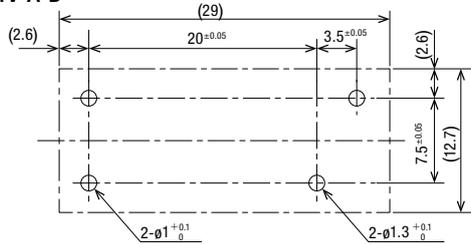
RC2V-C-D



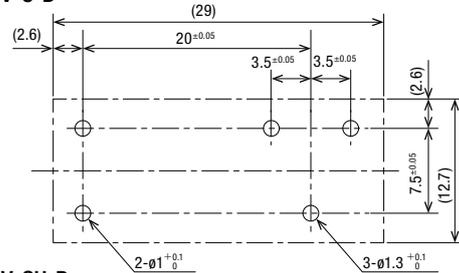
PCB drilling layout (Bottom View)

All dimensions in mm.

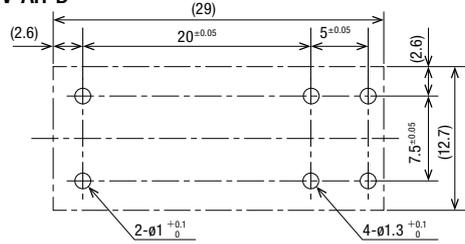
RC1V-A-D



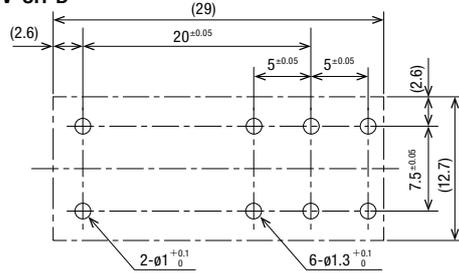
RC1V-C-D



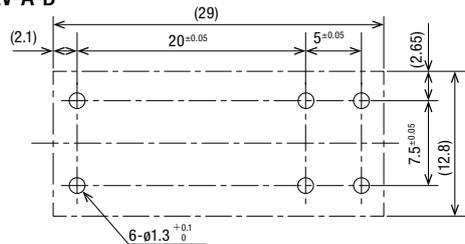
RC1V-AH-D



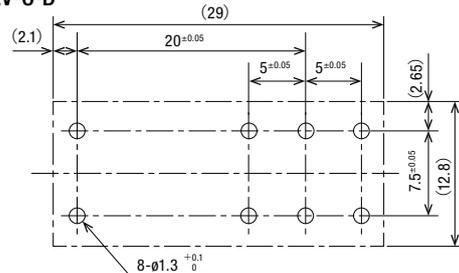
RC1V-CH-D



RC2V-A-D

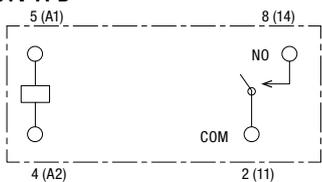


RC2V-C-D

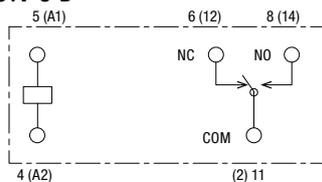


Internal connection (Bottom View)

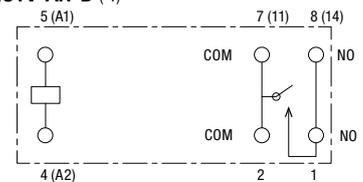
RC1V-A-D



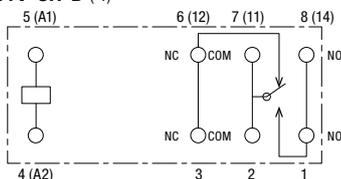
RC1V-C-D



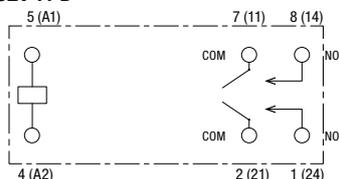
RC1V-AH-D (*1)



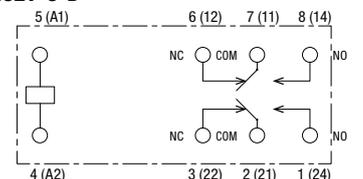
RC1V-CH-D (*1)



RC2V-A-D



RC2V-C-D



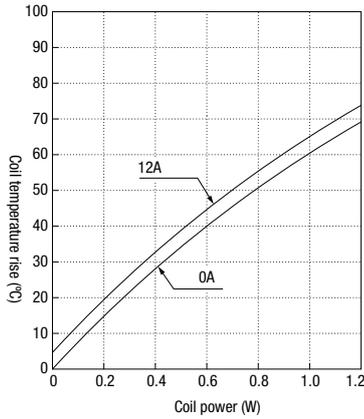
Note) IEC notation in ().

