DC Power Relays

G9EA/G9EB/G9EC
DC Control in a Relay
A Leader in Clean Energy with Compact, Quiet, Energy-efficient Designs

Compact models added to further expand Series
OMRON has improved on the standard DC circuit that switches using a contactor or circuit-breaker by developing the G9EA/G9EB/G9EC DC Power Relay Series. These Relays enable switching high-voltage and high-capacity loads. The switch’s gas-filled construction allows a considerable reduction in the relay switch size, while also lowering the operating noise during load switching. Furthermore, the new design has decreased the power consumption of the coil and achieved long-term contact stability.

**Features**

OMRON DC Power Switching Technologies

- Sealed switching
- Gas-cooled arc
- Magnetic arc control

**Applications**

Smaller and quieter for a variety of DC applications

**Automobiles**
- Hybrid cars, fuel-cell cars, compact electric passenger vehicles, etc.

**Special Vehicles**
- Battery-operated golf carts, forklifts, AGV (automated guided vehicles), battery-powered agricultural equipment, etc.

**Electric Power and Distributed Power Generation**
- Wind-powered or photovoltaic power generation systems, fuel-cell cogeneration systems, etc.

**General-purpose Industrial Equipment**
- Inverters, UPS, power supplies, robots, machining centers, elevators, escalators, medical equipment, testing equipment (batteries, fuel cells), etc.

* Compared with the same class (load switching) of G9EA contactor.
OMRON DC Power Relays Interrupt High-capacity DC Loads while Enabling Compact, Low-noise, Safe Applications

### List of DC Power Relays

<table>
<thead>
<tr>
<th>Model</th>
<th>G9EA</th>
<th>G9EC</th>
<th>G9EB</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>G9EA-1(-B)</td>
<td>G9EA-1(-B)-CA</td>
<td>G9EC-1(-B)</td>
</tr>
<tr>
<td>Classification</td>
<td>Switching/current conduction</td>
<td>High-current conduction</td>
<td>Switching/current conduction</td>
</tr>
<tr>
<td>Appearance</td>
<td><img src="image1" alt="Image" /></td>
<td><img src="image2" alt="Image" /></td>
<td><img src="image3" alt="Image" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Features</th>
<th>Standard model</th>
<th>Carries 100 A</th>
<th>Largest capacity in series</th>
<th>Smallest in series</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact, carries/switches 400-V, 60-A loads</td>
<td>Low contact resistance when carrying current</td>
<td>Carries/switches 400-V, 200-A loads</td>
<td>Carries/switches 250-V, 25-A loads</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Contacts</th>
<th>Contact form</th>
<th>SPST-NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact structure</td>
<td>Double-break, single</td>
<td></td>
</tr>
<tr>
<td>Contact resistance</td>
<td>30 mΩ max. (0.6 mΩ typical)</td>
<td></td>
</tr>
<tr>
<td>Switching voltage drop</td>
<td>0.1 V max. (for a carry current of 60 A)</td>
<td></td>
</tr>
<tr>
<td>Electrical endurance</td>
<td>120 VDC, 100 A, 3,000 operations min.</td>
<td></td>
</tr>
<tr>
<td>400 VDC, 30 A, 1,000 operations min.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>400 VDC, 200 A, 3,000 operations min.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>250 VDC, 25 A, 30,000 operations min.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum switching current</td>
<td>100 A</td>
<td></td>
</tr>
<tr>
<td>Rated carry current</td>
<td>200 A</td>
<td></td>
</tr>
<tr>
<td>180 A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>160 A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>140 A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>120 A</td>
<td></td>
<td></td>
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<tr>
<td>100 A</td>
<td></td>
<td></td>
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<tr>
<td>80 A</td>
<td></td>
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<tr>
<td>60 A</td>
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<td></td>
</tr>
<tr>
<td>40 A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short-time carry current</td>
<td>100 A (10 min)</td>
<td></td>
</tr>
<tr>
<td>150 A (10 min)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 A</td>
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<td></td>
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<tr>
<td>80 A</td>
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<td>60 A</td>
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<tr>
<td>40 A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum interruption current</td>
<td>600 A at 300 VDC (5 times)</td>
<td></td>
</tr>
<tr>
<td>1,000 A at 400 VDC (10 times)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 A at 250 VDC (5 times)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overload interruption</td>
<td>180 A at 400 VDC (100 times min.)</td>
<td></td>
</tr>
<tr>
<td>100 A at 120 VDC (150 times min.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>700 A at 400 VDC (40 times min.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 A at 250 VDC (50 times min.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reverse polarity interruption</td>
<td>-60 A at 200 VDC (1,000 times min.)</td>
<td></td>
</tr>
<tr>
<td>-200 A at 200 VDC (1,000 times min.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
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</tr>
</tbody>
</table>

