

### Automotive Relays

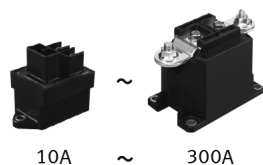
RoHS

## EV RELAYS (DC Contactors)

### High voltage DC, High capacity Cut-off Relays using Capsule Contact Mechanism

«Protective construction» Capsule contact

#### Normal types



10A ~ 300A

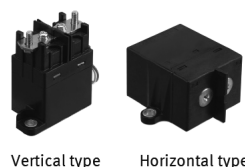
#### High short circuit capacity type



#### Compact high short-circuit capacity type



#### Quiet types



Vertical type Horizontal type

#### FEATURES

##### 1. Compact, lightweight and safety

To realize quick gap cutoff with high voltage DC, hydrogen gas, which has superior arc cooling capability, is sealed in the capsule contact chamber. At the same time, superior safety is achieved owing to an airtight construction that prevents arc leakage.

##### 2. High contact reliability

Since the contact portion is sealed in hydrogen gas, there is no contact oxidation. It is also dustproof and waterproof.

##### 3. Richly varied lineup

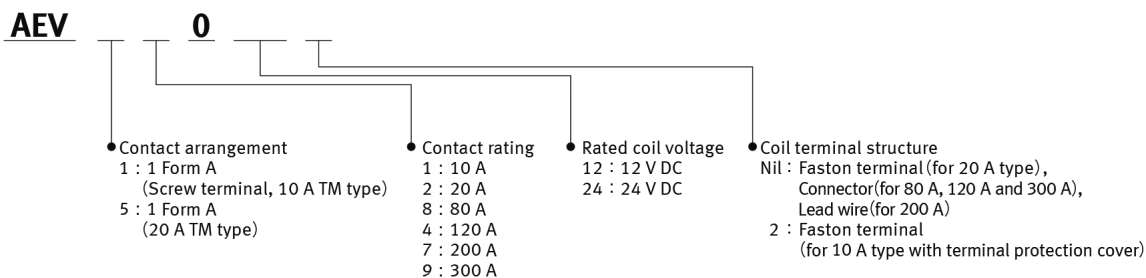
Types that are quiet in operation types and high short-circuit capacity types are also available. Moreover, the lineup includes plenty of all plug-in types, as well as high carrying current types.

#### APPLICATIONS

1. Electric vehicles (HEV, PHEV, BEV, and FCV)
2. Battery charge and discharge systems
3. High voltage DC applications such as hybrid construction equipment

### EV Relay [Normal type]

#### ORDERING INFORMATION (PART NO.)



Note : EV80A, EV120A, and EV200A have vertical type, EV120A has high short-circuit capacity type, and high carrying current type (135A, 200A) : please inquire our sales representative for more information.

#### TYPES

Contact rating	Rated coil voltage	Contact arrangement	Part No.	Standard packing	
				Carton	Outer carton
10 A	12 V DC	1 Form A	AEV110122	25 pieces	100 pieces
20 A			AEV52012	25 pieces	50 pieces
80 A			AEV18012	1 piece	20 pieces
120 A			AEV14012	1 piece	20 pieces
200 A			AEV17012	1 piece	10 pieces
300 A			AEV19012	1 piece	5 pieces
10 A	24 V DC	1 Form A	AEV110242	25 pieces	100 pieces
80 A			AEV18024	1 piece	20 pieces
120 A			AEV14024	1 piece	20 pieces
200 A			AEV17024	1 piece	10 pieces
300 A			AEV19024	1 piece	5 pieces

## RATING

## Coil data

Contact rating	Rated coil voltage	Operate (Set) voltage (at 20°C) (Initial)	Release (Reset) voltage (at 20°C) (Initial)	Rated operating current (±10%, at 20°C)	Coil resistance (±10%, at 20°C)	Rated operating power (at 20°C)	Max. allowable voltage <sup>*2</sup>
10 A	12 V DC	Max. 9 V DC	Min. 1 V DC	0.103 A	116 Ω	1.24 W	16 V DC
20 A <sup>*1</sup>			Min. 0.5 V DC	0.327 A	36.7 Ω	3.9 W	
80 A			Min. 1 V DC	0.353 A	34 Ω	4.2 W	
120 A			Min. 1 V DC	0.353 A	34 Ω	4.2 W	
200 A			Min. 1 V DC	0.5 A	24 Ω	6 W	
300 A			Min. 2 V DC	3.2 A (Inrush)	-	Inrush: 37.9 W <sup>*3</sup> Stable: 3.6 W	
10 A	24 V DC	Max. 18 V DC	Min. 2 V DC	0.052 A	464 Ω	1.24 W	32 V DC
80 A			Min. 2 V DC	0.176 A	136 Ω	4.2 W	
120 A			Min. 2 V DC	0.176 A	136 Ω	4.2 W	
200 A			Min. 2 V DC	0.25 A	96 Ω	6 W	
300 A			Min. 4 V DC	1.85 A (Inrush)	-	Inrush: 44.4 W <sup>*3</sup> Stable: 3.8 W	

\*1. Please inquire our sales representative for more information about EV20A with rated coil voltage of 24V DC.

\*2. Max. continuous applied voltage to the coil is the same as max. allowable voltage.

\*3. Approx. 0.1 sec.

## Specifications

## 10A Type/20A Type

Item			Specifications	
			10A Type	20A Type
Contact data	Contact arrangement		1 Form A	
	Contact material		Molybdenum	Copper alloy
	Rated switching capacity (resistive)		10 A 450 V DC	20 A 400 V DC
	Max. carrying current		10 A Continuity 15 A 2 min. 30 A 30 sec. (2 mm <sup>2</sup> wire)	20 A Continuity 40 A 10 min. 60 A 1 min. (3 mm <sup>2</sup> wire)
	Min. switching load (resistive)*1		1 A 12 V DC (at 20°C)	
	Contact voltage drop (initial)		Max. 0.5 V (by voltage drop 6 V DC 10 A)	Max. 0.2 V (by voltage drop 6 V DC 20 A)
Insulation resistance (initial)			Min. 100 MΩ (At 500 V DC, Measured portion is the same as the case of dielectric strength.)	
Dielectric strength (initial)	Between open contacts		2,500 Vrms for 1 min. (detection current: 10 mA)	
	Between contact and coil		2,500 Vrms for 1 min. (detection current: 10 mA)	
Time characteristics (initial)	Operate (Set) time		Max. 50 ms (at rated coil voltage at 20°C, without bounce)	
	Release (Reset) time		Max. 30 ms (at rated coil voltage at 20°C, without diode)	
Shock resistance	Functional		For ON: Min. 196 m/s <sup>2</sup> (half-sine shock pulse: 11 ms, detection time: 10 μs)	
			For OFF: Min. 196 m/s <sup>2</sup> (half-sine shock pulse: 11 ms, detection time: 10 μs)	For OFF: Min. 98 m/s <sup>2</sup> (half-sine shock pulse: 11 ms, detection time: 10 μs)
	Destructive		Min. 490 m/s <sup>2</sup> (half-sine shock pulse: 6 ms)	
Vibration resistance	Functional		10 to 200 Hz, 43 m/s <sup>2</sup> (detection time: 10 μs)	
	Destructive		10 to 200 Hz, 43 m/s <sup>2</sup> (Time of vibration for each direction; X, Y, Z direction: 4 hours)	
Expected life	Mechanical life		Min. 10 <sup>5</sup> (at 60 cpm)	Min. 2 × 10 <sup>5</sup> (at 60 cpm)
	Electrical life (resistive)*2		10 A 400 V DC, Min. 75,000 operations 10 A 450 V DC, Min. 30,000 operations	20 A 400 V DC, Min. 3,000 operations
	Switch off life *2 *3	Forward direction	30 A 450 V DC, Min. 50 operations	60 A 400 V DC, Min. 50 operations
		Reverse direction	-	-
	Inrush resistance current (capacitor)		30 A 400 V DC, Min. 50,000 operations 15 A 450 V DC, Min. 70,000 operations	40 A 400 V DC, Min. 75,000 operations
Conditions	Conditions for usage, transport and storage*4		Ambient temperature: -40 to +80°C (Storage: Max. +85°C) Humidity: 5 to 85% R.H. (Avoid icing when using at temperatures lower than 0°C.)	
Unit weight			Approx. 90 g	Approx. 180 g

Note: The coil voltage 12V DC type and 24V DC type have the same specifications.

\*1. This value can change due to the switching frequency, environmental conditions, and desired reliability level, therefore it is recommended to check this with the actual load.

\*2. The performance value applies when a varistor is connected in parallel to the coil. Please be warned that working life will be reduced when a diode is used.

\*3. at L/R ≤ 1 ms

\*4. The upper operation ambient temperature limit is the maximum temperature that can satisfy the coil temperature rise value. For details, please refer to the "Automotive Relay Users Guide".