*1) Both #1 and #8 should be used and the pattern should be designed to short-circuit on the board.

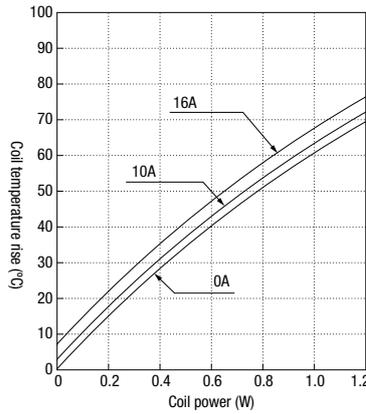
Characteristics (Reference)

Coil temperature rise

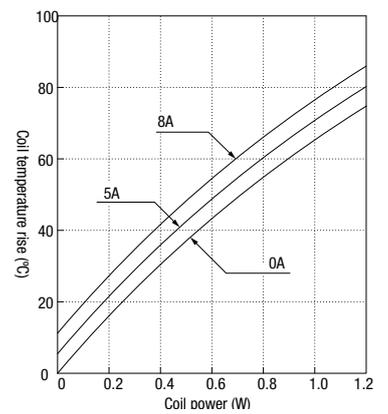
RC1V (basic)



RC1V (high capacity)

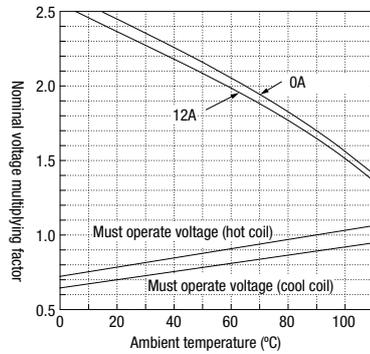


RC2V (basic)

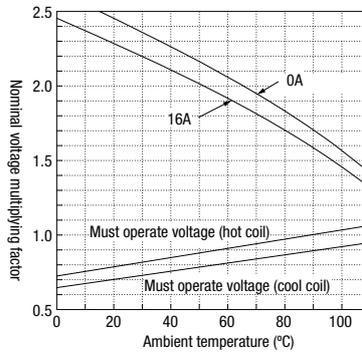


Operating range

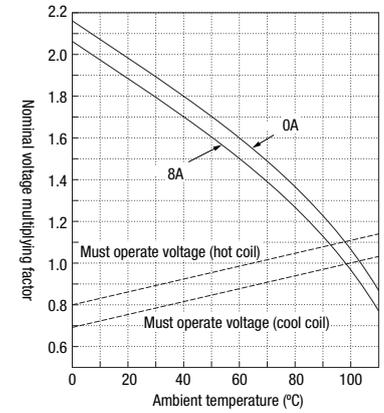
RC1V (basic)



RC1V (high capacity)

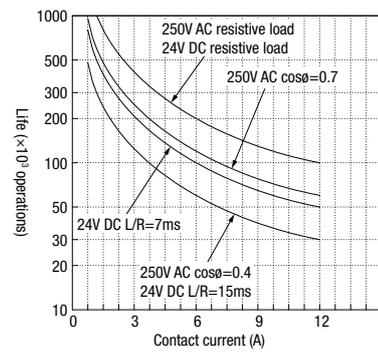


RC2V (basic)

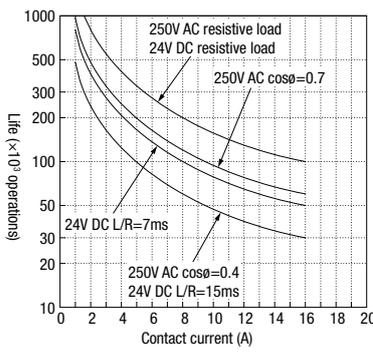


Electric life curves

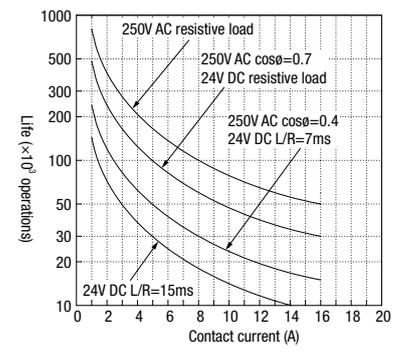
RC1V (basic)



