

# NAIS

## COMPACT BUT CUT OFF DC POWER CURRENT, POWER CAPSULE CONTACT RELAY.

# EV-RELAYS

### FEATURES

- **Small size & light weight:** size 1/4, weight 1/2 (compared to conventional contactors)

- **No arc space is required:** size including arc space 1/9 (compared to conventional contactors)

The arc is not exposed to the outside, therefore, no arc space is not required.

- **Safety construction**

The arc is not exposed, therefore, the contactor is explosion proof and intrinsically safe.

- **Quiet: operation noise 1/4 (compared to conventional contactors).**

Along with the above-mentioned miniaturization, the operation noise has been reduced to 70dB, and, in addition, the

operation noise remains unchanged when a current of 1000A or more is interrupted.

- **High contact reliability**

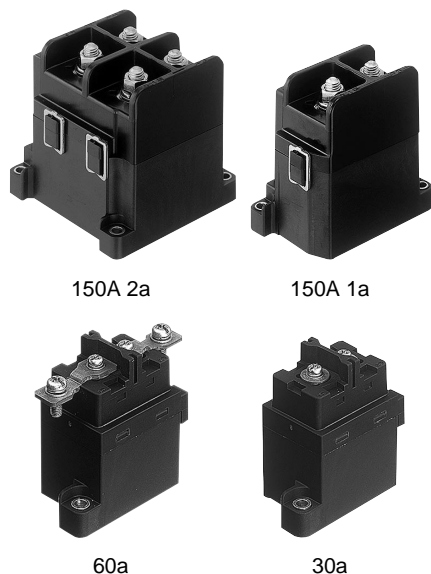
The contact part is hermetically sealed with H<sub>2</sub> mixed gas, hence the contact resistance remains stable regardless of the ambient conditions.

- **Mounting direction is not specified**

The weight of the movable parts is light, and also the restoring force is large, hence the contactor is relatively unaffected by gravity.

- **Line-up of indicator Type (150A Type only)**

A line-up of relays with indicator that can monitor the relay operation.



### SPECIFICATIONS

#### Contact

Type		150A type	60A type	30A type
Arrangement		1 Form A, 2 Form A	1 Form A	1 Form A
Rating	Nominal switching capacity (resistive load)	150A 400V DC	60A 400V DC	30A 400V DC
	Short term current	300A (10min) (40mm <sup>2</sup> )	120A (15min) (15mm <sup>2</sup> )	60A (5min) (5.5mm <sup>2</sup> )
	Max. cut-off current	2,500A 300V DC (3 cycles) <sup>#1</sup>	600A 300V DC (5 cycles)	—
	Overload opening/closing rating	600A 300V DC (25 cycles)	120A 400V DC (50 cycles)	120A 400V DC (50 cycles)
	Contact voltage drop (Max.)	0.1V (When current (is 150A per 1) contact set)	0.1V (When current (is 60A per 1) contact set)	0.2V (When current (is 30A per 1) contact set)
Nominal operating power		35W (Inrush, approx 0.1s) 5W (Stable)	Max. 5W	Max. 5W
Expected life (min. operations)	Mechanical	1 Form A: 10 <sup>5</sup> 2 Form A: 5 × 10 <sup>4</sup>	10 <sup>5</sup>	
	Electrical	150A 400V DC 10 <sup>3</sup> L/R ≤ 1ms	60A 400V DC 10 <sup>3</sup> L/R ≤ 1ms	30A 400V DC 3 × 10 <sup>4</sup> L/R ≤ 1ms

#### Characteristics

Initial insulation resistance		Min. 100 MΩ (at 500 V DC) <sup>*1</sup>
Initial breakdown voltage	Between open contacts	AC 2,500 Vrms for 1 min. <sup>*2</sup>
	Between contact and coil	AC 2,500 Vrms for 1 min. <sup>*2</sup>
Operate time (at 20°C) (at nominal voltage)		Max. 50ms <sup>*3</sup>
Reset time (without diode) (at 20°C) (at nominal voltage)		Max. 30ms <sup>*4</sup>
Shock resistance	Functional	Min. 196 m/s <sup>2</sup> {20 G} <sup>*5</sup>
	Destructive	Min. 490 m/s <sup>2</sup> {50 G} <sup>*6</sup>
Vibration resistance	Functional	43 m/s <sup>2</sup> {4.4 G} 10 to 200Hz <sup>*7</sup>
	Destructive	43 m/s <sup>2</sup> {4.4 G} 10 to 200 Hz <sup>*8</sup>
Conditions for operation, transport and storage (Not freezing and condensing at low temperature)		Ambient temperature
		Humidity
Unit weight		150 A 1 Form A: 660 g 21.16oz    150 A 2 Form A: 1,100 g 38.80oz 60 A: 330 g 11.64oz    30 A: 310 g 10.93oz

#### Remarks

\* Specifications will vary with foreign standards certification ratings.