**80A Type/120A Type/200A Type/300A Type**

Item			Specifications			
			80A Type	120A Type	200A Type	300A Type
Contact data	Contact arrangement		1 Form A			
	Contact material		Tungsten and copper alloys	Copper alloy		
	Rated switching capacity (resistive)		80 A 450 V DC	120 A 450 V DC	200 A 450 V DC	300 A 450 V DC
	Max. carrying current		80 A Continuity 120 A 15 min. 180 A 2 min. (15 mm² wire)	120 A Continuity 225 A 3 min. 400 A 30 sec. (38 mm² wire)	200 A Continuity 300 A 15 min. (60 mm² wire)	300 A Continuity 400 A 10 min. (100 mm² wire)
	Min. switching load (resistive)*¹		1 A 12 V DC (at 20°C)			1 A 24 V DC (at 20°C)
	Contact voltage drop (initial)		Max. 0.067 V (by voltage drop 6 V DC 20 A)	Max. 0.03 V (by voltage drop 6 V DC 20 A)	Max. 0.1 V (200 A carry current)	Max. 0.06 V (300 A carry current)
Insulation resistance (initial)			Min. 100 MΩ (At 500 V DC, Measured portion is the same as the case of dielectric strength.)			
Dielectric strength (initial)	Between open contacts		2,500 Vrms for 1 min. (detection current: 10 mA)			
	Between contact and coil		2,500 Vrms for 1 min. (detection current: 10 mA)			
Time characteristics (initial)	Operate (Set) time		Max. 50 ms (at rated coil voltage at 20°C, without bounce)			Max. 30 ms (at 20°C, without bounce)
	Release (Reset) time		Max. 30 ms (at rated coil voltage at 20°C, without diode)			Max. 10 ms (at 20°C)
Shock resistance	Functional		For ON: Min. 196 m/s² (half-sine shock pulse: 11 ms, detection time: 10 μs) For OFF: Min. 98 m/s² (half-sine shock pulse: 11 ms, detection time: 10 μs)			
	Destructive		Min. 490 m/s² (half-sine shock pulse: 6 ms)			
Vibration resistance	Functional		80 A, 120 A, 200 A Type: 10 to 200 Hz, 43 m/s² (detection time: 10 μs) 300 A Type: 10 to 200 Hz, 44.1 m/s² (detection time: 10 μs)			
	Destructive		80 A, 120 A, 200 A Type: 10 to 200 Hz, 43 m/s² (Time of vibration for each direction; X, Y, Z direction: 4 hours) 300 A Type: 10 to 200 Hz, 44.1 m/s² (Time of vibration for each direction; X, Y, Z direction: 4 hours)			
Expected life	Mechanical life		Min. 2 × 10⁵ (at 60 cpm)			
	Electrical life (resistive)*²		80 A 450 V DC, Min. 1,000 operations	30 A 450 V DC, Min. 1,000 operations	200 A 450 V DC, Min. 3,000 operations	300 A 450 V DC, Min. 1,000 operations
	Switch off life *² *³	Forward direction	800 A 300 V DC, Min. 1 operation 120 A 450 V DC, Min. 50 operations	1,200 A 300 V DC, Min. 1 operation 120 A 450 V DC, Min. 50 operations	2,000 A 350 V DC, Min. 1 operation 400 A 450 V DC, Min. 50 operations	2,500 A 300 V DC, Min. 3 operations*⁴ 600 A 450 V DC, Min. 50 operations
		Reverse direction	-120 A 200 V DC, Min. 50 operations	-120 A 200 V DC, Min. 50 operations	-200 A 200 V DC, Min. 1,000 operations	-300 A 200 V DC, Min. 100 operations
	Inrush resistance current (capacitor)		150 A 20 V DC, Min. 70,000 operations	120 A 20 V DC, Min. 70,000 operations	140 A 20 V DC, Min. 70,000 operations	240 A 20 V DC, Min. 70,000 operations
Conditions	Conditions for usage, transport and storage*⁵		Ambient temperature: -40 to +80°C Humidity: 5 to 85% R.H. (Avoid icing when using at temperatures lower than 0°C.)		Ambient temperature: -40 to +85°C Humidity: 5 to 85% R.H.(Avoid icing when using at temperatures lower than 0°C.)	
Unit weight			Approx. 400 g		Approx. 600 g	Approx. 750 g

Note: The coil voltage 12 V DC type and 24 V DC type have the same specifications.

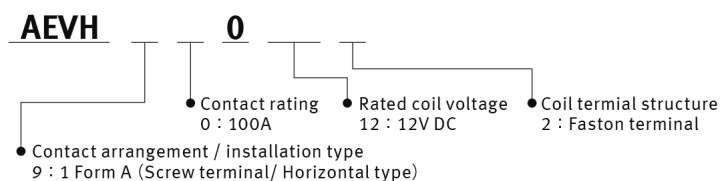
\*1.This value can change due to the switching frequency, environmental conditions, and desired reliability level, therefore it is recommended to check this with the actual load.

\*2.The performance value applies when a varistor is connected in parallel to the coil. Please be warned that working life will be reduced when a diode is used.

\*3.at L/R ≤ 1ms

\*4.Condition: Nominal switching 10 cycles, each switch-off 2,500 A.

\*5.The upper operation ambient temperature limit is the maximum temperature that can satisfy the coil temperature rise value. For details, please refer to the "Automotive Relay Users Guide".

**EV Relay [High short-circuit capacity type]****ORDERING INFORMATION (PART NO.)****TYPES**

Contact rating	Rated coil voltage	Contact arrangement	Part No.	Standard packing
100 A	12 V DC	1 Form A	AEVH900122	20 pieces (Carton 20 pieces / 1 tray)

RATING

Coil data

Contact rating	Rated coil voltage	Operate (Set) voltage (at 20°C) (Initial)	Release (Reset) voltage (at 20°C) (Initial)	Rated operating current (±10%, at 20°C)	Coil resistance (±10%, at 20°C)	Rated operating power (at 20°C)	Max. allowable voltage*1
100 A	12 V DC	Max. 9 V DC	Min. 0.5 V DC	0.453 A	26.5 Ω	5.4 W	16 V DC

\*1. When continually powered, the applied voltage is 14 V DC.

Specifications

Item	Specifications
Contact data	Contact arrangement
	Contact material
	Rated switching capacity (resistive)
	Max. carrying current
	Min. switching load (resistive)*1
	Contact voltage drop (initial)
	Short circuit capacity
Insulation resistance (initial)	
Dielectric strength (initial)	Between open contacts
	Between contact and coil
Time characteristics (initial)	Operate (Set) time
	Release (Reset) time
Shock resistance	Functional
	Destructive
Vibration resistance	Functional
	Destructive
Expected life	Mechanical life
	Switch off life *2 *3
	Inrush resistance current (capacitor)
Conditions	Conditions for usage, transport and storage*4
Unit weight	

\*1. This value can change due to the switching frequency, environmental conditions, and desired reliability level, therefore it is recommended to check this with the actual load.

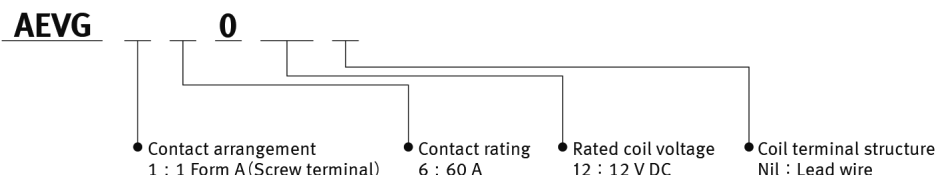
\*2. The performance value applies when a varistor is connected in parallel to the coil. Please be warned that working life will be reduced when a diode is used.

\*3. at L/R ≤ 1 ms

\*4. The upper operation ambient temperature limit is the maximum temperature that can satisfy the coil temperature rise value. For details, please refer to the "Automotive Relay Users Guide".

## EV Relay [Compact high short-circuit capacity type]

ORDERING INFORMATION (PART NO.)



Note : There are also all plug-in types : please inquire our sales representative for more information.

TYPES

Contact rating	Rated coil voltage	Contact arrangement	Part No.	Standard packing
60 A	12 V DC	1 Form A	AEVG16012	40 pieces (Carton 40 pieces / 1 tray)

## RATING

## Coil data

Contact rating	Rated coil voltage	Operate (Set) voltage (at 20°C) (Initial)	Release (Reset) voltage (at 20°C) (Initial)	Rated operating current (±10%, at 20°C)	Coil resistance (±10%, at 20°C)	Rated operating power (at 20°C)	Max. allowable voltage*1
60 A	12 V DC	Max. 9 V DC	Min. 0.5 V DC	0.429 A	28 Ω	5.2 W	16 V DC

\*1. When continually powered, the applied voltage is 14 V DC.

## Specifications

Item	Specifications
Contact data	Contact arrangement
	Contact material
	Rated switching capacity (resistive)
	Max. carrying current
	Min. switching load (resistive)*1
	Contact voltage drop (initial)
	Short circuit capacity
Insulation resistance (initial)	
Dielectric strength (initial)	Between open contacts
	Between contact and coil
Time characteristics (initial)	Operate (Set) time
	Release (Reset) time
Shock resistance	Functional
	Destructive
Vibration resistance	Functional
	Destructive
Expected life	Mechanical life
	Switch off life*2 *3
	Inrush resistance current (capacitor)
Conditions	Conditions for usage, transport and storage*4
Unit weight	

\*1. This value can change due to the switching frequency, environmental conditions, and desired reliability level, therefore it is recommended to check this with the actual load.

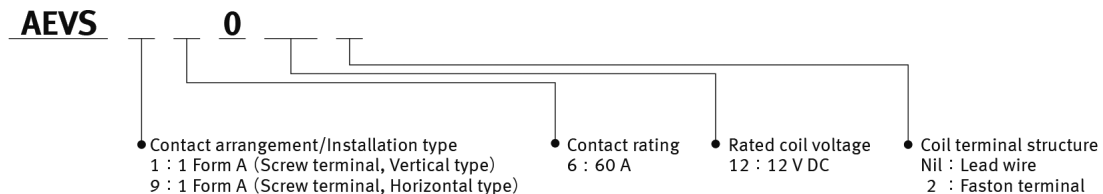
\*2. The performance value applies when a varistor is connected in parallel to the coil. Please be warned that working life will be reduced when a diode is used.