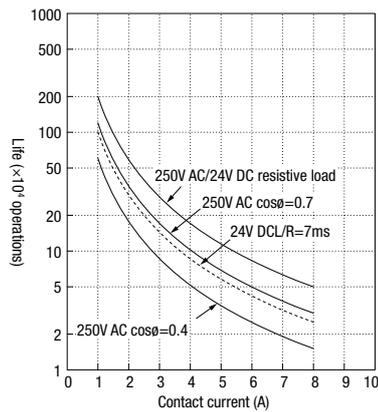
RC1V-AH (high capacity)



RC1V-CH (high capacity)



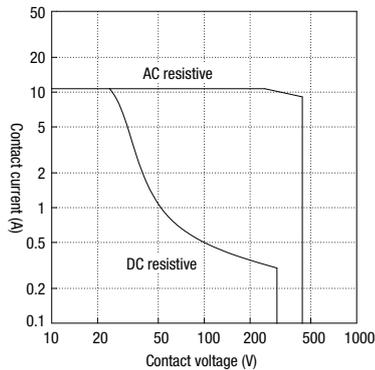
RC2V (basic)



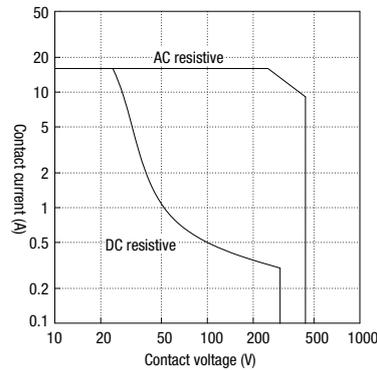
Characteristics (Reference)

Maximum operating frequency

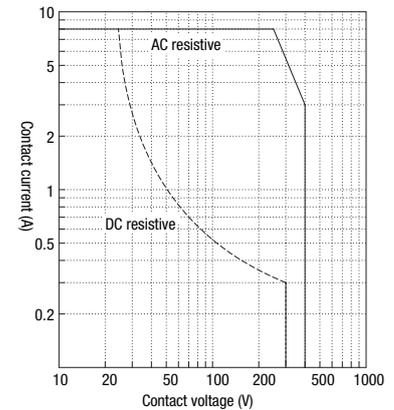
RC1V (basic)



RC1V (high capacity)



RC2V (basic)

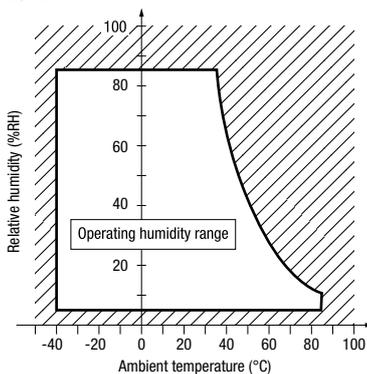


Instructions

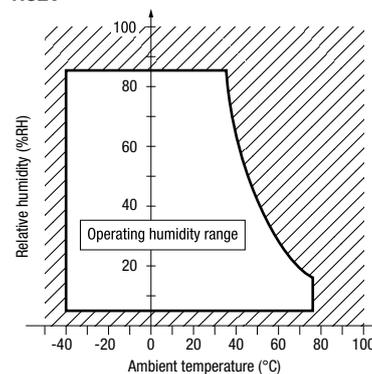
- Do not subject the relay to vibrations or shocks exceeding the rated values (vibration resistance and shock resistance). Abnormal vibration or shock may cause not only malfunction but also deformation or damage to the internal parts of the relay, which may result in malfunction.
- Be sure to apply a square wave rated voltage to the coil. For other uses, confirm the operation characteristics with the actual device before use.
- Avoid using the product in an atmosphere where silicone gas, sulfide gas, or organic gas exists. Also, note that the use of silicone resin around the relay may cause contact failure.
- When using in low temperatures below 0°C, be careful of freezing. Freezing may cause adhering of moving parts, delay in operation, or ice between contacts, which may interfere with contact continuity.
- When multiple relays are closely mounted on the same board, magnetic interference between relays and heat generation may affect the relay characteristics. Confirm that the individual relays operate under the operating conditions of the surrounding relays before use.
- Precautions when mounting on PCB
 - Hand soldering should be done quickly at 360°C within 3 seconds.
 - Auto-soldering: Pre-heat at below 120°C within 90 seconds. Solder at 255°C±5°C within 5 seconds.
 - Because the terminal part is filled with epoxy resin, do not excessively solder or bend the terminal. Otherwise, air tightness will degrade.
 - Avoid the soldering iron from touching the relay cover or the epoxy filled terminal part.
 - Use a non-corrosive rosin flux.