| Coil | Rated voltage | 12, 24, 48, 60, and 100 VDC |
|      | Power consumption | Approx. 5 to 5.4 W |
|      |                        | Approx. 11 W |
|      |                        | Approx. 2 W |
|      | Mechanical endurance | 200,000 operations min. |
|      |                        | 100,000 operations min. |
### DC Power Relays Selection Guide

#### 4 DC Power Relays

<table>
<thead>
<tr>
<th>Model</th>
<th>G9EA</th>
<th>G9EC</th>
<th>G9EB</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>G9EA-1(-B)</td>
<td>G9EA-1(-B)-CA</td>
<td>G9EC-1(-B)</td>
</tr>
<tr>
<td><strong>Classification</strong></td>
<td>Switching/current conduction</td>
<td>High-current conduction</td>
<td>Switching/current conduction</td>
</tr>
<tr>
<td><strong>Insulation resistance</strong> (See note 2.)</td>
<td>Between coil and contacts: 1,000 MΩ min.</td>
<td>Between contacts of the same polarity: 1,000 MΩ min.</td>
<td>Between coil and contacts: 2,500 VAC, 1 min</td>
</tr>
<tr>
<td><strong>Dielectric strength</strong></td>
<td>Between coil and contacts: 2,500 VAC, 1 min</td>
<td>Between contacts of the same polarity: 2,500 VAC, 1 min</td>
<td></td>
</tr>
<tr>
<td><strong>Impulse withstand voltage</strong> (See note 3.)</td>
<td>4,500 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ambient operating temperature</strong></td>
<td>−40 to 70°C (with no icing or condensation)</td>
<td>−40 to 50°C (with no icing or condensation)</td>
<td>−40 to 70°C (with no icing or condensation)</td>
</tr>
<tr>
<td><strong>Ambient operating humidity</strong></td>
<td>5% to 85%</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Terminals</strong></td>
<td>Screw terminals: Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Lead wire output: Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>Approx. 310 g</td>
<td>Approx. 560 g</td>
<td>Approx. 135 g</td>
</tr>
<tr>
<td><strong>Refer to page</strong></td>
<td>5</td>
<td>11</td>
<td>17</td>
</tr>
</tbody>
</table>

**Note:**
1. The insulation resistance was measured with a 500-VDC megohmmeter.
2. The impulse withstand voltage was measured with a JEC-212 (1981) standard impulse voltage waveform (1.2 × 50 μs).
DC Power Relays Capable of Interrupting High-voltage, High-current Loads

- A compact relay (73 x 36 x 67.2 mm (L x W x H)) capable of switching 400-V 60-A DC loads. (Capable of interrupting 600 A at 300 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 and DIN Track Adapters are also available for industrial applications.
- UL/CSA standard UL508 approved.

Note: Refer to Precautions on page 22.