\*3. at  $L/R \leq 1\text{ ms}$

\*4. The upper operation ambient temperature limit is the maximum temperature that can satisfy the coil temperature rise value. For details, please refer to the "Automotive Relay Users Guide".

## EV Relay [Quiet type]

## ORDERING INFORMATION (PART NO.)



Note : There are also all plug-in types and 150A carry current type : please inquire our sales representative for more information.

## TYPES

Contact rating	Rated coil voltage	Contact arrangement	Installation type	Part No.	Standard packing	
					Carton	Outer carton
60 A	12 V DC	1 Form A	Vertical type	AEVS16012	1 piece	20 pieces
			Horizontal type	AEVS960122		

## Automotive Relays EV RELAYS (DC Contactors)

### RATING

### Coil data

Contact rating	Rated coil voltage	Operate (Set) voltage (at 20°C) (Initial)	Release (Reset) voltage (at 20°C) (Initial)	Rated operating current (±10%, at 20°C)	Coil resistance (±10%, at 20°C)	Rated operating power (at 20°C)	Max. allowable voltage*1
60 A	12 V DC	Max. 9 V DC	Min. 1 V DC	0.375 A	32 Ω	4.5 W	16 V DC

\*1. When continually powered, the applied voltage is 14 V DC (at 65°C).

### Specifications

Item		Specifications	
		Vertical Type	Horizontal Type
Contact data	Contact arrangement	1 Form A	
	Contact material	Tungsten and copper alloys	
	Rated switching capacity (resistive)	60 A 450 V DC	
	Max. carrying current	60 A Continuity, 100 A 10 min., 180 A 1 min. (15 mm <sup>2</sup> wire)	
	Min. switching load (resistive)*1	1 A 12 V DC (at 20°C)	
	Contact voltage drop (initial)	Max. 0.067 V (by voltage drop 6 V DC 20 A)	
Insulation resistance (initial)		Min. 100 MΩ (At 500 V DC, Measured portion is the same as the case of dielectric strength.)	
Dielectric strength (initial)	Between open contacts	2,500 Vrms for 1 min. (detection current: 10 mA)	2,000 Vrms for 1 min. (detection current: 10 mA)
	Between contact and coil	2,500 Vrms for 1 min. (detection current: 10 mA)	2,000 Vrms for 1 min. (detection current: 10 mA)
Time characteristics (initial)	Operate (Set) time	Max. 50 ms (at rated coil voltage at 20°C, without bounce)	
	Release (Reset) time	Max. 50 ms (at rated coil voltage at 20°C, without diode)	
Shock resistance	Functional	For ON: Min. 196 m/s <sup>2</sup> (half-sine shock pulse: 11 ms, detection time: 10 μs) For OFF: Min. 98 m/s <sup>2</sup> (half-sine shock pulse: 11 ms, detection time: 10 μs)	
	Destructive	Min. 490 m/s <sup>2</sup> (half-sine shock pulse: 6 ms)	
Vibration resistance	Functional	10 to 100 Hz, 43 m/s <sup>2</sup> 100 to 200 Hz, 19.6 m/s <sup>2</sup> (detection time: 10 μs)	
	Destructive	10 to 100 Hz, 43 m/s <sup>2</sup> 100 to 200 Hz, 19.6 m/s <sup>2</sup> (Time of vibration for each direction; X, Y, Z direction: 4 hours)	
Expected life	Mechanical life		Min. 2 × 10 <sup>5</sup> (at 60 cpm)
	Electrical life (resistive)*2		60 A 450 V DC, Min. 800 operations
	Switch off life *2 *3	Forward direction	600 A 300 V DC, Min. 5 operations 120 A 450 V DC, Min. 50 operations
		Reverse direction	-120 A 200 V DC, Min. 50 operations
	Inrush resistance current (capacitor)		60 A 20 V DC, Min. 70,000 operations
Conditions	Conditions for usage*4		Ambient temperature: -40 to +80°C (When continuous steady current at 14 V DC: -40 to +65°C) Humidity: 5 to 85% R.H. (Avoid icing when using at temperatures lower than 0°C.)
	Conditions for transport and storage		Ambient temperature : -40 to +80°C Humidity : 5 to 85% R.H. (Avoid icing when using at temperatures lower than 0°C.)
Unit weight		Approx. 250 g	Approx. 240 g

\*1. This value can change due to the switching frequency, environmental conditions, and desired reliability level, therefore it is recommended to check this with the actual load.

\*2. The performance value applies when a varistor is connected in parallel to the coil. Please be warned that working life will be reduced when a diode is used.

\*3. at L/R ≤ 1 ms

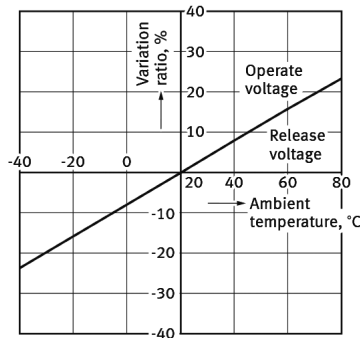
\*4. The upper operation ambient temperature limit is the maximum temperature that can satisfy the coil temperature rise value. For details, please refer to the "Automotive Relay Users Guide".

# EV Relay [Normal type]

## REFERENCE DATA

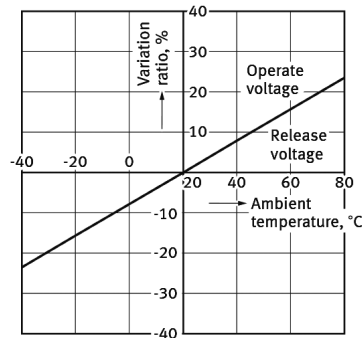
1-1. Ambient temperature characteristics (10A Type)

Sample : AEV110122, 3 pcs.



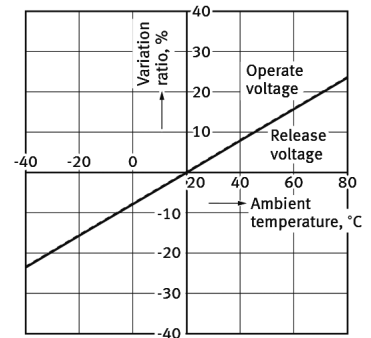
1-2. Ambient temperature characteristics (20A Type)

Sample : AEV52012, 3 pcs.



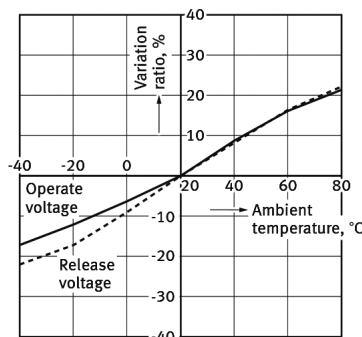
1-3. Ambient temperature characteristics (80A Type)

Sample : AEV18012, 3 pcs.



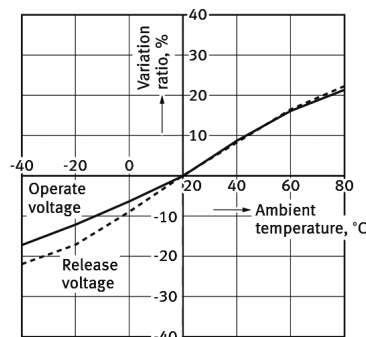
1-4. Ambient temperature characteristics (120A Type)

Sample : AEV14012, 3 pcs.



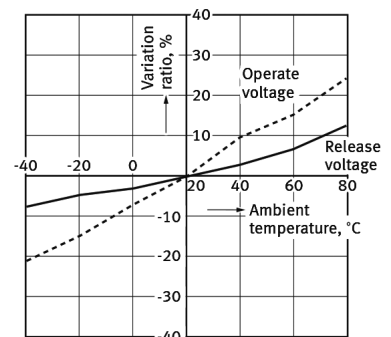
1-5. Ambient temperature characteristics (200A Type)

Sample : AEV17012, 3 pcs.

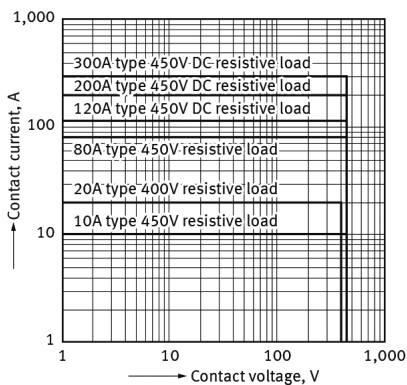


1-6. Ambient temperature characteristics (300A Type)

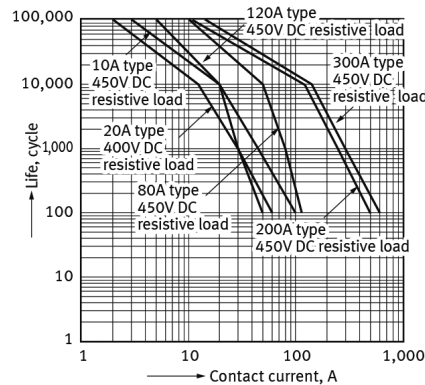
Sample : AEV19012, 3 pcs.