<sup>\*1</sup> Measurement at same location as "Initial breakdown voltage" section.

<sup>\*2</sup> Detection current: 10mA.

<sup>\*3</sup> Nominal voltage applied to the coil, excluding bounce time.

<sup>\*4</sup> Nominal voltage applied to the coil.

<sup>\*5</sup> Half-wave pulse of sine wave: 11 ms; detection time: 10μs.

<sup>\*6</sup> Half-wave pulse of sine wave: 6 ms.

<sup>\*7</sup> Detection time: 10 μs.

<sup>\*8</sup> 3 directions, each 4 hours.

<sup>\*9</sup> Storage: Max. 85°C 185°F.

#### Notes:

Same specifications as the 12 V type.

<sup>#1</sup> Condition: Nominal switching 100cycles, each cut off 2,500A

**Indicator ratings**

Arrangement	1 Form A	1 Form B
Material	Gold-clad	
Rating (resistive load)	0.1 A 30 V DC	
Contact resistance	Max. 100 m MΩ	

**Note:**

Indicator type is only available for the 150 A type.

**TYPICAL APPLICATIONS**

- Electric Vehicle
- Hybrid Electric Vehicle

**ORDERING INFORMATION**

Ex. A EV 1 5 0 12

Product Name	Contact arrangement	Contact rating	Indicator contact arrangement	Coil voltage
EV	1: 1 Form A 2: 2 Form A	3: 30A 5: 150A 6: 60A	0: without indicator contact 1: a contact (150A type only) 3: b contact (150A type only)	12: 12V DC 24: 24V DC

**Packing quantity**

Types	Inner	Outer
150A 2 Form A	1pc.	5pcs.
150A 1 Form A	1pc.	10pcs.
60A 1 Form A	1pc.	20pcs.
30A 1 Form A	1pc.	20pcs.

**SPARE PARTS**

Installing parts	Part No.	Packing Quantity
M8 nut with washer for 150A type	AEV801	2pcs.
M5 screw for 60A type	AEV802	2pcs.
M4 screw for 30A type	AEV803	2pcs.
Bus bar for 60A type	AEV804	1pcs.

**TYPES AND COIL DATA (at 20°C 68°F)**

Part No.	Coil voltage, V DC	Pick-up voltage, V DC (max.)	Drop-out voltage, V DC (min.)	Nominal coil current, mA (±10%)	Operating power, W (12 V DC)	Max. allowable voltage, V DC			
AEV25012*	12 V DC	9 V DC	1 V DC	2.8 A (at peak)*	35W (Inrush, approx. 0.1S) 5W (Stable)	16 V DC			
AEV15012*				0.415 A	Max. 5W				
AEV16012									
AEV13012									
AEV25024*	24 V DC	18 V DC	2 V DC	1.9 A (at peak)*	35W (Inrush, approx. 0.1S) Max. 5W (1 Form A) Max. 6W (2 Form A)	32 V DC			
AEV15024*				2.2 A (at peak)*	Max. 5W				
AEV16024				0.208 A					
AEV13024									