Model Number Structure

Model Number Legend

G9EA-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
   Blank: Lead wire output

4. Special Functions
   CA: High-current conduction (100 A)

Ordering Information

List of Models

<table>
<thead>
<tr>
<th>Models</th>
<th>Terminals</th>
<th>Contact terminals</th>
<th>Contact form</th>
<th>Rated coil voltage</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switching/current conduction</td>
<td>Screw terminals (See note 2.)</td>
<td>Screw terminals (See note 1.)</td>
<td>SPST-NO</td>
<td>12 VDC</td>
<td>G9EA-1-B</td>
</tr>
<tr>
<td>models</td>
<td>Lead wires</td>
<td></td>
<td></td>
<td>24 VDC</td>
<td>G9EA-1</td>
</tr>
<tr>
<td>High-current conduction</td>
<td>Screw terminals (See note 2.)</td>
<td></td>
<td></td>
<td>48 VDC</td>
<td>G9EA-1-CA</td>
</tr>
<tr>
<td>models</td>
<td>Lead wires</td>
<td></td>
<td></td>
<td>60 VDC</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100 VDC</td>
<td></td>
</tr>
</tbody>
</table>

Note: 1. Two M5 screws are provided for the contact terminal connection.
2. Two M3.5 screws are provided for the coil terminal connection.
## Specifications

### Ratings

#### Coil

<table>
<thead>
<tr>
<th>Rated voltage</th>
<th>Rated current</th>
<th>Coil resistance</th>
<th>Must-operate voltage</th>
<th>Must-release voltage</th>
<th>Maximum voltage (See note 3.)</th>
<th>Power consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 VDC</td>
<td>417 mA</td>
<td>28.8 Ω</td>
<td>75% max. of rated voltage</td>
<td>8% min. of rated voltage</td>
<td>130% of rated voltage at 23°C within 10 minutes</td>
<td>Approx. 5 W</td>
</tr>
<tr>
<td>24 VDC</td>
<td>208 mA</td>
<td>115.2 Ω</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48 VDC</td>
<td>102 mA</td>
<td>469.3 Ω</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60 VDC</td>
<td>86.2 mA</td>
<td>685.7 Ω</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 VDC</td>
<td>53.6 mA</td>
<td>1,864 Ω</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Resistive load</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated load</td>
<td>G9EA-1(-B)</td>
</tr>
<tr>
<td>Rated carry current</td>
<td>60 A at 400 VDC, 100 A at 120 VDC</td>
</tr>
<tr>
<td>Maximum switching voltage</td>
<td>400 V</td>
</tr>
<tr>
<td>Maximum switching current</td>
<td>100 A</td>
</tr>
</tbody>
</table>

### Characteristics

<table>
<thead>
<tr>
<th>Item</th>
<th>G9EA-1(-B)</th>
<th>G9EA-1(-B)-CA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact resistance (See note 2.)</td>
<td>30 mΩ max. (0.6 mΩ typical)</td>
<td>10 mΩ max. (0.3 mΩ typical)</td>
</tr>
<tr>
<td>Contact voltage drop</td>
<td>0.1 V max.</td>
<td>0.1 V max.</td>
</tr>
<tr>
<td>Operate time</td>
<td>50 ms max.</td>
<td>30 ms max.</td>
</tr>
<tr>
<td>Release time</td>
<td>30 ms max.</td>
<td>30 ms max.</td>
</tr>
<tr>
<td>Insulation resistance (See note 3.)</td>
<td>1,000 MΩ min.</td>
<td>1,000 MΩ min.</td>
</tr>
<tr>
<td>Dielectric strength</td>
<td>2,500 VAC, 1 min</td>
<td>2,500 VAC, 1 min</td>
</tr>
<tr>
<td>Impulse withstand voltage (See note 4.)</td>
<td>4,500 V</td>
<td></td>
</tr>
<tr>
<td>Vibration resistance</td>
<td>Destruction</td>
<td>Destruction</td>
</tr>
<tr>
<td>Shock resistance</td>
<td>490 m/s²</td>
<td>196 m/s²</td>
</tr>
<tr>
<td>Mechanical endurance (See note 5.)</td>
<td>200,000 ops. min.</td>
<td></td>
</tr>
<tr>
<td>Electrical endurance (See note 6.)</td>
<td>120 VDC, 100 A, 3,000 ops. min.</td>
<td>400 VDC, 30 A, 1,000 ops. min.</td>
</tr>
<tr>
<td>Maximum interruption current</td>
<td>600 A at 300 VDC (5 times)</td>
<td>---</td>
</tr>
<tr>
<td>Overload interruption</td>
<td>180 A at 400 VDC (100 times min.)</td>
<td>100 A at 120 VDC (150 times min.)</td>
</tr>
<tr>
<td>Reverse polarity interruption</td>
<td>−60 A at 200 VDC (1,000 times min.)</td>
<td>---</td>
</tr>
<tr>
<td>Ambient operating temperature</td>
<td>−40 to 70°C (with no icing or condensation)</td>
<td></td>
</tr>
<tr>
<td>Ambient operating humidity</td>
<td>5% to 85%</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>Approx. 310 g</td>
<td></td>
</tr>
</tbody>
</table>