Operation humidity range

RC1V

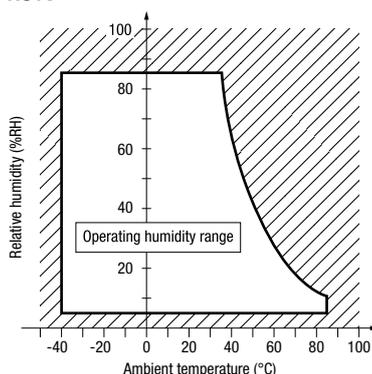


RC2V

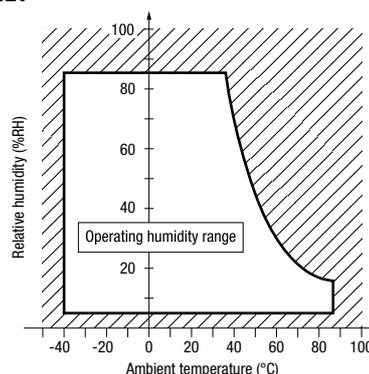


Storage humidity range

RC1V



RC2V



Safety Precautions

- Turn off the power to the product before starting installation, removal, wiring, maintenance, or inspection. Failure to turn power off may cause electrical shock or fire.
- Be sure to use the product within the rated specifications. Failure to turn power off may cause electrical shock or fire.

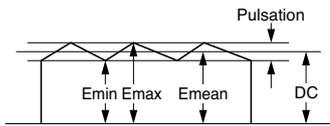
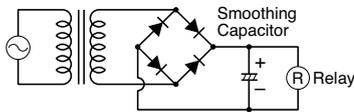
Instructions

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

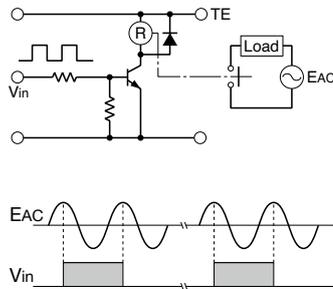
A complete DC voltage is best for the coil power to make sure of stable operation. When using a power supply containing a ripple voltage, suppress the ripple factor within 5%. When power is supplied through a rectification circuit, relay operating characteristics, such as pickup voltage and dropout voltage,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



$$\text{Ripple Factor (\%)} = \frac{E_{\text{max}} - E_{\text{min}}}{E_{\text{mean}}} \times 100\%$$

E_{max} = Maximum of pulsating current
 E_{min} = Minimum of pulsating current
 E_{mean} = DC mean value

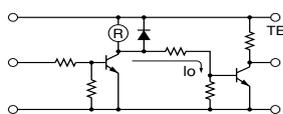
(3) Operating the relay in sync with an AC load



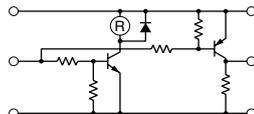
If the relay operates in sync with the relay contact, the relay life may be reduced. If this is the case, select a relay in consideration of the required reliability for the load Or, make the relay turn on and off irrespective of the AC power phase or near the point where the AC phase crosses zero voltage.

(4) Leakage current while relay is off

Incorrect



Correct

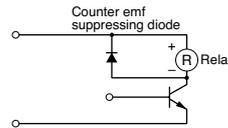


When driving an element at the same time as the relay operation, special consideration is needed for the circuit design. As shown in the incorrect circuit below, leakage current (I_0) flows through the relay coil while the relay is off. Leakage current causes the coil release failure or adversely affects the vibration resistance and shock resistance. Design a circuit as shown in the correct example.

- For wiring, use wires of proper size to meet voltage and current requirements. Tighten the terminal screws to the recommended tightening torque.

(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.



(6) Counter-electromotive force diode model has polarity. Be sure to connect according to the diagram. Incorrect wiring may cause malfunction.