**Note:**

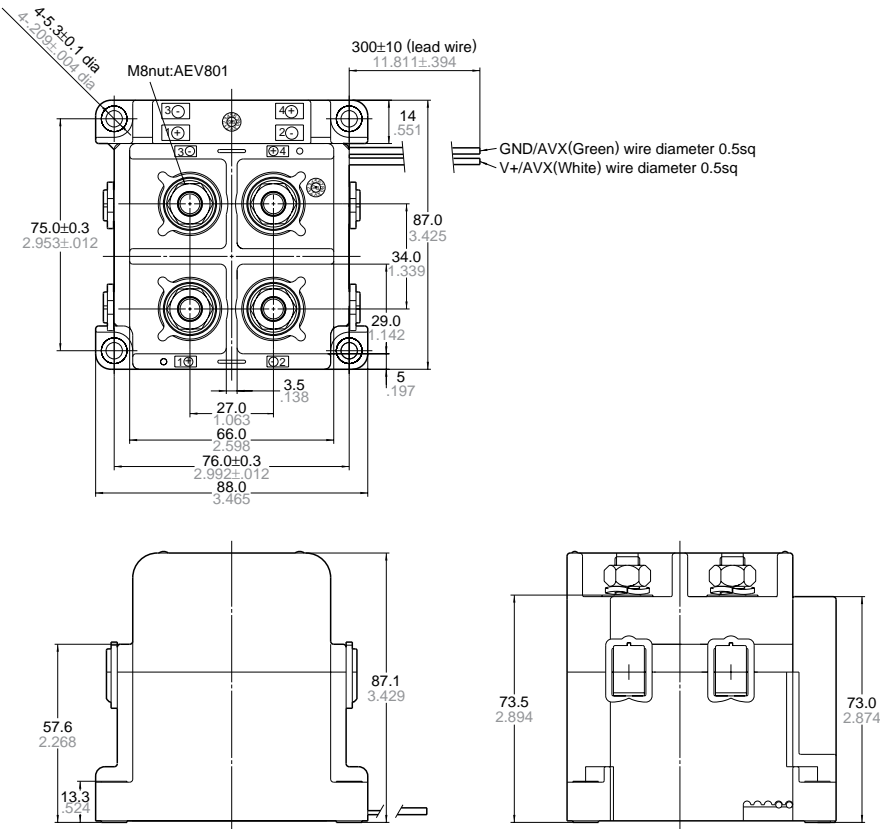
\* Same coil data as Indicator type.

EV

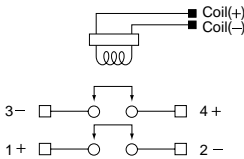
DIMENSIONS

mm inch

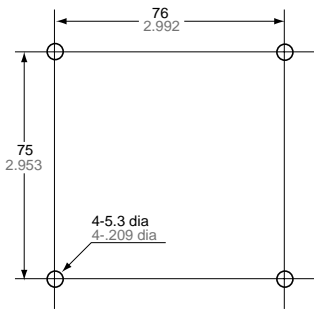
150A 2a



Schematic (TOP VIEW)

