DC Power Relays (200-A Models)
G9EC-1

DC Power Relays Capable of Interrupting High-voltage, High-current Loads

- A compact relay (98 x 44 x 86.7 mm (L x W x H)) capable of switching 400-V 200-A DC loads. (Capable of interrupting 1,000 A at 400 VDC max.)
- The switching section and driving section are gas-injected and hermetically sealed, allowing these compact relays to interrupt high-capacity loads. The sealed construction also requires no arc space, saves space, and helps ensure safe applications.
- Downsizing and optimum design allow no restrictions on the mounting direction.
- Terminal Cover is also available for industrial applications.
- UL/CSA standard UL508 approved.

Note: Refer to *Precautions* on page 22.

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Model Number Structure

■ Model Number Legend

G9EC-□-□-□-□
1 2 3 4

1. **Number of Poles**
   1: 1 pole
2. **Contact Form**
   Blank: SPST-NO
3. **Coil Terminals**
   B: M3.5 screw terminals (standard)
   Blank: Lead wire output
4. **Special Functions**

Ordering Information

■ List of Models

Models	Terminals		Contact form	Coil rated voltage	Model
	Coil terminals	Contact terminals			
Switching/current conduction models	Screw terminals (See note 2.)	Screw terminals (See note 1.)	SPST-NO	12 VDC 24 VDC 48 VDC 60 VDC 100 VDC	G9EC-1-B
	Lead wire				G9EC-1

Note: 1. Two M8 nuts are provided for the contact terminal connection.
2. Two M3.5 screws are provided for the coil terminal connection.

Specifications

■ Ratings

Coil

Rated voltage	Rated current	Coil resistance	Must-operate voltage	Must-release voltage	Maximum voltage (See note 3.)	Power consumption
12 VDC	938 mA	12.8 Ω	75% max. of rated voltage	8% min. of rated voltage	110% of rated voltage (at 23°C within 10 minutes)	Approx. 11 W
24 VDC	469 mA	51.2 Ω				
48 VDC	234 mA	204.8 Ω				
60 VDC	188 mA	320.0 Ω				
100 VDC	113 mA	888.9 Ω				

Note: 1. The figures for the rated current and coil resistance are for a coil temperature of 23°C and have a tolerance of ±10%.
2. The figures for the operating characteristics are for a coil temperature of 23°C.
3. The figure for the maximum voltage is the maximum voltage that can be applied to the relay coil.

Contacts

Item	Resistive load
	G9EC-1(-B)
Rated load	200 A at 400 VDC
Rated carry current	200 A
Maximum switching voltage	400 V
Maximum switching current	200 A

■ Characteristics

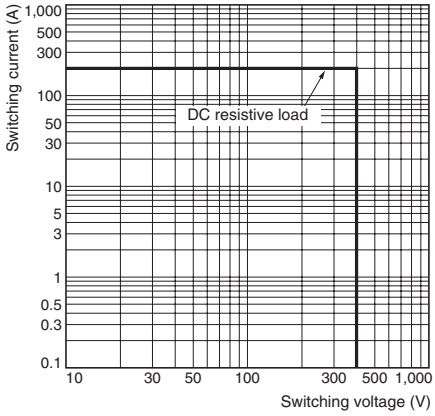
Item		G9EC-1(-B)
Contact resistance (See note 2.)		30 mΩ max. (0.2 mΩ typical)
Contact voltage drop		0.1 V max. (for a carry current of 200 A)
Operate time		50 ms max.
Release time		30 ms max.
Insulation resistance (See note 3.)	**Between coil and contacts**	1,000 MΩ min.
	Between contacts of the same polarity	1,000 MΩ min.
Dielectric strength	**Between coil and contacts**	2,500 VAC, 1 min
	Between contacts of the same polarity	2,500 VAC, 1 min
Impulse withstand voltage (See note 4.)		4,500 V
Vibration resistance	**Destruction**	10 to 55 to 10 Hz 0.75-mm single amplitude (Acceleration: 2.94 to 88.9 m/s^2)
	Malfunction	10 to 55 to 10 Hz 0.75-mm single amplitude (Acceleration: 2.94 to 88.9 m/s^2)
Shock resistance	**Destruction**	490 m/s^2
	Malfunction	196 m/s^2
Mechanical endurance (See note 5.)		200,000 operations min.
Electrical endurance (resistive load) (See note 6.)		400 VDC, 200 A, 3,000 operations min.
Short-time carry current		300 A (15 min)
Maximum interruption current		1,000 A at 400 VDC (10 times)
Overload interruption		700 A at 400 VDC (40 times min.)
Reverse polarity interruption		−200 A at 200 VDC (1,000 times min.)
Ambient operating temperature		−40 to 50°C (with no icing or condensation)
Ambient operating humidity		5% to 85%
Weight		Approx. 560 g

