

Automotive Relay Glossary

The meaning of terms used in this catalog are stated below.

1 Coil

● Coil Symbol

Coil drive types are displayed as below.

mono-stable	
Polarized	Non-polarized

● Rated Coil Voltage

A reference voltage applied to the coil when the relay is used under the normal operating conditions.

● Rated Coil Current

The current which flows through the coil when the rated voltage is applied at a temperature of 20°C. The tolerance is +15°C/-20°C unless otherwise specified.

● Coil Resistance

The resistance of the coil, measured at a temperature of 20°C. A tolerance of ±10% shall apply unless otherwise noted.

● Coil Power Consumption

The power dissipated by the coil when the rated voltage is applied to it. The coil power consumption is equal to the Rated Coil Voltage multiplied by the Rated Coil Current.

● Pull In Voltage (Must Operate Voltage)

The minimum coil voltage required to pull-in the relay contacts at a temperature of 20°C.

● Drop Out Voltage (Release Voltage)

The minimum coil voltage at which a relay's contacts will drop-out at a temperature of 20°C.

● Hot Start

The Minimum Operate Voltage when measured immediately following a pre-determined operating condition.

● Voltage Range

The region of safe operating potential applied to the coil.

● Maximum Continuous Coil Voltage

The voltage that can be continuously applied to the coil without exceeding the maximum temperature limits.

2 Contacts

● Contact Form

The contact mechanism of the relay. Classification of the relay contact configuration. The most common types in automotive applications are "A-Form" (SPST), "B-Form" (SPST) and "C-Form" (SPDT).

● Contact Symbol

The symbol for each contact mechanism is displayed as below.

	a-contact	b-contact	c-contact
Contact symbol in the catalog			
Contact symbol in the JIS			

Note: JIS contact symbol is used in "Glossary: Terms related to relays" and "Notice related to relays" except for special cases.

● Contact Rating

An expression of the voltage, current, or ambient temperature (or any combination thereof) that a relay's contacts may be exposed to while being expected to retain acceptable operating characteristics.

● Maximum Continuous Current Rating

The current that can be continuously carried through the contacts without exceeding the maximum temperature limits.

● Maximum Switching Power

The maximum wattage that can be switched without exceeding the design parameters of the relay. Care should be taken to not exceed this value. (VA is used in the case of AC. W is used in the case of DC.)

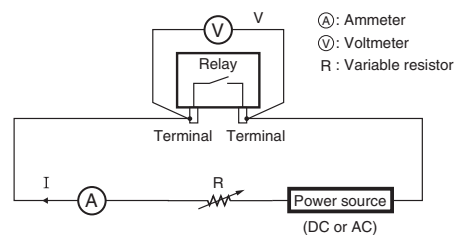
● Contact Resistance

The total electrical resistance of a pair of closed contacts measured at their associated contact terminals. The contact resistance values in this catalog are initial rated values; therefore they are not an indicator of pass or fail after actual use in the application circuitry. Contact resistance is determined by measuring the voltage drop across the contacts using the appropriate test current shown below.

$$\text{Contact Resistance} = \frac{V}{I} (\Omega) \left(\text{DC measurements are obtained by testing with alternating polarities and adopting the mean value.} \right)$$

Contact Resistance Test Current

Rated current or switched current (A)	Test current (mA)
0.1 or higher but less than 1	100
1 or higher	1,000



● Maximum Contact Voltage

The maximum value of contact voltage that the contact can withstand. Do not apply a voltage that exceeds the maximum contact voltage of the relay.

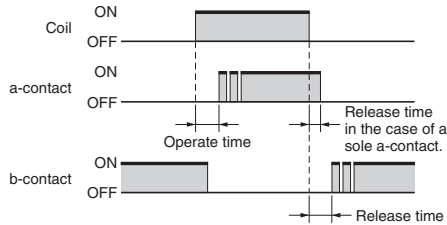
● Maximum Switching Current (contact)

The maximum value of the contact current that the contact can safely switch. Do not apply a current that exceeds the maximum contact switching rating of the relay (this includes inrush.)

3 Electrical Characteristics

● Operate Time

The time that elapses between the instant power is applied to a relay coil and the moment the contacts have closed. In case the relay has several contacts, the duration of the operate time shall be considered to end when the last contact has closed unless otherwise specified. Release time is always specified at 20°C unless otherwise noted. Operate bounce time is not included in the operate time of a relay.



● Release Time

For an SPDT relay, the release time is the time that elapses between the instant a relay coil is de-energized, and closure of the NC contacts. For an SPST relay, the release time concludes at the opening of the NO contacts. Release time is specified at 20°C unless otherwise noted. Release bounce time is not included in the release time of a relay.

● Bounce

Intermittent opening and closing of contacts caused by vibration or shock resulting from the collision of the relay's moving parts.

Operate Bounce Time

The time interval between the initial closure of the NO contact and when the bounce ceases.

Release Bounce Time

The time interval between the initial closure of the NC contact and when the bounce ceases.

● Insulation Resistance

The resistance between any two electrically conductive parts within the relay that are intended to be electrically isolated from each other.

Typical examples would include:

1. Between the coil and contact: Between the coil terminal and all contact terminals
2. Between contacts of a different polarity: Between contact terminals of a different polarity
3. Between contacts of the same polarity: Between contact terminals of the same polarity

● Dielectric Strength

The ability of electrically isolated parts within the relay to withstand high voltage applied across them without arcing. Typically, an acceptable leakage current is established at a particular voltage for a specified duration.

4 Mechanical Characteristics

● Vibration Resistance

Vibration resistance of a relay is characterized by two values:

Malfunction Durability, refers to the maximum vibration the relay can withstand without changing state (vibration doesn't cause closed contacts to open or open contacts to close).