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.
### G9EA-1(-B) Switching/Current Conduction Models

#### Maximum Switching Capacity

<table>
<thead>
<tr>
<th>Switching Voltage (V)</th>
<th>Switching Current (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>100</td>
<td>100</td>
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<tr>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>1,000</td>
<td>1,000</td>
</tr>
</tbody>
</table>

#### Electrical Endurance (Switching Performance)

<table>
<thead>
<tr>
<th>Switching Voltage (V)</th>
<th>Operations (A × 10,000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>400</td>
<td>400</td>
</tr>
</tbody>
</table>

#### Electrical Endurance (Interruption Performance)

<table>
<thead>
<tr>
<th>Switching Voltage (V)</th>
<th>Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>400</td>
<td>400</td>
</tr>
</tbody>
</table>

#### Carry Current vs Energizing Time

<table>
<thead>
<tr>
<th>Energizing Time (s)</th>
<th>Carry Current (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>1,000</td>
<td>1,000</td>
</tr>
</tbody>
</table>

### G9EA-1(-B)-CA High-current Conduction Models

#### Maximum Switching Capacity

<table>
<thead>
<tr>
<th>Switching Voltage (V)</th>
<th>Contact Current (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>1,000</td>
<td>1,000</td>
</tr>
</tbody>
</table>

#### Electrical Endurance (Switching Performance)

<table>
<thead>
<tr>
<th>Switching Voltage (V)</th>
<th>Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>400</td>
<td>400</td>
</tr>
</tbody>
</table>

#### Carry Current vs Energizing Time

<table>
<thead>
<tr>
<th>Energizing Time (s)</th>
<th>Carry Current (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>1,000</td>
<td>1,000</td>
</tr>
</tbody>
</table>
All G9EA-1 Models

Must-operate Voltage and Must-release Voltage Distributions

Time Characteristic Distributions

Vibration Malfunction

Vibration Resistance

Shock Malfunction

Shock Resistance

Start | After test
---|---
Must-operate voltage | Must-release voltage

The value at which malfunction occurred was measured after applying shock 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.

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.

Characteristics were measured after applying a shock of 490 m/s^2 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

G9EA-1-B(-CA)

<table>
<thead>
<tr>
<th>Dimension (mm)</th>
<th>Tolerance (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 or lower</td>
<td>±0.3</td>
</tr>
<tr>
<td>10 to 50</td>
<td>±0.5</td>
</tr>
<tr>
<td>50 or higher</td>
<td>±1</td>
</tr>
</tbody>
</table>

Models with Lead Wires

G9EA-1(-CA)

<table>
<thead>
<tr>
<th>Dimension (mm)</th>
<th>Tolerance (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 or lower</td>
<td>±0.3</td>
</tr>
<tr>
<td>10 to 50</td>
<td>±0.5</td>
</tr>
<tr>
<td>50 or higher</td>
<td>±1</td>
</tr>
</tbody>
</table>

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

Terminal Cover

P9EA-C

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

DIN Track Adapter

P9EA-D

* Dimensions of cutouts for wiring.