Note: 1. The above values are initial values at an ambient temperature of 23°C unless otherwise specified.
2. The contact resistance was measured with 1 A at 5 VDC using the voltage drop method.
3. The insulation resistance was measured with a 500-VDC megohmmeter.
4. The impulse withstand voltage was measured with a JEC-212 (1981) standard impulse voltage waveform (1.2 × 50 μs).
5. The mechanical endurance was measured at a switching frequency of 3,600 operations/hr.
6. The electrical endurance was measured at a switching frequency of 60 operations/hr.

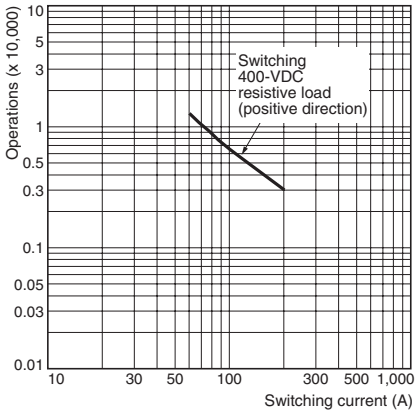
Engineering Data

■ G9EC-1(-B) Switching/Current Conduction Models

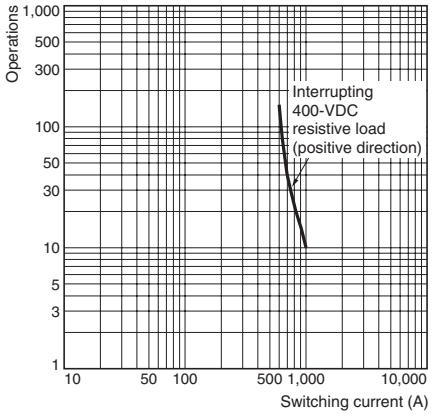
Maximum Switching Capacity



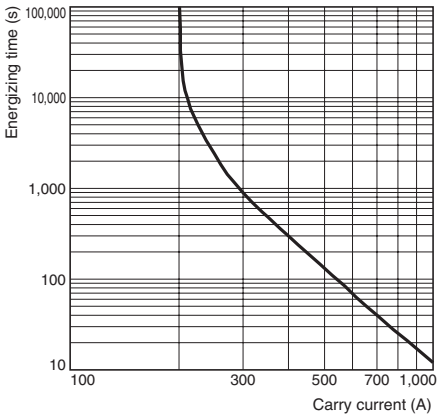
Electrical Endurance (Switching Performance)



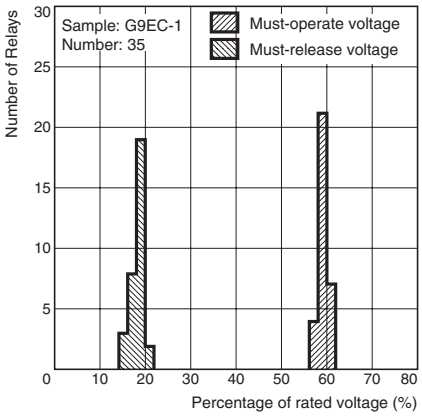
Electrical Endurance (Interruption Performance)



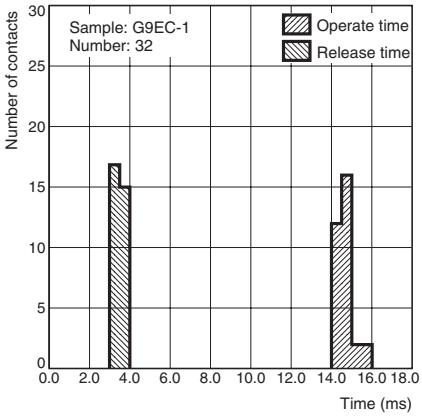
Carry Current vs Energizing Time



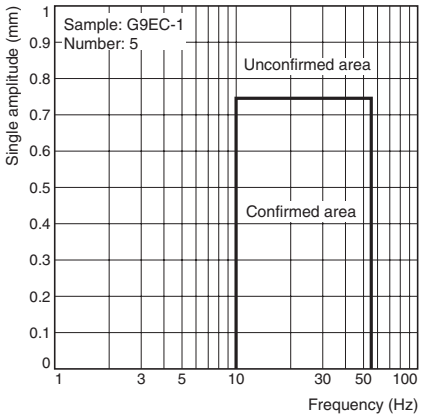
Must-operate Voltage and Must-release Voltage Distributions