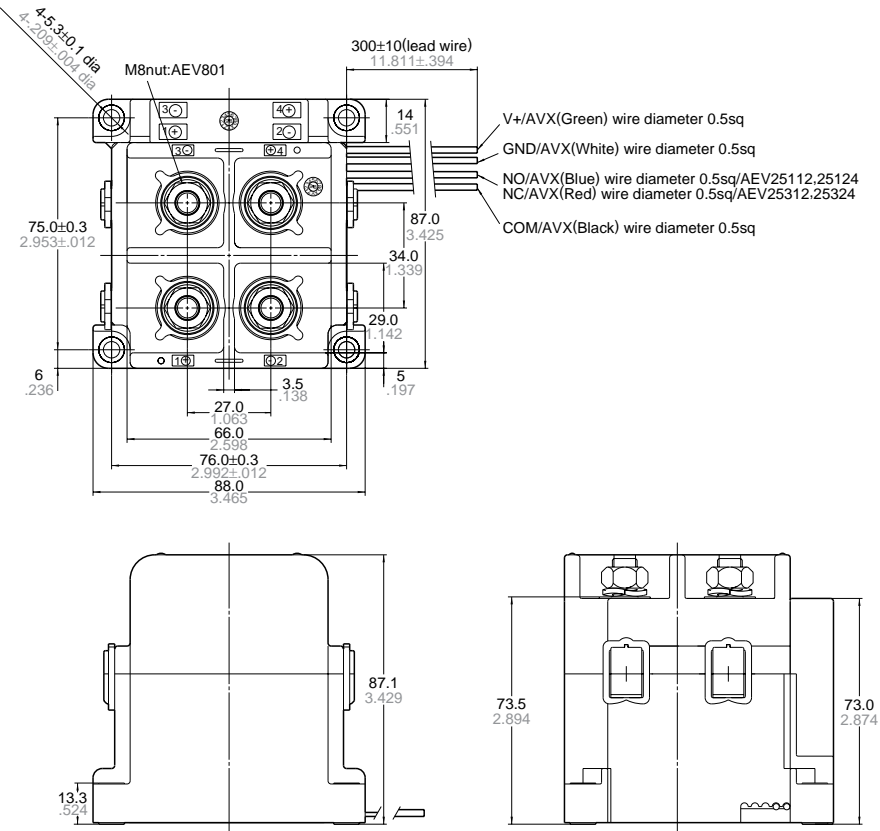


Mounting dimensions

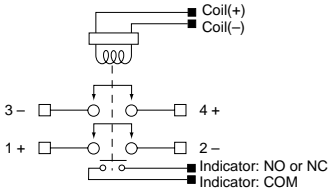


General tolerance:  
less than 10 (.394) ±0.3 (±.012)  
10 (.394) to 50 (1.969) ±0.6 (±.024)  
more than 50 (1.969) ±1.0 (±.039)

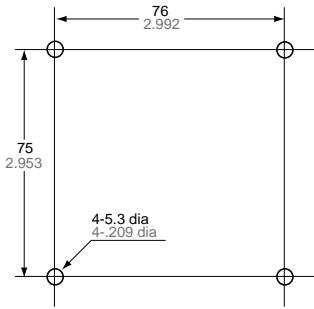
150A 2a Indicator Type



Schematic (TOP VIEW)

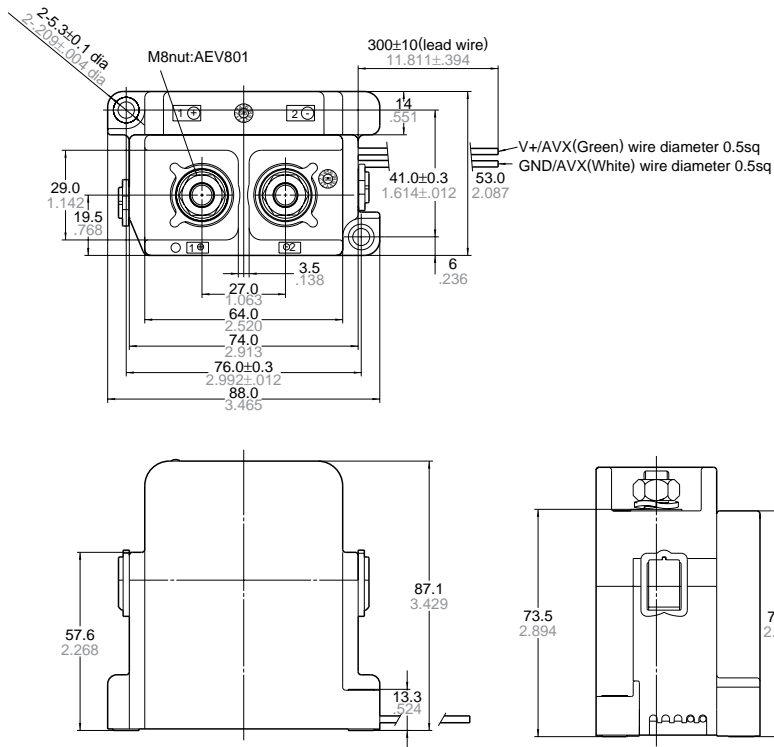


Mounting dimensions

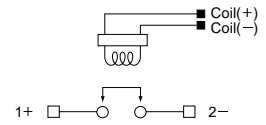


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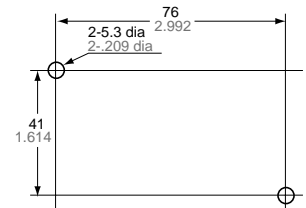
## 150A 1a



Schematic (TOP VIEW)