<table>
<thead>
<tr>
<th>Dimension (mm)</th>
<th>Tolerance (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 or lower</td>
<td>±0.3</td>
</tr>
<tr>
<td>10 to 50</td>
<td>±0.5</td>
</tr>
<tr>
<td>50 or higher</td>
<td>±1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dimension (mm)</th>
<th>Tolerance (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 or lower</td>
<td>±0.3</td>
</tr>
<tr>
<td>10 to 50</td>
<td>±0.5</td>
</tr>
<tr>
<td>50 or higher</td>
<td>±1</td>
</tr>
</tbody>
</table>
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.

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

<table>
<thead>
<tr>
<th>Models</th>
<th>Terminals</th>
<th>Contact form</th>
<th>Coil rated voltage</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coil terminals</td>
<td>Contact terminals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switching/current conduction models</td>
<td>Screw terminals (See note 2.)</td>
<td>Screw terminals (See note 1.)</td>
<td>SPST-NO</td>
<td>G9EC-1-B</td>
</tr>
<tr>
<td></td>
<td>Lead wire</td>
<td></td>
<td></td>
<td>G9EC-1</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Rated voltage</th>
<th>Rated current</th>
<th>Coil resistance</th>
<th>Must-operate voltage</th>
<th>Must-release voltage</th>
<th>Maximum voltage (See note 3.)</th>
<th>Power consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 VDC</td>
<td>938 mA</td>
<td>12.8 Ω</td>
<td>75% max. of rated voltage</td>
<td>8% min. of rated voltage</td>
<td>110% of rated voltage (at 23°C within 10 minutes)</td>
<td>Approx. 11 W</td>
</tr>
<tr>
<td>24 VDC</td>
<td>469 mA</td>
<td>51.2 Ω</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48 VDC</td>
<td>234 mA</td>
<td>204.8 Ω</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60 VDC</td>
<td>188 mA</td>
<td>320.0 Ω</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 VDC</td>
<td>113 mA</td>
<td>868.9 Ω</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Resistive load</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated load</td>
<td>G9EC-1(-B)</td>
</tr>
<tr>
<td>Rated carry current</td>
<td>200 A</td>
</tr>
<tr>
<td>Maximum switching voltage</td>
<td>400 V</td>
</tr>
<tr>
<td>Maximum switching current</td>
<td>200 A</td>
</tr>
</tbody>
</table>

■ Characteristics

<table>
<thead>
<tr>
<th>Item</th>
<th>G9EC-1(-B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact resistance (See note 2.)</td>
<td>30 mΩ max. (0.2 mΩ typical)</td>
</tr>
<tr>
<td>Contact voltage drop</td>
<td>0.1 V max. (for a carry current of 200 A)</td>
</tr>
<tr>
<td>Operate time</td>
<td>50 ms max.</td>
</tr>
<tr>
<td>Release time</td>
<td>30 ms max.</td>
</tr>
<tr>
<td>Insulation resistance (See note 3.)</td>
<td>Between coil and contacts 1,000 MΩ min.</td>
</tr>
<tr>
<td></td>
<td>Between contacts of the same polarity 1,000 MΩ min.</td>
</tr>
<tr>
<td>Dielectric strength</td>
<td>Between coil and contacts 2,500 VAC, 1 min</td>
</tr>
<tr>
<td></td>
<td>Between contacts of the same polarity 2,500 VAC, 1 min</td>
</tr>
<tr>
<td>Impulse withstand voltage (See note 4.)</td>
<td>4,500 V</td>
</tr>
<tr>
<td>Vibration resistance</td>
<td>Destruction 10 to 55 to 10 Hz 0.75-mm single amplitude (Acceleration: 2.94 to 88.9 m/s²)</td>
</tr>
<tr>
<td></td>
<td>Malfunction 10 to 55 to 10 Hz 0.75-mm single amplitude (Acceleration: 2.94 to 88.9 m/s²)</td>
</tr>
<tr>
<td>Shock resistance</td>
<td>Destruction 490 m/s²</td>
</tr>
<tr>
<td></td>
<td>Malfunction 196 m/s²</td>
</tr>
<tr>
<td>Mechanical endurance (See note 5.)</td>
<td>200,000 operations min.</td>
</tr>
<tr>
<td>Electrical endurance (resistive load) (See note 6.)</td>
<td>400 VDC, 200 A, 3,000 operations min.</td>
</tr>
<tr>
<td>Short-time carry current</td>
<td>300 A (15 min)</td>
</tr>
<tr>
<td>Maximum interruption current</td>
<td>1,000 A at 400 VDC (10 times)</td>
</tr>
<tr>
<td>Overload interruption</td>
<td>700 A at 400 VDC (40 times min.)</td>
</tr>
<tr>
<td>Reverse polarity interruption</td>
<td>−200 A at 200 VDC (1,000 times min.)</td>
</tr>
<tr>
<td>Ambient operating temperature</td>
<td>−40 to 50°C (with no icing or condensation)</td>
</tr>
<tr>
<td>Ambient operating humidity</td>
<td>5% to 85%</td>
</tr>
<tr>
<td>Weight</td>
<td>Approx. 560 g</td>
</tr>
</tbody>
</table>