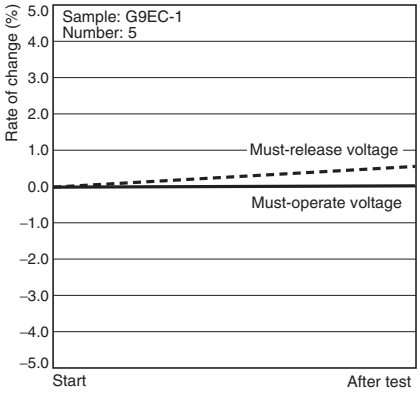
Time Characteristic Distributions



Vibration Malfunction

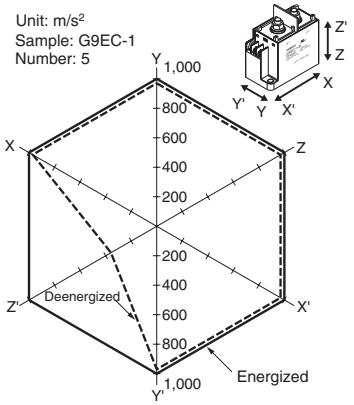


Vibration Resistance



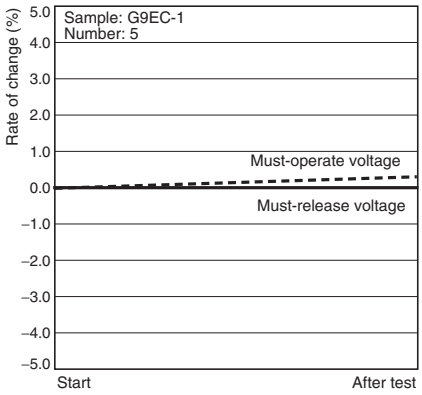
Characteristics were measured after applying vibration at a frequency of 10 to 55 Hz (single amplitude of 0.75 mm) to the test piece (not energized) for 2 hours each in 3 directions. The percentage rate of change is the average value for all of the samples

Shock Malfunction



The value at which malfunction occurred was measured after applying shock to the test piece 3 times each in 6 directions along 3 axes.

Shock Resistance



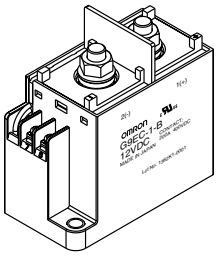
Characteristics were measured after applying a shock of 490 m^2/s to the test piece 3 times each in 6 directions along 3 axes. The percentage rate of change is the average value for all of the samples.

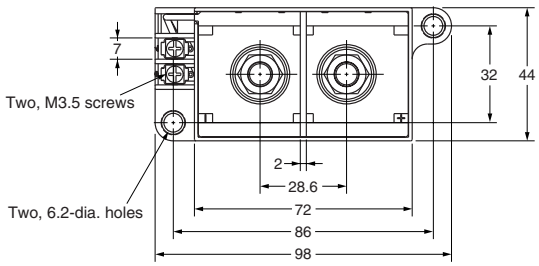
Dimensions

Note: All units are in millimeters unless otherwise indicated.

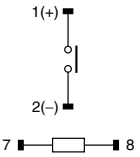
Models with Screw Terminals

G9EC-1-B



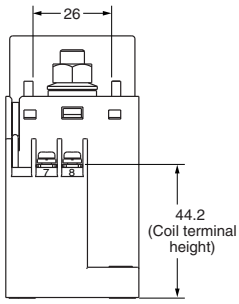


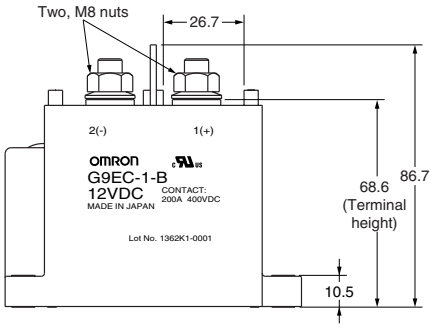
Terminal Arrangement/ Internal Connections
(TOP VIEW)



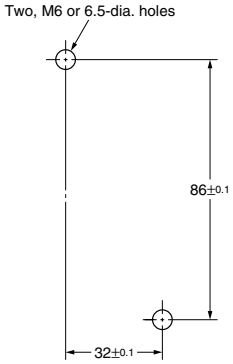
Note: Be sure to connect terminals with the correct polarity. Coils do not have polarity.