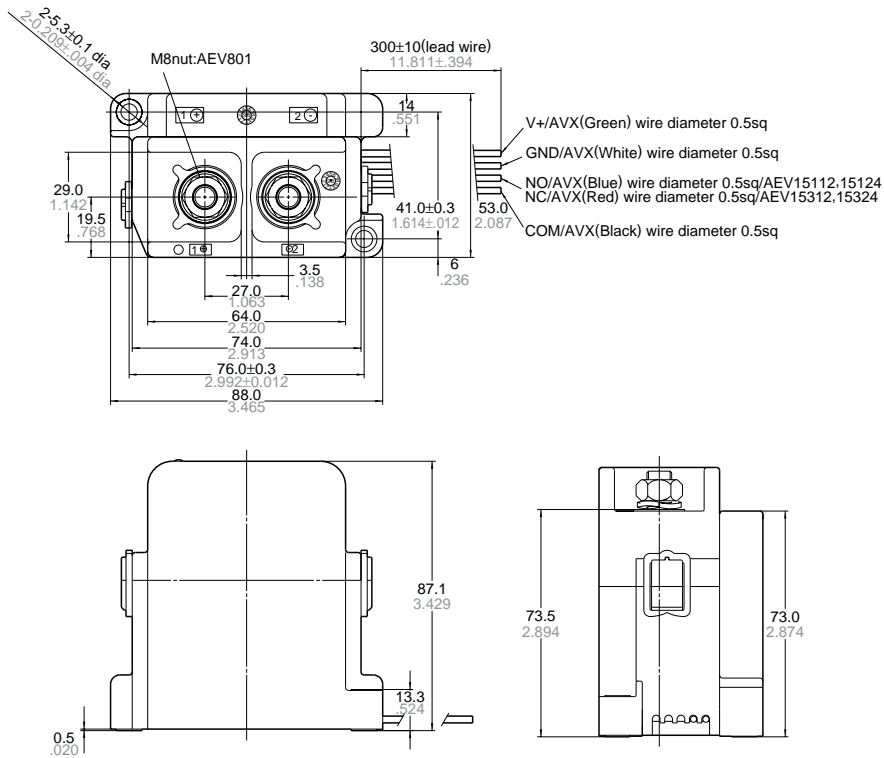


Mounting dimensions

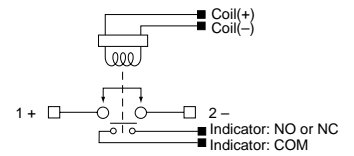
General tolerance:

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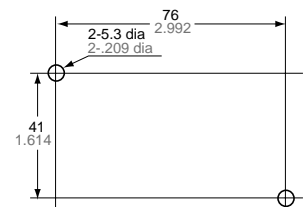
## 150A 1a Indicator Type