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-Ω megohmmeter.
4. The impulse withstand voltage was measured with a JEC-212 (1981) standard impulse voltage waveform (1.2 x 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**

---

**Sample: G9EC-1**

**Number: 35**

**Switching 400-VDC resistive load (positive direction)**

**Interrupting 400-VDC resistive load (positive direction)**

---

**Switching current (A)**

**Switching voltage (V)**

**Operations (x 10,000)**

---

**Must-operate Voltage and Must-release Voltage Distributions**

**Time Characteristic Distributions**

**Operate time**

**Release time**

---

**Percentage of rated voltage (%)**

**Time (ms)**

---

**Number of contacts**

---

**Number of Relays**

---

**Sample: G9EC-1**

**Number: 32**

---

**Operations**

**Switching current (A)**

---

**Operations**

**Switching current (A)**

---

**Operations**

**Switching current (A)**

---

**Operations**

**Switching current (A)**

---

**Operations**

**Switching current (A)**

---

**Operations**

**Switching current (A)**

---

**Operations**

**Switching current (A)**

---

**Operations**

**Switching current (A)**

---

**Operations**

**Switching current (A)**

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

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.
Dimensions

Note: All units are in millimeters unless otherwise indicated.

Models with Screw Terminals

G9EC-1-B

<table>
<thead>
<tr>
<th>Dimension (mm)</th>
<th>Tolerance (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 or lower</td>
<td>±0.3</td>
</tr>
<tr>
<td>10 to 50</td>
<td>±0.5</td>
</tr>
<tr>
<td>50 or higher</td>
<td>±1</td>
</tr>
</tbody>
</table>

Terminal Arrangement/ Internal Connections (TOP VIEW)

Mounting Hole Dimensions (TOP VIEW)

Models with Lead Wires

G9EC-1

<table>
<thead>
<tr>
<th>Dimension (mm)</th>
<th>Tolerance (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 or lower</td>
<td>±0.3</td>
</tr>
<tr>
<td>10 to 50</td>
<td>±0.5</td>
</tr>
<tr>
<td>50 or higher</td>
<td>±1</td>
</tr>
</tbody>
</table>
Options

Terminal Cover

P9EC-C

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

<table>
<thead>
<tr>
<th>Dimension (mm)</th>
<th>Tolerance (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 or lower</td>
<td>±0.3</td>
</tr>
<tr>
<td>10 to 50</td>
<td>±0.5</td>
</tr>
<tr>
<td>50 or higher</td>
<td>±1</td>
</tr>
</tbody>
</table>
DC Power Relays Capable of Interrupting High-voltage, High-current DC Load

- Utilizes a unique gas-filled, fully sealed, non-ceramic construction achieved by using resin with a metal case. This reduces the need for special processing and materials that were required with previous models, resulting in a low-cost relay that is both compact and lightweight.
- Smallest and lightest in its class at 25 x 60 x 58 mm and approximately 135 g. This is approximately half the volume and a third of the weight of other DC Power Relays in the same class (400 VDC, 25 A).*
- The unique design of the contact switching component and permanent magnet for blowing out the arc eliminates the need for polarity in the main circuit (contact terminal). This improves ease of wiring and installation, and contributes to providing failsafe measures against incorrect wiring.