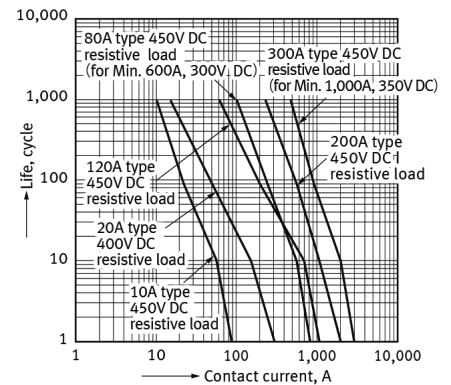
2. Max. switching capacity



3. Switching life curve (Forward direction)

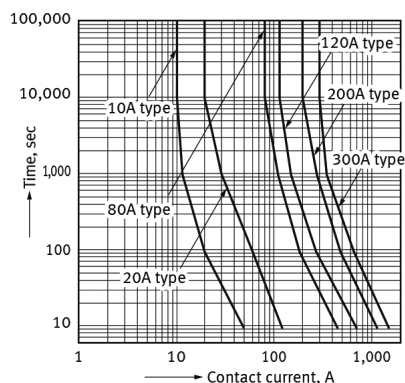


4. Switching and cut-off life curve (Forward direction)



5. Carrying performance life curve (80°C)

Note : For 200 A and 300 A, at 85°C



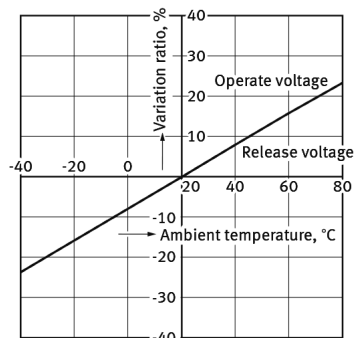


## EV Relay [High short-circuit capacity type]

### REFERENCE DATA

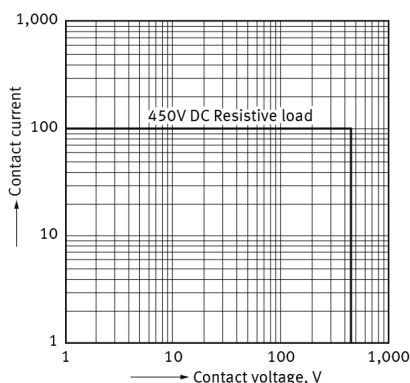
1. Ambient temperature characteristics

Sample: AEVH900122, 3 pcs.



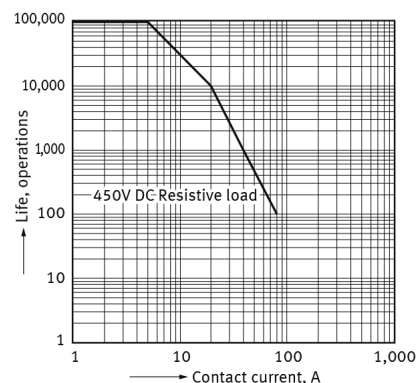
2. Max. switching capacity

Sample: AEVH900122, 3 pcs.



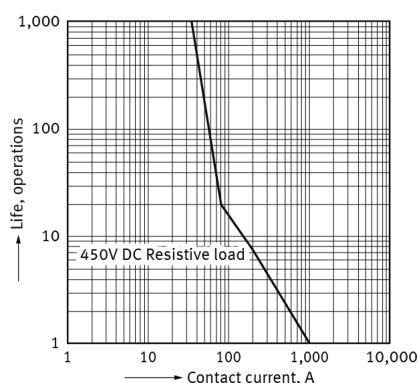
3. Switching life curve

Sample: AEVH900122, 3 pcs.



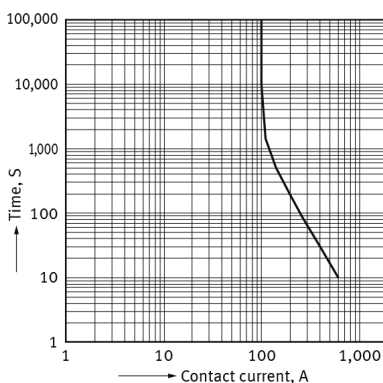
4. Switching and cut-off life curve

Sample: AEVH900122, 3 pcs.



5. Carrying performance life curve (80°C)

Sample: AEVH900122, 3 pcs.

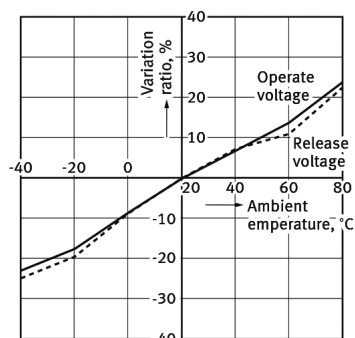


## EV Relay [Compact high short-circuit capacity type]

### REFERENCE DATA

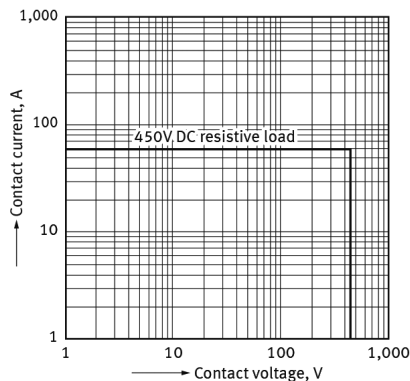
1. Ambient temperature characteristics

Sample: AEVG16012, 3 pcs.



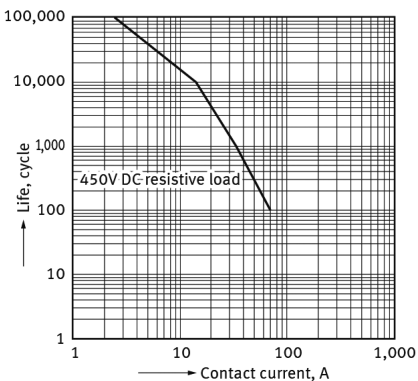
2. Max. switching capacity

Sample: AEVG16012, 3 pcs.



3. Switching life curve (Forward direction)

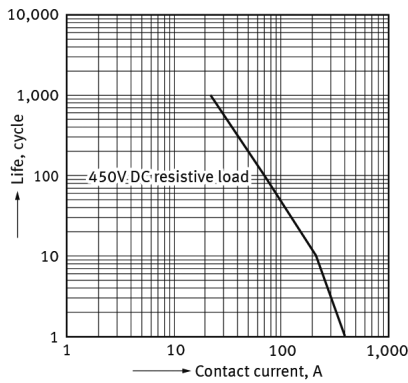
Sample: AEVG16012, 3 pcs.



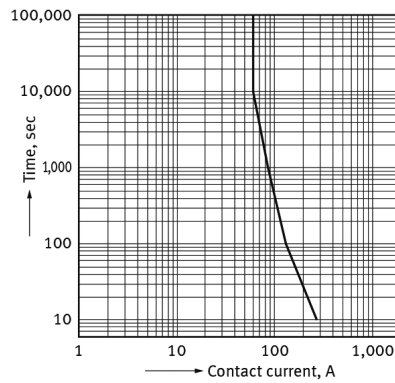


4.Switching and cut-off life curve (Forward direction) 5.Carrying performance life curve (80°C)

Sample : AEVG16012, 3 pcs.



Sample : AEVG16012, 3 pcs.

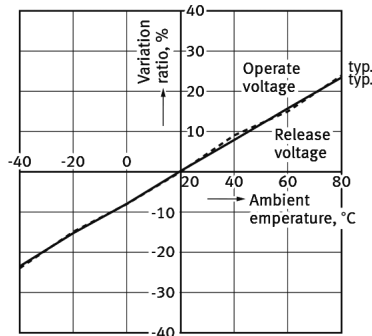


## EV Relay [Quiet type]

### REFERENCE DATA

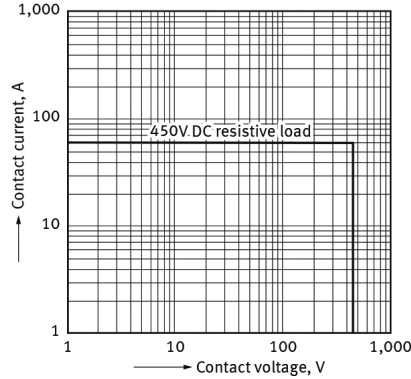
1.Ambient temperature characteristics

Sample : AEVS16012, 3 pcs.



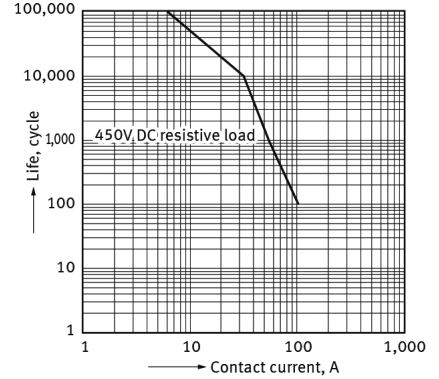
2.Max. switching capacity

Sample : AEVS16012, 3 pcs.



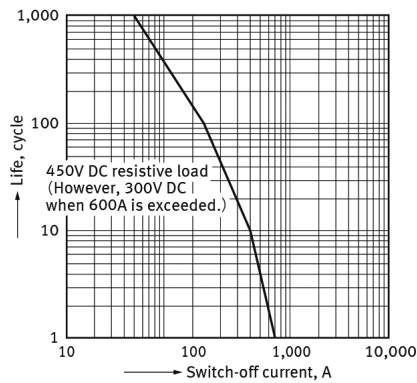
3.Switching life curve (Forward direction)

Sample : AEVS16012, 3 pcs.