Dimension (mm)	Tolerance (mm)
10 or lower	±0.3
10 to 50	±0.5
50 or higher	±1



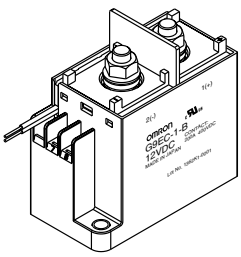


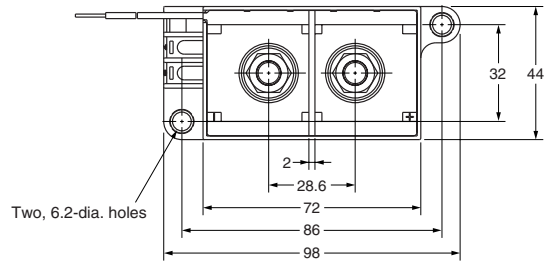
Mounting Hole Dimensions
(TOP VIEW)



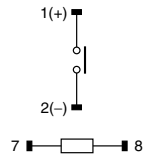
Models with Lead Wires

G9EC-1



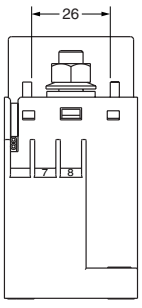


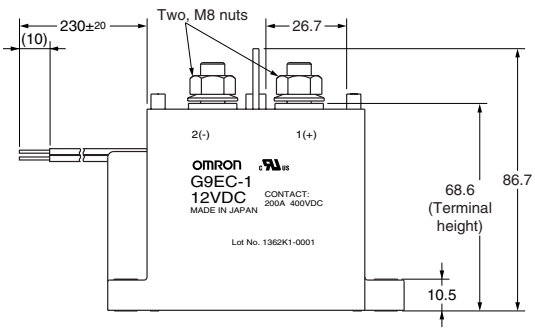
Terminal Arrangement/ Internal Connections
(TOP VIEW)



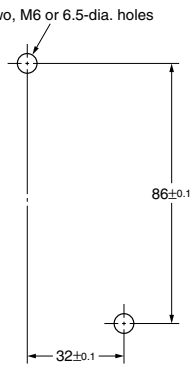
Note: Be sure to connect terminals with the correct polarity. Coils do not have polarity.

Dimension (mm)	Tolerance (mm)
10 or lower	±0.3
10 to 50	±0.5
50 or higher	±1





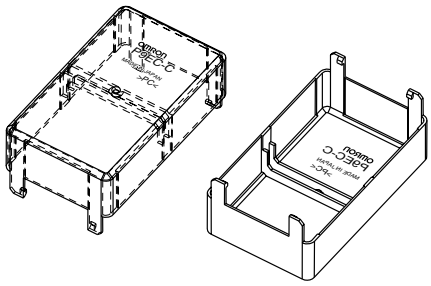
Mounting Hole Dimensions
(TOP VIEW)

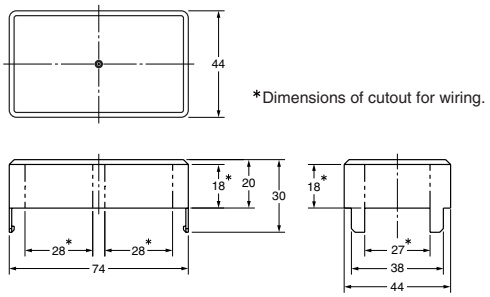


■ Options

Terminal Cover

P9EC-C





*Dimensions of cutout for wiring.

Note: Be sure to remove the cutouts for wiring that are located in the wiring outlet direction before installing the Terminal Cover.