* Based on our investigation as of December 2004.

Note: Refer to Precautions on page 22.

Model Number Structure

■ Model Number Legend

G9EB-1-1-1-1

1. Number of Poles
   1: 1 pole
2. Contact Form
   Blank: SPST-NO
3. Coil Terminals
   B: M4 screw terminals
4. Special Functions

Ordering Information

■ List of Models

<table>
<thead>
<tr>
<th>Models Terminals</th>
<th>Contact terminals</th>
<th>Contact form</th>
<th>Coil rated voltage</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switching/current conduction models</td>
<td>Screw terminals (See note 2.)</td>
<td>Screw terminals (See note 1.)</td>
<td>SPST-NO</td>
<td>12 VDC, 24 VDC, 48 VDC, 60 VDC, 100 VDC</td>
</tr>
</tbody>
</table>

Note: 1. Two M4 screws are provided for the contact terminal connection.
   2. Two M4 screws are provided for the coil terminal connection.
Specifications

■ Ratings

Coil

<table>
<thead>
<tr>
<th>Rated voltage</th>
<th>Rated current</th>
<th>Coil resistance</th>
<th>Must-operate voltage</th>
<th>Must-release voltage</th>
<th>Maximum voltage (See note 3.)</th>
<th>Power consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 VDC</td>
<td>166.7 mA</td>
<td>72 Ω</td>
<td>75% max. of rated voltage</td>
<td>10% min. of rated voltage</td>
<td>130% of rated voltage (at 23°C within 10 minutes)</td>
<td>Approx. 2 W</td>
</tr>
<tr>
<td>24 VDC</td>
<td>83.3 mA</td>
<td>288 Ω</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48 VDC</td>
<td>41.7 mA</td>
<td>1,152 Ω</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60 VDC</td>
<td>33.3 mA</td>
<td>1,800 Ω</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 VDC</td>
<td>20 mA</td>
<td>5,000 Ω</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Item</th>
<th>G9EB-1(-B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated load</td>
<td>25 A at 250 VDC</td>
</tr>
<tr>
<td>Rated carry current</td>
<td>25 A</td>
</tr>
<tr>
<td>Maximum switching voltage</td>
<td>250 V</td>
</tr>
<tr>
<td>Maximum switching current</td>
<td>25 A</td>
</tr>
</tbody>
</table>