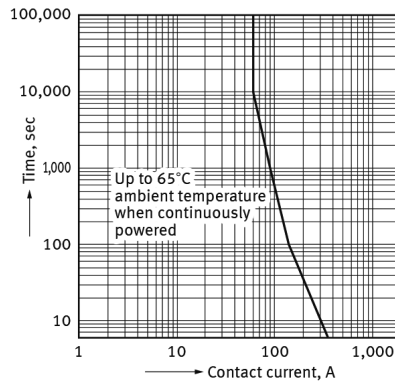


4.Switching and cut-off life curve (Forward direction) 5.Carrying performance life curve (80°C)

Sample : AEVS16012, 3 pcs.

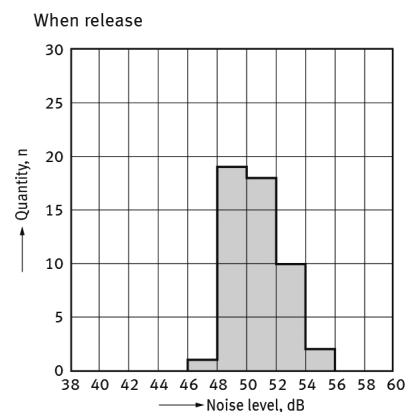
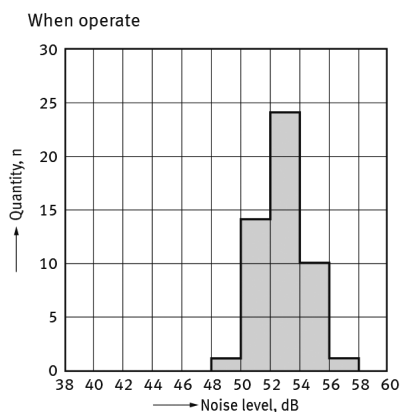
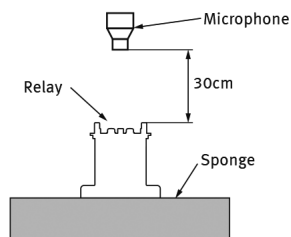


Sample : AEVS16012, 3 pcs.



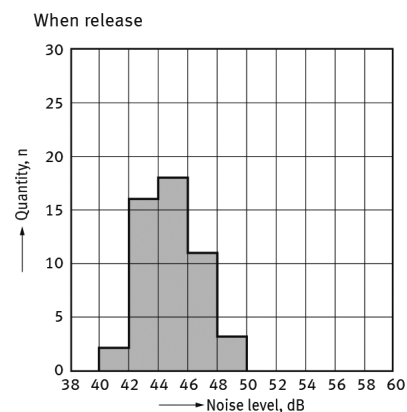
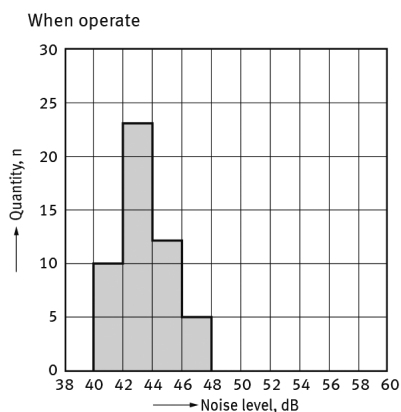
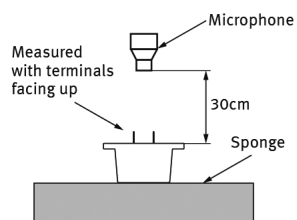
## 6-1.Distribution of operation noise (vertical type)

Measuring conditions  
 Sample : AEVS16012, 50pcs  
 Equipment setting : "A" weighted, Fast, Max. hold  
 Coil voltage : 12V DC  
 Coil connection device : 18V zener diode  
 Background noise : approx. 20dB



## 6-2.Distribution of operation noise (horizontal type)

Measuring conditions  
 Sample : AEVS960122, 50pcs  
 Equipment setting : "A" weighted, Fast, Max. hold  
 Coil voltage : 12V DC  
 Coil connection device : 18V zener diode  
 Background noise : approx. 20dB



## EV Relay [Normal type]

### DIMENSIONS

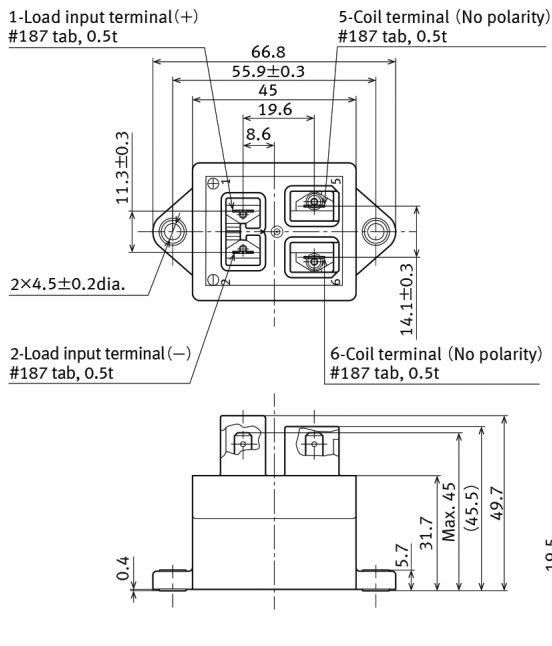
**CAD** The CAD data of the products with a "CAD" mark can be downloaded from our Website.

Unit: mm

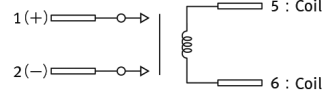
#### 10A

##### CAD

#### External dimensions

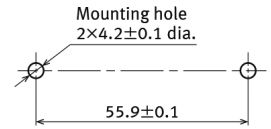


#### Schematic (TOP VIEW)



Load side has polarities (+) and (-).

#### Mounting dimensions

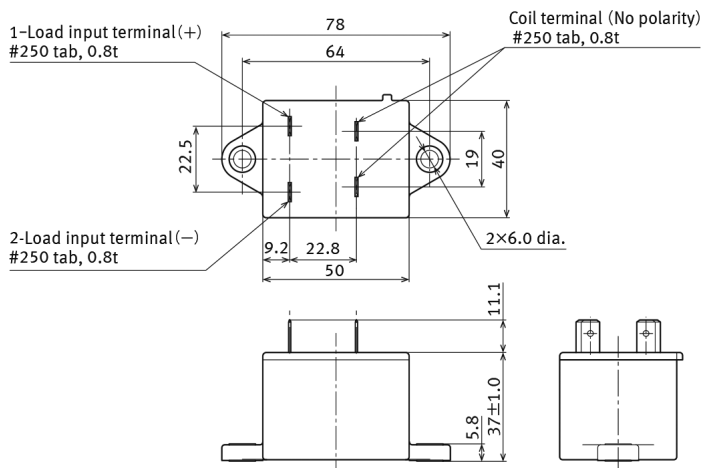


Tolerance  
 Less than 10mm : ±0.3  
 10 to 50mm : ±0.6  
 More than 50mm : ±1.0

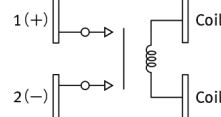
#### 20A

##### CAD

#### External dimensions

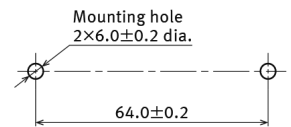


#### Schematic (TOP VIEW)



Load side has polarities (+) and (-).

#### Mounting dimensions

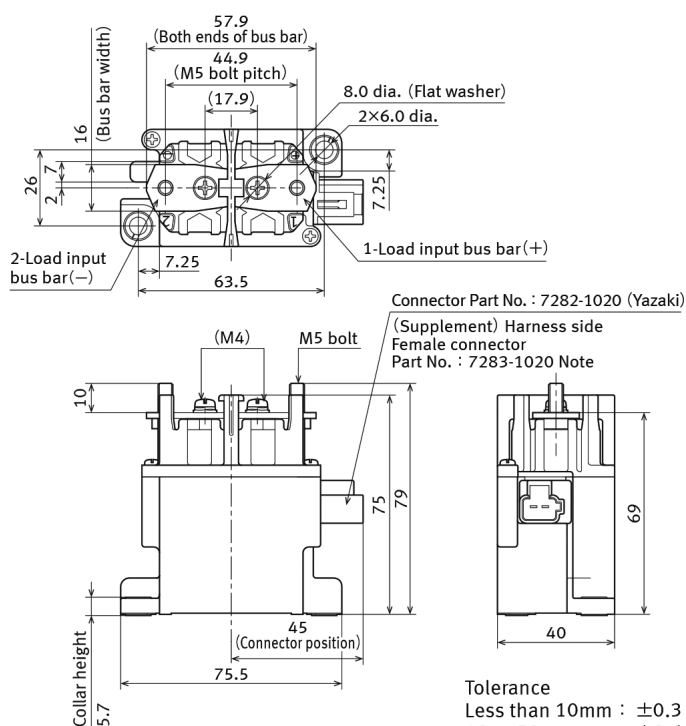


Tolerance  
 Less than 10mm : ±0.3  
 10 to 50mm : ±0.6  
 More than 50mm : ±1.0

80A

CAD

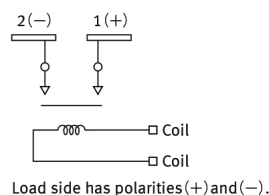
External dimensions



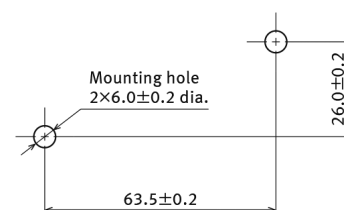
Tolerance  
Less than 10mm :  $\pm 0.3$   
10 to 50mm :  $\pm 0.6$   
More than 50mm :  $\pm 1.0$

Note : Separate connection of the terminal and lead wire is required.