Dimension (mm)	Tolerance (mm)
10 or lower	±0.3
10 to 50	±0.5
50 or higher	±1

Precautions

⚠ WARNING

Take measures to prevent contact with charged parts when using the Relay for high voltages.

■ Precautions for Correct Use

Refer to the relevant catalog for common precautions.

1. Be sure to tighten all screws to the appropriate torque given below. Loose screws may result in burning due to abnormal heat generation during energization.
   - M8 screws: 8.82 to 9.80 N·m
   - M6 screws: 3.92 to 4.90 N·m
   - M5 screws: 1.57 to 2.35 N·m
   - M4 screws: 0.98 to 1.37 N·m
   - M3.5 screws: 0.75 to 1.18 N·m
2. The G9EA and G9EC Relays' contacts have polarity. Be sure to perform connections with the correct polarity. If the contacts are connected with the reverse polarity, the switching characteristics specified in this document cannot be assured.
3. Do not drop or disassemble this Relay. Not only may the Relay fail to meet the performance specifications, it may also result in damage, electric shock, or burning.
4. Do not use these Relays in strong magnetic fields of 800 A/m or higher (e.g., near transformers or magnets). The arc discharge that occurs during switching may be bent by the magnetic field, resulting in flashover or insulation faults.
5. This Relay is a device for switching high DC voltages. If it is used for voltages exceeding the specified range, it may not be possible to interrupt the load and burning may result. In order to prevent fire spreading, use a configuration in which the current load can be interrupted in the event of emergencies.
   In order to ensure safety of the system, replace the Relay on a regular basis.
6. If the Relay is used for no-load switching, the contact resistance may increase and so confirm correct operation under the actual operating conditions.
7. These Relays contain pressurized gas. Even in applications with low switching frequencies, the ambient temperature and heat caused by arc discharge in the contacts may allow permeation of the sealed gas, resulting in arc interruption failure.
   In order to ensure safety of the system, replace Relays on a regular basis.
8. Do not use or store the Relay in a vacuum. Doing so will accelerate deterioration of the sealing.
9. With this Relay, if the rated voltage (or current) is continuously applied to the coil and contacts, and then turned OFF and immediately ON again, the coil temperature, and consequently the coil resistance, will be higher than usual. This means that the must operate voltage will also be higher than usual, exceeding the rated value ("hot start"). In this case, take the appropriate countermeasures, such as reducing the load current or restricting the energizing time or ambient operating temperature.
10. The ripple percentage for DC relays can cause fluctuations in the must-operate voltage or humming. For this reason, reduce the ripple percentage in full-wave rectified power supply circuits by adding a smoothing capacitor. Ensure that the ripple percentage is less than 5%.
11. Ensure that a voltage exceeding the specified maximum voltage is not continuously applied to the coil. Abnormal heating in the coil may shorten the lifetime of the insulation coating.
12. Do not use the Relay at a switching voltage or current greater than the specified maximum values. Doing so may result in arc discharge interruption failure or burning due to abnormal heating in the contacts.
13. The contact ratings are for resistive loads. The electrical endurance with inductive loads is inferior to that of resistive loads. Confirm correct operation under the actual operating conditions.
14. Do not use the Relay in locations where water, solvents, chemicals, or oil may come in contact with the case or terminals. Doing so may result in deterioration of the case resin or abnormal heating due to corrosion or contamination of the terminals. Also, if electrolyte adheres to the output terminals, electrolysis may occur between the output terminals, resulting in corrosion of the terminals or wiring disconnections.
15. Be sure to turn OFF the power and confirm that there is no residual voltage before replacing the Relay or performing wiring.
16. The distance between crimp terminals or other conductive parts will be reduced and insulation properties will be lowered if wires are laid in the same direction from the contact terminals. Use insulating coverings, do not wire in the same direction, and take other measures as required to maintain insulation properties.
17. Use either a varistor, or a diode plus Zener diode as a protective circuit against reverse surge in the relay coil. Using a diode alone will reduce the switching characteristics.
18. Be sure to use the screws provided with the product for wiring coil terminals and contact terminals. The specified tightening torque cannot be achieved with different screws and may result in abnormal heat generation when energized.

Recommended Wire Size

Model	Size
G9EA-1(-B)	14 to 22 mm^2
G9EA-1(-B)-CA	22 to 38 mm^2
G9EC-1(-B)	38 to 60 mm^2
G9EB-1-B	2 to 5.5 mm^2

Note: Use flexible leads.

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