2. Protection for relay contacts

(1) The contact ratings show maximum values. Make sure that these values are not exceeded even momentarily. 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, the 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. 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 $\times 10$ 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.

When the relay coil is turned off, a high-voltage pulse is generated.

	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.	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.
	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.	

Instructions

3. PCB Mounting

- (1) When mounting the relays closely together, make sure that it does not affect other electric components. Do not use relays in the vicinity of the strong magnetic field as this may affect relay operation.
- (2) Instructions on PCB mounting
Mounting on PCB with warpage may damage the copper foil or displace the solder if used for a long period of time or subjected to vibration. Furthermore, avoid installation methods that may cause warping, as this can affect the relay characteristics.
- (3) Mounting Direction
Take into consideration the mounting direction in order to fully demonstrate the performance of the relay. Typical characteristics that are greatly affected by mounting orientation include shock resistance (shock noise characteristics), life span, and contact reliability.
 - Ideally, the relay should be mounted so that the direction of movement of the movable iron piece is perpendicular to the direction of vibration/shock.
 - When used with large loads (generally more than self-coil) that may cause arcing, contact debris may accumulate around the contacts and degrade the insulation resistance between circuits. In such cases, make sure that the relays are mounted in the standard mounting direction.
Note: The standard mounting direction is usually when the contacts are on top and the coil on the bottom.
 - It is not recommended to use a single relay for both large and small loads. When a large load is used, the generated contact debris may cause failure to maintain the cleanliness of the micro-load opening/closing contacts. Therefore, when using multi-pole relays, avoid mounting directions and terminal connections where the small load contact is positioned lower than the large load contact.
- (4) Mounting space
When installing a large number of relays close to each other, note the following:
 - Note the ambient temperature of the relay. Close mounting of a large number of relays may generate abnormal heat due to mutual interference of heat. Leave enough space between the relays to avoid heat buildup. Check the minimum mounting space between the relays.
 - When multiple PCBs with relays are mounted to a rack, the temperature may rise excessively. When mounting relays, leave enough space so that heat will not build up, and so that the relays' ambient temperature remains within the specified operating temperature range.

4 . Usage, transport, and storage conditions

- Condensation occurs when there is a sudden change in temperature under high temperature and high humidity conditions. The relay insulation may deteriorate due to condensation.
- Condensation or other moisture may freeze on the relay when the temperature is lower than 0°C. This causes problems such as sticking of movable parts or delays in operation.
- Plastic parts may become brittle when used in low temperature and low humidity environments.

5. Other precautions

- (1) General notice
 - ① To maintain the initial performance, do not drop or provide shock to the relay.
 - ② The relay cover cannot be removed from the base during normal operation. To maintain the initial characteristics, do not remove the relay cover.
 - ③ Use the relay in environments free from condensation, dust, sulfur dioxide (SO₂), and hydrogen sulfide (H₂S).
 - ④ The relay cannot be washed as it is not a sealed type. Also make sure that flux does not leak to the PCB and enter the relay. (Except RF2 RTII models)
- (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
 - ① Connect an integration circuit.
 - ② Suppress the pulse voltage due to bouncing within the noise margin of the load.
- (3) UL- and CSA ratings may differ from the product ratings specified by IDEC depending on the certification organizations and local conditions.
- (4) Do not use relays in the vicinity of the strong magnetic field as this may affect relay operation.

Ordering Terms and Conditions

Thank you for using IDEC Products.

By purchasing products listed in our catalogs, datasheets, and the like (hereinafter referred to as "Catalogs") you agree to be bound by these terms and conditions. Please read and agree to the terms and conditions before placing your order.

1. Notes on contents of Catalogs

- (1) Rated values, performance values, and specification values of IDEC products listed in this Catalog are values acquired under respective conditions in independent testing, and do not guarantee values gained in combined conditions.
Also, durability varies depending on the usage environment and usage conditions.
- (2) Reference data and reference values listed in Catalogs are for reference purposes only, and do not guarantee that the product will always operate appropriately in that range.
- (3) The specifications / appearance and accessories of IDEC products listed in Catalogs are subject to change or termination of sales without notice, for improvement or other reasons.
- (4) The content of Catalogs is subject to change without notice.