Schematic  
(TOP VIEW)



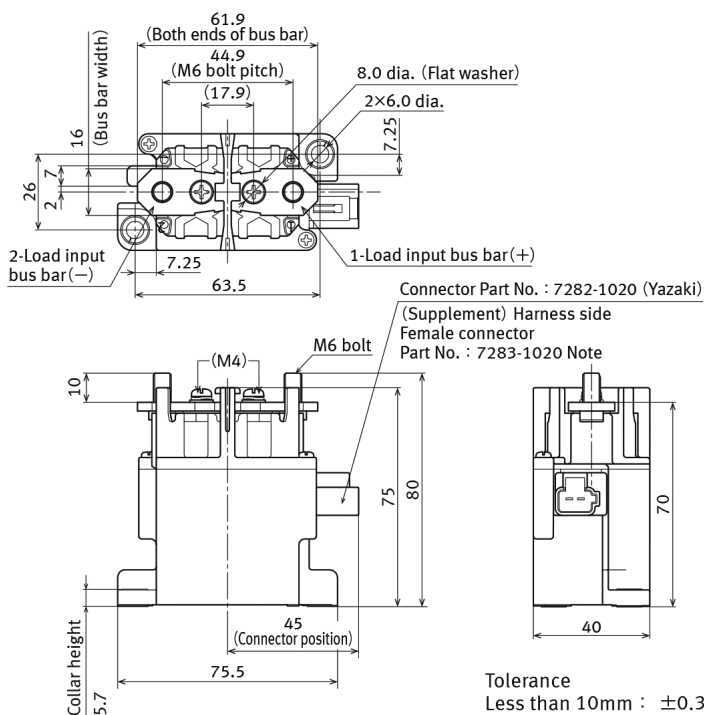
Mounting dimensions



120A

CAD

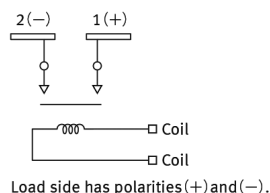
External dimensions



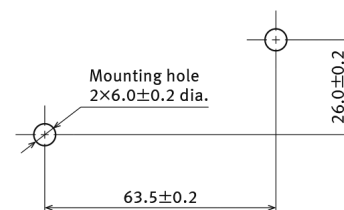
Tolerance  
Less than 10mm :  $\pm 0.3$   
10 to 50mm :  $\pm 0.6$   
More than 50mm :  $\pm 1.0$

Note : Separate connection of the terminal and lead wire is required.

Schematic  
(TOP VIEW)

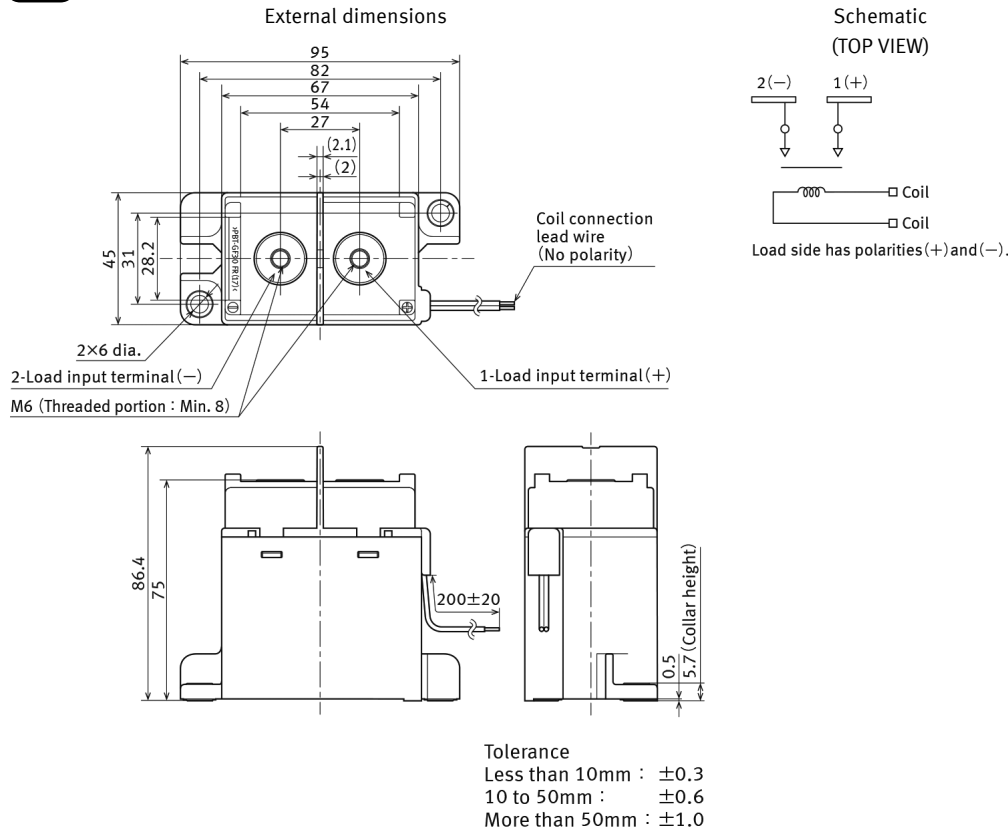


Mounting dimensions



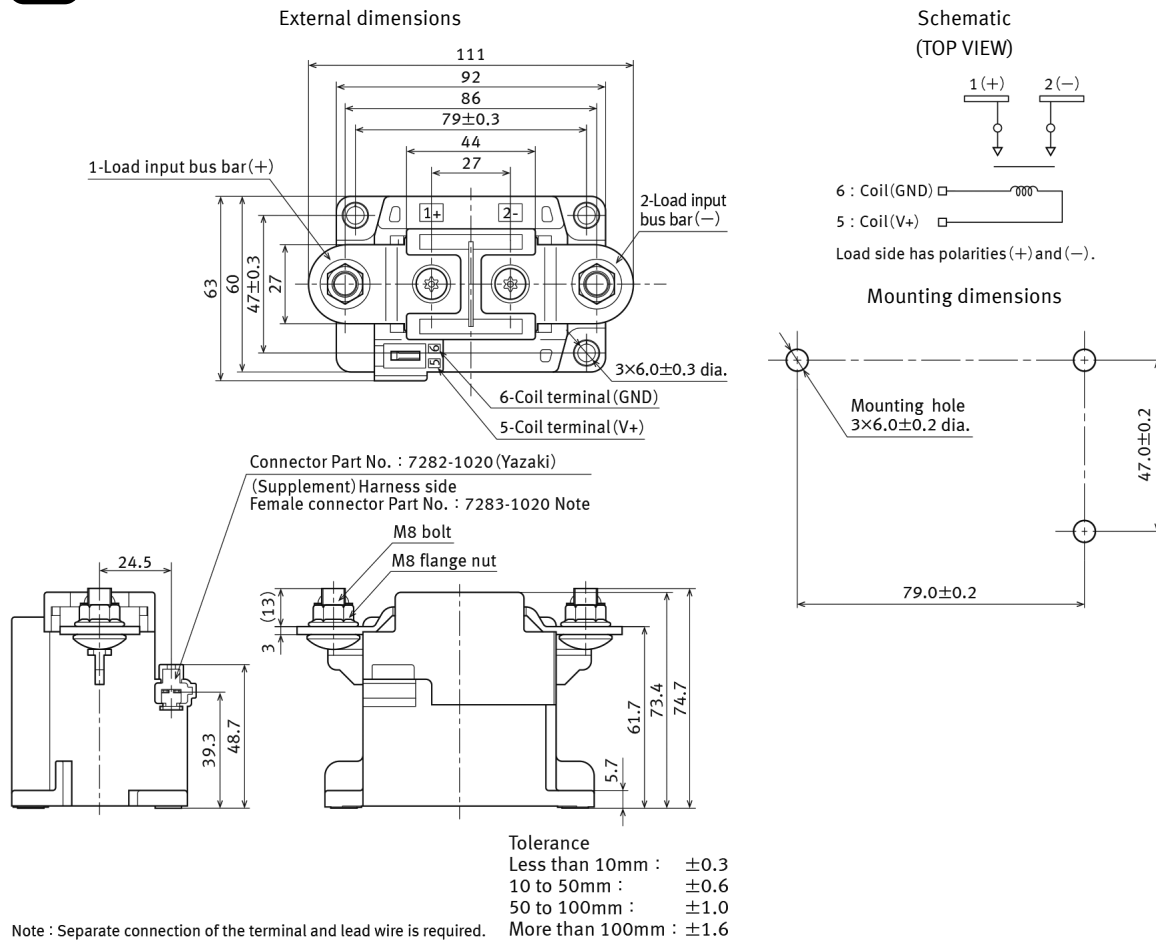
## 200A

CAD



## 300A

CAD



## EV Relay [High short-circuit capacity type]

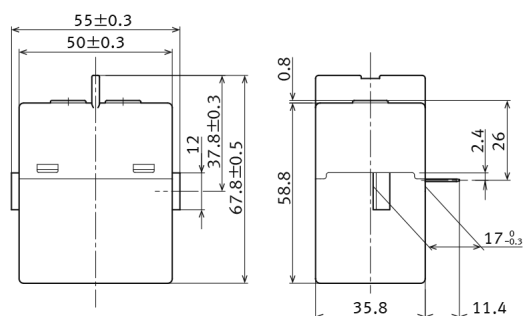
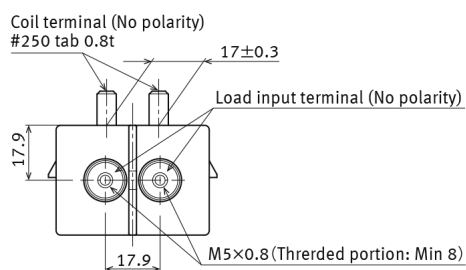
### DIMENSIONS