Mechanical Durability, refers to the maximum vibration the relay can withstand without causing it to permanently change its operating characteristics.

● Shock Resistance

Shock Resistance of a relay is characterized by two values:

Malfunction Durability, refers to the maximum shock the relay can withstand without changing state (vibration doesn't cause closed contacts to open or open contacts to close.)

Mechanical Durability, refers to the maximum shock the relay can withstand without causing it to permanently change its operating characteristics.

5 Endurance (Lifetime)

● Mechanical Endurance (Lifetime)

The number of operations the relay can successfully complete without any electrical load.

● Electrical Endurance (Lifetime)

The number of operations the relay can successfully complete with the rated load applied. Electrical endurance is not indicative of relay performance for loads other than the rated load.

● Minimum Carry or Switching Current

The smallest acceptable value of carry or switching current that maintains reliable electrical performance of the contacts.

6 Ambient Temperature Range (When using, transporting and storing the relay)

The temperature limits under which the relay can predictably operate are indicated on the data sheet. However, any freezing condition is excluded.

This does not guaranteed to meet the values given on the data sheet for the entire operating temperature range.

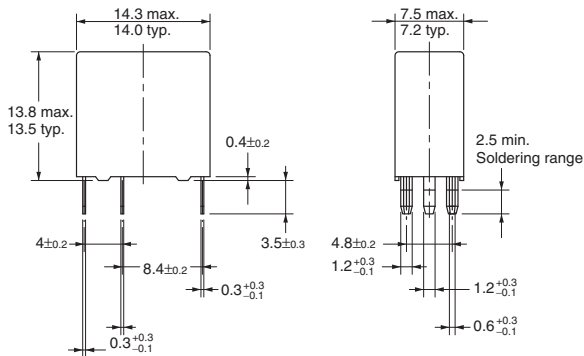
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7 Contour and Shape

● Contour Dimension

Relay for automotive PCB

For miniature relays, dimensions (either nominal or maximum) are provided to aid the customer in the design process.



Plug-in Relays

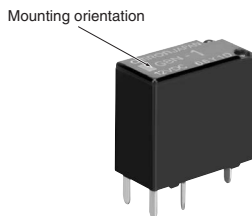
Maximum dimensions are shown as a reference for design.

● Marking

Various markings are used such as relay type, voltage rating, internal connection diagram, etc. Because of space restrictions on the surface of smaller relays, they may not display all of the information found on larger relays.

● Mounting Orientation Mark

The top of all Omron relays are marked to indicate the location of the relay coil. Knowing the terminal location aids in designing PCB patterns, and when spacing components. Also, the printing makes it easy to discern pin orientation when automatic or hand-mounting the relay.



● Terminal Layout/Internal Connection

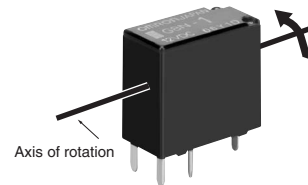
(1) Bottom View

When a relay's terminals can not be seen from top view (such as in the example below), the **BOTTOM VIEW** is shown in the catalog.



(2) Rotation direction to BOTTOM VIEW

The bottom view shown in the catalog or data sheet is rotated in the direction indicated by the arrow, with the coil always on the left.



	PCB processing dimension	Terminal layout/Internal connection
Symbol		
Example	<p>Directional mark</p> <p>(BOTTOM VIEW)</p>	<p>Directional mark</p> <p>(BOTTOM VIEW)</p>

Note: In a contour dimensional drawing, PCB process dimensional drawing or terminal layout/internal connection diagram, the directional mark is found on the left. JIS contact symbol is not inscribed to match with case marking.

Safety Precautions for All Automotive Relays

Precautions for Safe Use

● Notice to ensure safety

- This relay is intended for automotive use only. Do not subject it to any other use. Refer to the specification and confirm that the relay meets the application before using any relay from this catalog.
- Confirm acceptability for safety critical applications by appropriate testing or contact Omron.
- Do not use the relay for loads which exceed the rated values given in the data sheet. Failure to do so may result in unforeseen consequences such as insulation failure, smoking, breakdown of operation, etc.
- Do not apply over-voltage to the relay coil. Do not apply AC power to a DC relay coil. Be careful not to exceed the temperature ratings of the relay.
- Do not make incorrect connections to the relay terminals.
- Endurance (Lifetime) is significantly affected by changes to the load and switching condition. When using the relay, check the relay behavior with an actual product under actual conditions. Use the relay within timing characteristics it can meet according to the data sheet.
- Carry out the proper number of confirmation tests with an actual product for each application or contact Omron.
- A relay is a precision part. Do not apply vibration and shock beyond the specified value. Do not drop the relay. Do not use a relay that has been dropped.
- Do not remove the case of a relay or modify the terminals in any way.
- Do not touch the relay terminal or opposing mating terminal while applying current. Electric shock may occur.
- Do not use a relay under any environment that contains flammable or explosive gas. Fire or an explosion may result.

● When using a relay

- As with all technologies, relays may not always behave as expected. Therefore, evaluation under actual application conditions is always best.
- Each performance rating in this catalog is based on the value under controlled conditions (i.e. temperature, humidity, etc 86 to 106kPa) unless otherwise specified. Confirm not only load condition but also actual environmental conditions for actual use.
- Reference data in the catalog is based on measurement values from sampling of production. The values are as accurate as possible and believed to be correct at the time of publication. Due to production necessity or other reasons, specifications may change without notice.
- When a relay is used outside the recommended conditions, there is no way for Omron to predict the failure mode or results of the failure. Omron will remain blameless for the results of applying relays outside of the recommended parameters described in this catalog.