2. Note on applications

- (1) If using IDEC products in combination with other products, confirm the applicable laws / regulations and standards.
Also, confirm that IDEC products are compatible with your systems, machines, devices, and the like by using under the actual conditions. IDEC shall bear no liability whatsoever regarding the compatibility with IDEC products.
- (2) The usage examples and application examples listed in Catalogs are for reference purposes only. Therefore, when introducing a product, confirm the performance and safety of the instruments, devices, and the like before use. Furthermore, regarding these examples, IDEC does not grant license to use IDEC products to you, and IDEC offers no warranties regarding the ownership of intellectual property rights or non-infringement upon the intellectual property rights of third parties.
- (3) When using IDEC products, be cautious when implementing the following.
 - i. Use of IDEC products with sufficient allowance for rating and performance
 - ii. Safety design, including redundant design and malfunction prevention design that prevents other danger and damage even in the event that an IDEC product fails
 - iii. Wiring and installation that ensures the IDEC product used in your system, machine, device, or the like can perform and function according to its specifications
- (4) Continuing to use an IDEC product even after the performance has deteriorated can result in abnormal heat, smoke, fires, and the like due to insulation deterioration or the like. Perform periodic maintenance for IDEC products and the systems, machines, devices, and the like in which they are used.
- (5) IDEC products are developed and manufactured as general-purpose products for general industrial products. They are not intended for use in the following applications, and in the event that you use an IDEC product for these applications, unless otherwise agreed upon between you and IDEC, IDEC shall provide no guarantees whatsoever regarding IDEC products.
 - i. Use in applications that require a high degree of safety, including nuclear power control equipment, transportation equipment (railroads / airplanes / ships / vehicles / vehicle instruments, etc.), equipment for use in outer space, elevating equipment, medical instruments, safety devices, or any other equipment, instruments, or the like that could endanger life or human health
 - ii. Use in applications that require a high degree of reliability, such as provision systems for gas / waterworks / electricity, etc., systems that operate continuously for 24 hours, and settlement systems
 - iii. Use in applications where the product may be handled or used deviating from the specifications or conditions / environment listed in the Catalogs, such as equipment used outdoors or applications in environments subject to chemical pollution or electromagnetic interference
If you would like to use IDEC products in the above applications, be sure to consult with an IDEC sales representative.

3. Inspections

We ask that you implement inspections for IDEC products you purchase without delay, as well as thoroughly keep in mind management/maintenance regarding handling of the product before and during the inspection.

4. Warranty

(1) Warranty period

The warranty period for IDEC products shall be one (1) year after purchase or delivery to the specified location. However, this shall not apply in cases where there is a different specification in the Catalogs or there is another agreement in place between you and IDEC.

(2) Warranty scope

Should a failure occur in an IDEC product during the above warranty period for reasons attributable to IDEC, then IDEC shall replace or repair that product, free of charge, at the purchase location / delivery location of the product, or an IDEC service base. However, failures caused by the following reasons shall be deemed outside the scope of this warranty.

- i. The product was handled or used deviating from the conditions / environment listed in the Catalogs
 - ii. The failure was caused by reasons other than an IDEC product
 - iii. Modification or repair was performed by a party other than IDEC
 - iv. The failure was caused by a software program of a party other than IDEC
 - v. The product was used outside of its original purpose
 - vi. Replacement of maintenance parts, installation of accessories, or the like was not performed properly in accordance with the user's manual and Catalogs
 - vii. The failure could not have been predicted with the scientific and technical standards at the time when the product was shipped from IDEC
 - viii. The failure was due to other causes not attributable to IDEC (including cases of force majeure such as natural disasters and other disasters)
- Furthermore, the warranty described here refers to a warranty on the IDEC product as a unit, and damages induced by the failure of an IDEC product are excluded from this warranty.

5. Limitation of liability

The warranty listed in this Agreement is the full and complete warranty for IDEC products, and IDEC shall bear no liability whatsoever regarding special damages, indirect damages, incidental damages, or passive damages that occurred due to an IDEC product.

6. Service scope

The prices of IDEC products do not include the cost of services, such as dispatching technicians. Therefore, separate fees are required in the following cases.

- (1) Instructions for installation / adjustment and accompaniment at test operation (including creating application software and testing operation, etc.)
- (2) Maintenance inspections, adjustments, and repairs
- (3) Technical instructions and technical training
- (4) Product tests or inspections specified by you

The above content assumes transactions and usage within your region. Please consult with an IDEC sales representative regarding transactions and usage outside of your region. Also, IDEC provides no guarantees whatsoever regarding IDEC products sold outside your region.

IDEC CORPORATION

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Taiwan IDEC Taiwan Corporation

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