**CAD** The CAD data of the products with a "CAD" mark can be downloaded from our Website.

Unit: mm

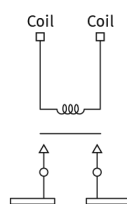
#### CAD

#### External dimensions



Tolerance:  
Less than 10mm: ±0.3  
10 to 50mm: ±0.6  
More than 50mm: ±1.0

#### Schematic (TOP VIEW)



There is no polarity on the load side.

## EV Relay [Compact high short-circuit capacity type]

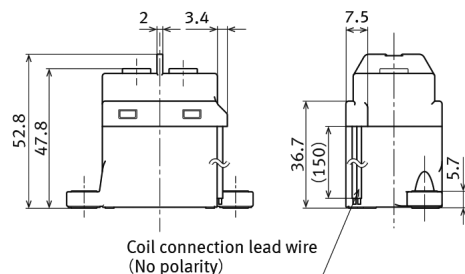
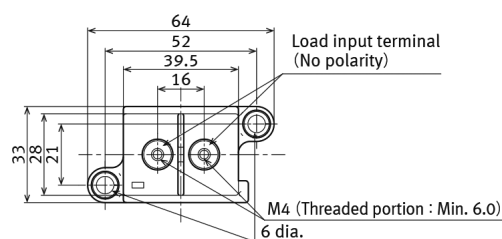
### DIMENSIONS

**CAD** The CAD data of the products with a "CAD" mark can be downloaded from our Website.

Unit: mm

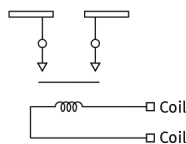
#### CAD

#### External dimensions



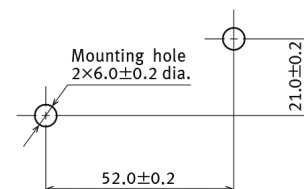
Tolerance  
Less than 10mm : ±0.3  
10 to 50mm : ±0.6  
More than 50mm : ±1.0

#### Schematic (TOP VIEW)



There is no polarity on the load side.

#### Mounting dimensions



## EV Relay [Quiet type]

### DIMENSIONS

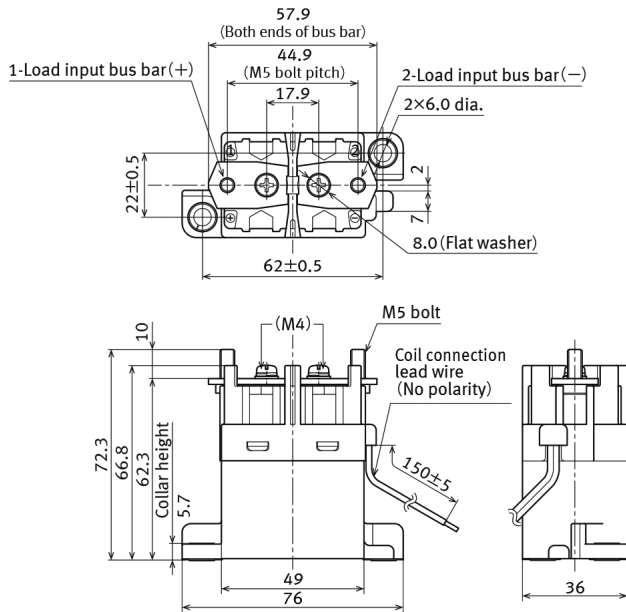
**CAD** The CAD data of the products with a "CAD" mark can be downloaded from our Website.

Unit: mm

#### 60A Vertical type

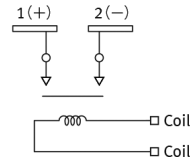
**CAD**

External dimensions

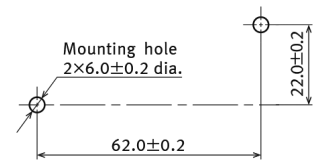


Tolerance  
Less than 10mm :  $\pm 0.3$   
10 to 50mm :  $\pm 0.6$   
More than 50mm :  $\pm 1.0$

Schematic  
(TOP VIEW)



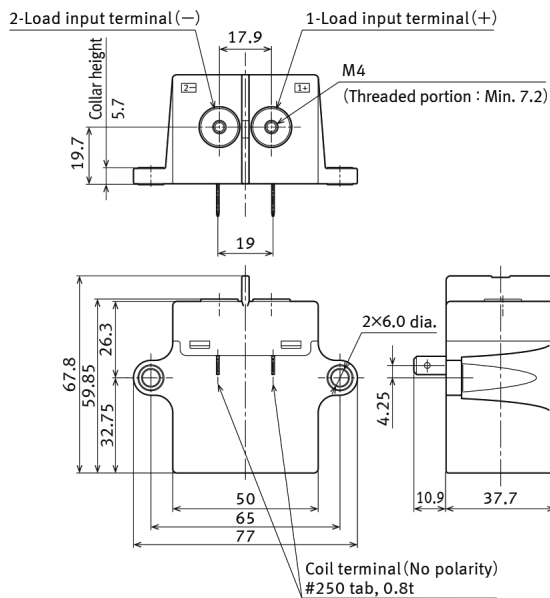
Mounting dimensions



#### 60A Horizontal type

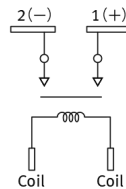
**CAD**

External dimensions

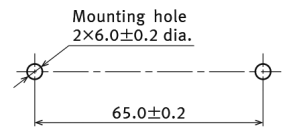


Tolerance  
Less than 10mm :  $\pm 0.3$   
10 to 50mm :  $\pm 0.6$   
More than 50mm :  $\pm 1.0$

Schematic  
(TOP VIEW)



Mounting dimensions





## NOTES

**Safety precautions**

We are doing our best to constantly improve the quality and reliability of our products. However, some electric items/components do in fact fail despite our efforts. The durability of products also varies depending on service environments and conditions. Please check your product under actual service conditions before use.

If you continue to use a product in a poor condition, items with deteriorated insulation performance may generate abnormal heat or smoke or even ignite. The product's failure or end of service life may cause accidents involving risks to human health, fire, or danger to the public at large. We advise you to apply safety measures and regular maintenance work, such as the use of redundant design, fireproofing, and malfunction-preventing design, to rule out such accidents.

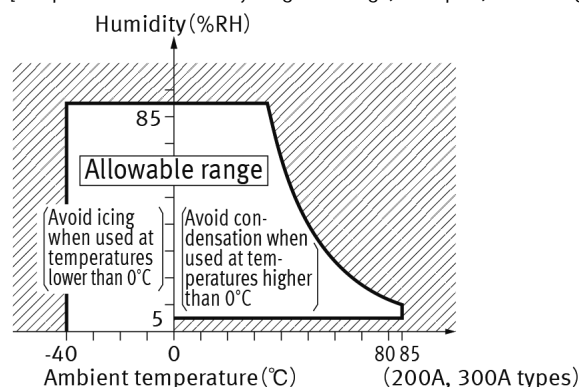
For general cautions for use, please refer to the "Automotive Relay Users Guide".

**Precautions when using EV relays****Usage, transport and storage conditions**

1. Ambient temperature, humidity, and air pressure during usage, transport, and storage of the relay
  - (1) Ambient temperature:  $-40$  to  $+80^{\circ}\text{C}$   
(200 A and 300 A types:  $-40$  to  $+85^{\circ}\text{C}$ )
  - (2) Humidity: 5 to 85% R.H.  
(Avoid icing and condensation.)
  - (3) Air pressure: 86 to 106 kPa

Note: The humidity range varies with the temperature. Use within the range indicated in the graph below.

[Temperature and humidity range for usage, transport, and storage]



2. Water condensation

Water condensation occurs when the ambient temperature drops suddenly from a high temperature and humidity, or, the relay is suddenly transferred from a low ambient temperature to a high temperature and humidity. Condensation causes the failures like insulation deterioration, wire disconnection and rust etc. Panasonic Corporation does not guarantee the failures caused by condensation.

3. Low-temperature, low-humidity atmosphere;  
If the relay is exposed to a low-temperature, low-humidity atmosphere for a long time, its plastic parts may become brittle and fragile.
4. Storage  
Do not keep under high-temperature and high-humidity.