■ Characteristics

<table>
<thead>
<tr>
<th>Item</th>
<th>G9EB-1-B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact resistance (See note 2.)</td>
<td>30 mΩ max.</td>
</tr>
<tr>
<td>Contact voltage drop</td>
<td>0.1 V max. (for a carry current of 25 A)</td>
</tr>
<tr>
<td>Operate time</td>
<td>30 ms max.</td>
</tr>
<tr>
<td>Release time</td>
<td>15 ms max.</td>
</tr>
<tr>
<td>Insulation resistance (See note 3.) Between coil and contacts</td>
<td>1,000 MΩ min.</td>
</tr>
<tr>
<td>Between contacts of the same polarity</td>
<td>1,000 MΩ min.</td>
</tr>
<tr>
<td>Dielectric strength Between coil and contacts</td>
<td>2,500 VAC, 1 min</td>
</tr>
<tr>
<td>Between contacts of the same polarity</td>
<td>2,500 VAC, 1 min</td>
</tr>
<tr>
<td>Impulse withstand voltage (See note 4.)</td>
<td>4,500 V</td>
</tr>
<tr>
<td>Vibration resistance</td>
<td>Destruction</td>
</tr>
<tr>
<td>10 to 55 to 10 Hz, 0.75-mm single amplitude (Acceleration: 2.94 to 88.9 m/s²)</td>
<td></td>
</tr>
<tr>
<td>Malfunction</td>
<td></td>
</tr>
<tr>
<td>10 to 55 to 10 Hz, 0.75-mm single amplitude (Acceleration: 2.94 to 88.9 m/s²)</td>
<td></td>
</tr>
<tr>
<td>Shock resistance</td>
<td>Destruction</td>
</tr>
<tr>
<td>490 m/s²</td>
<td></td>
</tr>
<tr>
<td>Malfunction</td>
<td></td>
</tr>
<tr>
<td>100 m/s²</td>
<td></td>
</tr>
<tr>
<td>Mechanical endurance (See note 5.)</td>
<td>100,000 operations min.</td>
</tr>
<tr>
<td>Electrical endurance (resistive load) (See note 6 and 7.)</td>
<td>250 VDC, 25 A, 30,000 ops. min.</td>
</tr>
<tr>
<td>Short-time carry current</td>
<td>50 A (5 min), 40 A (10 min)</td>
</tr>
<tr>
<td>Maximum interruption current (See note 7.)</td>
<td>100 A at 250 VDC (5 times)</td>
</tr>
<tr>
<td>Overload interruption (See note 7.)</td>
<td>50 A at 250 VDC (50 times min.)</td>
</tr>
<tr>
<td>Ambient operating temperature</td>
<td>−40 to 70°C (with no icing or condensation)</td>
</tr>
<tr>
<td>Ambient operating humidity</td>
<td>5% to 85%</td>
</tr>
<tr>
<td>Weight (including accessories)</td>
<td>Approx. 135 g</td>
</tr>
</tbody>
</table>

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.
7. These values are for when a varistor is used as the protective circuit against reverse surge in the relay coil. Using a diode will reduce the switching characteristics.
# G9EB-1-B Switching/Current Conduction Models

## Maximum Switching Capacity

![Switching voltage vs current graph](image)

- **Switching voltage (V)** vs **Switching current (A)**
- **DC resistive load**

## Electrical Endurance (Switching Performance)

![Switching endurance graph](image)

- **Operations (x 10,000)** vs **Switching current (A)**

## Electrical Endurance ( Interruption Performance)

![Interruption endurance graph](image)

- **Operations** vs **Switching current (A)**

## Carry Current vs Energizing Time

![Carry current vs time graph](image)

- **Switching voltage (V)** vs **Carry current (A)**

## Must-operate Voltage and Must-release Voltage Distributions

![Voltage distribution graph](image)

- **Must-operate Voltage** and **Must-release Voltage**

## Time Characteristic Distributions

![Time characteristic graph](image)

- **Percentage of rated voltage (%)** vs **Time (ms)**
- **Number of contacts** vs **Release time**
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.

Characteristics were measured after applying shock 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.

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

Note: All units are in millimeters unless otherwise indicated.

Screw Terminal Type

G9EB-1-B

<table>
<thead>
<tr>
<th>Dimension (mm)</th>
<th>Tolerance (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 or lower</td>
<td>±0.3</td>
</tr>
<tr>
<td>10 to 50</td>
<td>±0.5</td>
</tr>
<tr>
<td>50 or higher</td>
<td>±1</td>
</tr>
</tbody>
</table>

Terminal Arrangement/ Internal Connections (TOP VIEW)

Mounting Hole Dimensions (TOP VIEW)

Two, M4 or 4.8-dia. holes
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, electrical 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 G9EB 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.

The coil’s power consumption can be reduced by using in combination with a semiconductor circuit. Consult your OMRON representative for details.

Recommended Wire Size

<table>
<thead>
<tr>
<th>Model</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>G9EA-1(-B)</td>
<td>14 to 22 mm²</td>
</tr>
<tr>
<td>G9EA-1(-B)-CA</td>
<td>22 to 38 mm²</td>
</tr>
<tr>
<td>G9EC-1(-B)</td>
<td>38 to 60 mm²</td>
</tr>
<tr>
<td>G9EB-1-B</td>
<td>2 to 5.5 mm²</td>
</tr>
</tbody>
</table>

Note: Use flexible leads.
ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.