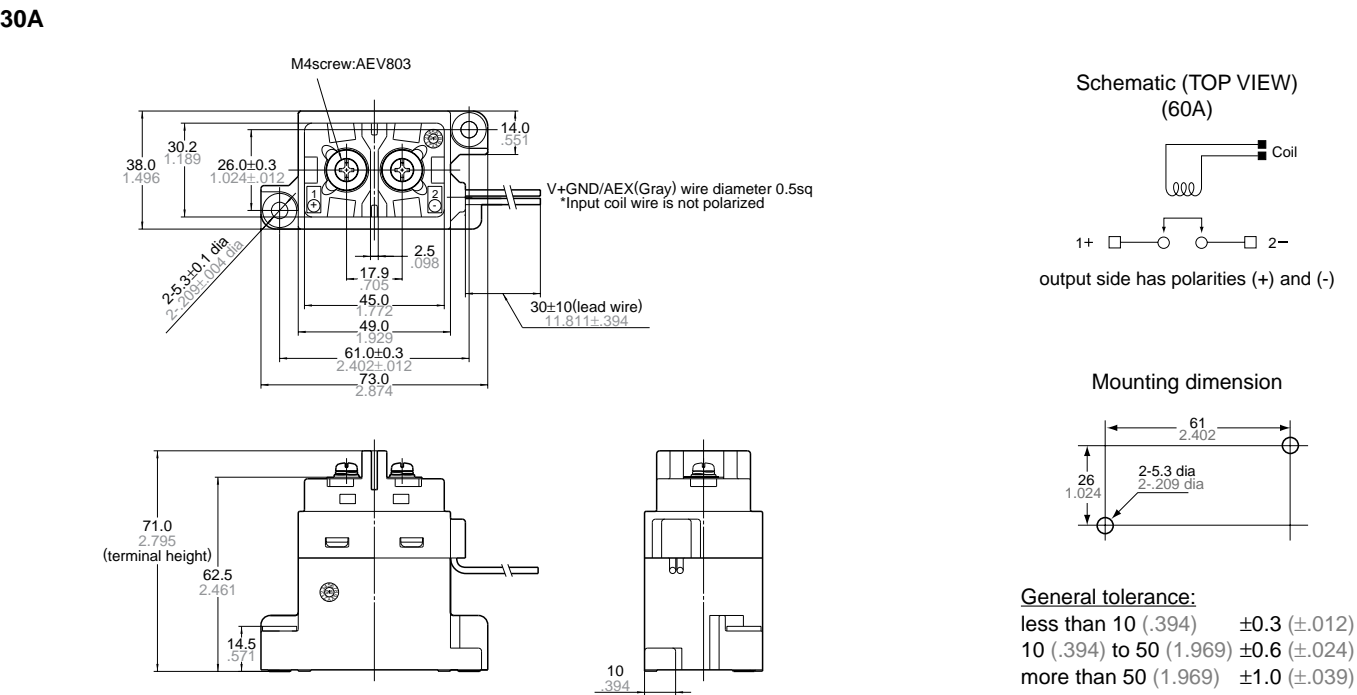
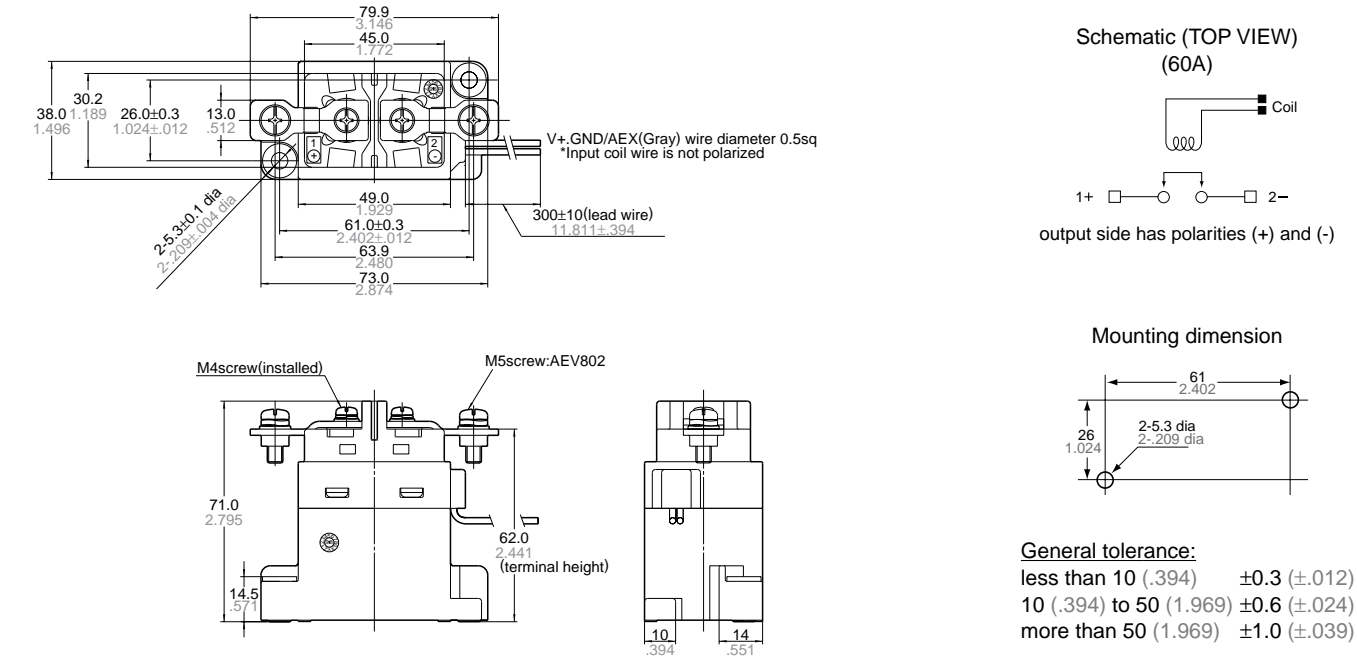
Schematic (TOP VIEW)



Mounting dimensions

General tolerance:

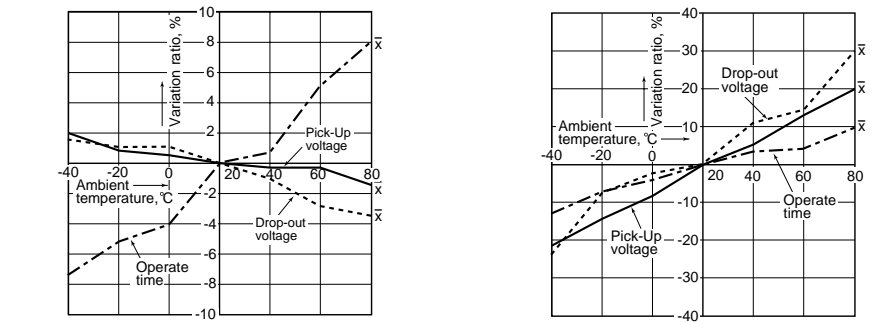
less than 10 (.394) ±0.3 (±.012)  
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 more than 50 (1.969) ±1.0 (±.039)



REFERENCE DATA

1-(1) Ambient temperature characteristics  
Sample: AEV15012,3pcs

1-(2) Ambient temperature characteristics  
Sample: AEV16012,3pcs



## NOTES

### 1. When installing the relay, always use washers to prevent loosening of the screws.

Tighten each of the screws within the rated ranges given below. Exceeding the maximum torque may result in breakage. Mounting is possible in either direction.

- M8 screw (for 150 A main terminal): 10 to 15 Nm
- M5 screw (150 A, 60 A, 30 A main unit mounting section)  
(60 A main terminal): 2.5 to 3.6 Nm
- M4 screw (30 A terminal): 1.8 to 2.7 Nm

### 2. The coils (150 A type) and contacts (30 A, 60 A, 150 A) of the relay are polarized, so follow the instructions in the connection schematic when connecting the coils and contacts.

Type 150 A has contains a reverse surge voltage absorption circuit; therefore a surge protector is not needed. We recommend installing a surge protector varistor (ZNR) for the 30 A and 60 A types. Avoid using a diode as this may result in decreased cut-off capability.

### 3. As a general rule, do not use a relay if it has been dropped.

### 4. Avoid mounting the relay in strong magnetic fields (near a transformer or magnet) or close to an object that radiates heat.

### 5. Electrical life

This relay is a high-voltage direct-current switch. In its final breakdown mode, it may lose the ability to provide the proper cut-off. Therefore, do not exceed the indicated switching capacity and life. (Please treat

the relay as a product with limited life and replace it when necessary.)

In the event that the relay loses cut-off ability, there is a possibility that burning may spread to surrounding parts, so configure the layout so that the power is turned off within one second.

When using the 30 A type, to prevent increases in the contact resistance, do not allow switching without any load.

### 6. Permeation life of internal gas

This relay uses a hermetically encased contact (capsule contact) with gas inside. The gas has a permeation life that is affected by the temperature inside the capsule contact (ambient temperature + temperature rise due to flow of electrical current). For this reason, make sure the ambient operating temperature is between  $-40$  and  $80^{\circ}\text{C}$   $-40$  and  $+176^{\circ}\text{F}$ , and the ambient storage temperature is between  $-40$  and  $85^{\circ}\text{C}$   $-40$  and  $+185^{\circ}\text{F}$ .

7. If the power is turned off and then immediately on after applying the rated voltage (current) continuously to the relay's coil and contact, the resistance of the coil will increase due to a rise in the coil temperature.

This causes the pick-up voltage to rise, and possibly exceed the rated pick-up voltage. In these circumstances, take measures such as reducing the load current, limiting the duration of current flow, and applying a coil voltage higher than the rated operating voltage (quick start).

8. Main contact ratings in the ratings apply to when there is a resistive load.

9. If you are using an inductive load (L load) such that  $L/R > 1$  ms, add surge protection in parallel with the inductive load. If this is not done, the electrical life will decrease and cut-off failure may occur.

10. When using the 150 A type, mount it as far away as possible from amateur wireless transmitters or devices that may generate large surges.

To prevent malfunctioning due to high emission levels, it may be necessary to take measures for E.M.I., such as adding a line noise filter or an electromagnetic shield.

11. Since coil current control is performed, a slight amount of superimposed line noise may be generated in the input line system. If this noise must be removed, install a line noise filter.

12. Be careful that foreign matter and oils and fats kind doesn't stick to the main terminal part because it is likely to cause a terminal part to give off unusual heat.

13. Avoid excessive load applied to the terminal in case of installing such as a bus bar etc., because it might give bad influence to the opening and closing performance.

- M8 screw terminal (150A main terminal part)

Terminal pulling up strength; Max.100N per terminal

The up-down rotation torque applied to the terminal; Max.15N·m