**When installing the relay, always use washers to prevent the screws from loosening.**

**Condition of tightening screw**

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

Relay attaching portion

M4 screw	10A type	1.8 to 2.7 Nm
M5 screw	Except 10A type	3 to 4 Nm

Main terminal attaching portion

M4 bolt	Compact high short-circuit capacity, Quiet horizontal types	2.2 to 2.8 Nm
M5 nut	80A, Quiet type	3 to 4 Nm
M6 nut	120A, 200A type	6 to 8 Nm
M8 nut	300A type	10 to 12 Nm

**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 switch-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 switch-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.

**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 and temperature rise due to flow of electrical current). For this reason, make sure the ambient operating temperature is between  $-40$  and  $+80^{\circ}\text{C}$  (200A and 300A types: Max.  $+85^{\circ}\text{C}$ ), and the ambient storage temperature is between  $-40$  and  $+85^{\circ}\text{C}$ .

The coils (300A type) and contacts (except compact high short-circuit capacity type) of the relay are polarized, so follow the connection schematic when connecting the coils and contacts.

The 300A type contains a reverse surge voltage absorption circuit; therefore a surge protector is not needed.

For the 300A type, drive the coil with a quick startup (apply 100 to 130% of rated coil voltage in less than 10ms). (Built-in one-shot pulse generator circuit)

After the ON signal enters the 300A type, automatic coil current switching occurs after approximately 0.1 seconds.

Do not repeatedly turn it OFF within that 0.1 seconds interval, as doing so may damage the relay.

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

Also, please use the following materials for connected harnesses and bus bars.

Nominal cross-sectional area

10A type	Min. 2 mm <sup>2</sup> nominal cross-sectional area
20A type	Min. 3 mm <sup>2</sup> nominal cross-sectional area
60A, 80A types	Min. 15 mm <sup>2</sup> nominal cross-sectional area
120A type	Min. 38 mm <sup>2</sup> nominal cross-sectional area
200A type	Min. 60 mm <sup>2</sup> nominal cross-sectional area
300A type	Min. 100 mm <sup>2</sup> nominal cross-sectional area

As a guide, the insertion strength of the plug-in terminal into the relay tab terminal should be 40 to 70N (10A type), 40 to 80N (20A and Quiet horizontal types). Please select a plug in terminal (flat connection terminal) which comply with JIS C2809-2014.

10A type	Plate thickness 0.5mm and #187 tab terminal
20A, Quiet horizontal types	Plate thickness 0.8mm and #250 tab terminal

Avoid excessive load applied to the terminal in case of installing such as a bus bar etc., Because it might adversely affect the switching performance.

Use the specified connector for the connector terminal connection (80A, 120A and 300A types).

- Yazaki Corporation: 7283 – 1020 or equivalent

#### Other cautions for use

1. Please make sure to contact our sales representative when the product is used not in accordance with its specifications. Your nearest sales office staff will review the required specification from your company and perform confirmation tests in actual condition as needed.
2. When the voltage is applied to the relay coil beyond the max. allowable voltage range, the relay operation cannot be assured. Additionally the ambient temperature and condition of your application should be considered under the worst condition of the actual usage because they may change the relay operate and release voltage.

Note: It is not allowed to apply the continuous maximum voltage to the coil. In order to obtain the specified performance, please apply the rated voltage.

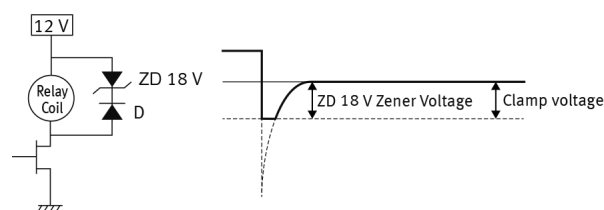
3. If it includes ripple, the ripple factor should be max. 5%. In addition, do not have a parallel connection with diode for the purpose of coil surge absorber. If only diode is connected in parallel to the relay coil, break performance of relay cannot be assured because contact release speed becomes slower. So do not use such a circuit. Instead of diode, a Varistor (ZNR) or Zener diode (ZD) when clamp voltage is 1.5 times larger than the rated voltage (Min. 18V for the rated 12V-relay), shall be used for the absorber.

#### Ex. 1 When Varistor (ZNR) is used

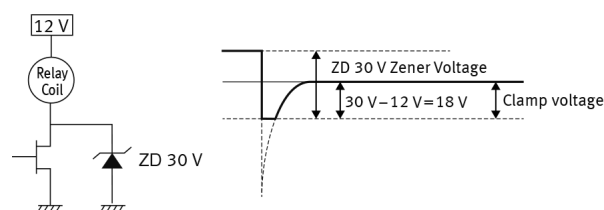
Recommended Varistor	Energy capability: Min 1 J (However, please set up the value with consideration of the worst value in use condition.)
Varistor Voltage	Min. 18 V at 12 V DC Min. 36 V at 24 V DC

#### Ex. 2 When Zener diode (circuit) is used

[1]



[2]



4. Lifetime is specified under the standard test conditions in JIS C 5442. (temperature 15°C to 35°C, humidity 25% R.H. to 75% R.H.)

Lifetime is dependent on the coil driving circuit, load type, operation frequency and ambient conditions. Check lifetime under the actual condition. Especially, contact terminals have polarity. So if the contact terminals were connected with opposite pole, the electrical life would be shortened.

We can not guarantee the relay's quality in case the relay is operated without load current (Dry-switching).

5. If the relay is dropped, it should not be used again.
6. Please contact our sales representative when AC load gets applied to this relay. Careful handling is required for switching AC load with this relay.

7. Please check the internal connection diagram in the catalog or specification, and connect the terminals correctly. If any wrong connection is made, it may cause circuit damage by unexpected malfunction, abnormal heat, fire, and so on.
8. Please check the insulation distance between each terminal and ground.
9. Please assure the evaluation of the relay under the actual worst condition to enhance the reliability for the actual usage.
10. Please absolutely avoid the ultrasonic and high frequency vibration to the relay that adversely affects its performance.
11. Minimum switching load is the lower limit switching current under the micro-load.  
When the relay is used below minimum switching load, reliability becomes lower. Please use the relay beyond minimum switching load. Additionally, minimum switching load is changed by coil drive circuit, type of load, switching frequency and environment condition. So please confirm the reliability with actual load under the assumed actual environment.
12. As for the screws of fixing relay-body and screws of fixing contact terminal, the tightening torque must be within the specified range.
  - The purpose of the tightening torque for the contact terminal is to secure adhesion force (axial force) at the fixing part and provide stable electrical connection. Therefore, do not use the screws (bolts and nuts) which require rotation torque of locking type (prevailing torque type) because sufficient adhesion force (axial force) may not be secured.  
In addition, if the locking type nut is used, an excessive torque may be applied to the case before generating of axial force and may cause breakage of the case.
  - Regarding the screw for fixing relay body, please use suitable screws after adequate verification at user's side.
13. The relay should not be installed near strong magnetic fields (transformers, magnets, etc.) and should not be installed near heat source.
14. If the several relays are mounted closely or a heatgeneration object is close to the relay, it may cause troubles the abnormal temperature-rise and the short insulation distance terminals outside of the relay so please assure the evaluation of the relay under the actual worst condition.
15. The relay contacts are encapsulated in an inert gas atmosphere. So, please avoid using or storing beyond the allowable ambient temperature range.
16. After that the relay has been applied with the rated voltage and current to the coil continuously and then the relay is once switched off and switched on immediately, the relay coil resistance may be increased due to the coil temperature increase. This will result in higher operate voltage and the value will surpass the rated operate voltage value. In order to avoid this failure, the following countermeasures are recommended.
  - decrease of the load current
  - restriction of time to apply voltage
  - restriction of operating ambient temperature, etc.
17. If an inductive load ( $L/R > 1\text{ms}$ ) is applied, add surge protection in parallel with the inductive load. If this is not done, the electrical life will be shortened and cut-off failure may occur.
18. In case using a capacitive load (C-load), please take a countermeasure as pre-charging to the capacitive load so that the inrush current will not surpass performance condition. The relay may have a contact welding without such countermeasure.
19. Use the suitable wire or bus bar according to the current. If the wire diameter is thin, maximum allowable contact current cannot be assured.  
Ex.) Carrying current; 120A: diameter of  $38\text{mm}^2$  (minimum) (for wire at the load side)
20. Take care to disconnect from the power supply when wiring.
21. The tension load applied to the coil lead wire when wiring should be max. 10N.  
In addition, take care not to bend at the lead wire pullout portion when wiring or apply a stationary load to the lead wire after wiring to avoid failure of the relay such as breaking of wire.  
(only applicable to the relay with the coil lead wire)
22. The relay satisfies water resistance level of JIS D 0203 R2. Please take any countermeasures additionally if it is installed in the place where higher water resistance level is required.
23. Do not use this product in such atmosphere where any kind of organic solvent (as benzene, thinner and alcohol) and the strong alkali (as ammonia and caustic soda) may be adhered to this product.
24. Be careful that oils and foreign matter do not stick to the main terminal part because it is likely to cause a terminal part to give off unusual heat.
25. Do not make additional manufacturing upon the relay housing.
26. Maximum overcurrent value in this specification is limited as single operation only. In the case of multiple operation, this relay may cause malfunction by heating. So, please confirm the temperature / operation using your application. In the case of multiple operation, please stop applying the over current to secure the relay's temperature under the maximum ambient temperature.
27. When applying current which includes precipitous changes or ripple, the relay may generate buzzing sound. Therefore, please confirm with the actual load.

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Please contact .....

## Panasonic Corporation

Electromechanical Control Business Division

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[industrial.panasonic.com/ac/e/](http://industrial.panasonic.com/ac/e/)

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