

## COMPACT AND HIGH CAPACITY GENERAL PURPOSE POWER RELAYS

## HK RELAYS (AHK)



RoHS Directive compatibility information  
<http://www.mew.co.jp/ac/e/environment/>

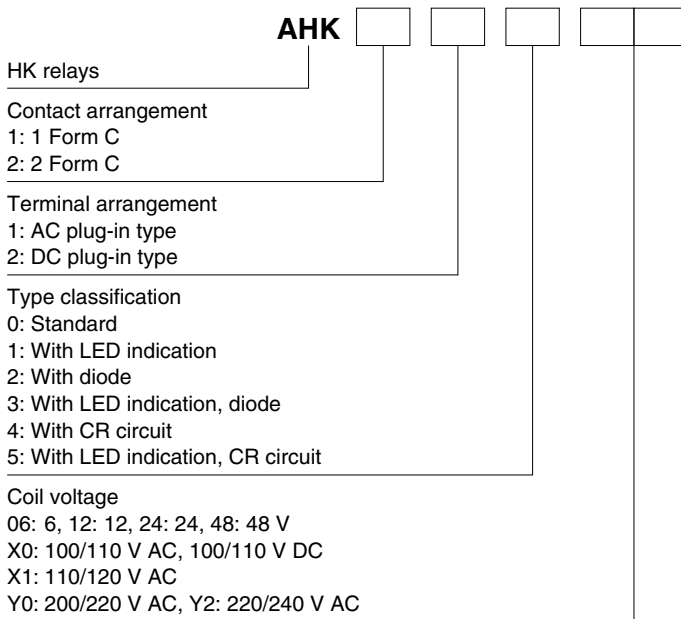
### FEATURES

- 1. Economical prices achieved**  
 To assist rationalization, prices reduced to about half the price of previous products.
- 2. Compact with high-capacity**  
 Enables high-capacity control:  
 15 A for 1 Form C, 10 A for 2 Form C
- 3. Types for wide range of applications**  
 Range includes relays with operation indicators, built-in diodes to absorb relay coil surge, and built-in CR circuits.
- 4. Cadmium-free contacts**
- 5. UL/C-UL and TÜV approved parts available. Compliance with Japanese Electrical Appliance and Material Control Law is standard.**

### TYPICAL APPLICATIONS

- Control panels
- Power supply units
- Molding machines
- Machine tools
- Welding equipment
- Agricultural equipment
- Office equipment
- Vending machines
- Communications equipment
- Amusement machines, etc.

### ORDERING INFORMATION



Note: Products conform to UL/C-UL and TÜV, as standard.

# HK (AHK)

## TYPES

### 1. Plug-in type

Coil voltage	1 Form C	2 Form C
	Part No.	Part No.
6V DC	AHK12006	AHK22006
12V DC	AHK12012	AHK22012
24V DC	AHK12024	AHK22024
48V DC	AHK12048	AHK22048
100/110V DC	AHK120X0	AHK220X0
12V AC	AHK11012	AHK21012
24V AC	AHK11024	AHK21024
48V AC	AHK11048	AHK21048
100/110V AC	AHK110X0	AHK210X0
110/120V AC	AHK110X1	AHK210X1
200/220V AC	AHK110Y0	AHK210Y0
220/240V AC	AHK110Y2	AHK210Y2

Standard packing: Carton: 20 pcs.; Case: 200 pcs.

### 2. Plug-in type (with LED indication)

Coil voltage	1 Form C	2 Form C
	Part No.	Part No.
6V DC	AHK12106	AHK22106
12V DC	AHK12112	AHK22112
24V DC	AHK12124	AHK22124
48V DC	AHK12148	AHK22148
100/110V DC	AHK121X0	AHK221X0
12V AC	AHK11112	AHK21112
24V AC	AHK11124	AHK21124
48V AC	AHK11148	AHK21148
100/110V AC	AHK111X0	AHK211X0
110/120V AC	AHK111X1	AHK211X1
200/220V AC	AHK111Y0	AHK211Y0
220/240V AC	AHK111Y2	AHK211Y2

Standard packing: Carton: 20 pcs.; Case: 200 pcs.

### 3. Plug-in type (with diode)

Coil voltage	1 Form C	2 Form C
	Part No.	Part No.
6V DC	AHK12206	AHK22206
12V DC	AHK12212	AHK22212
24V DC	AHK12224	AHK22224
48V DC	AHK12248	AHK22248
100/110V DC	AHK122X0	AHK222X0

Standard packing: Carton: 20 pcs.; Case: 200 pcs.

### 4. Plug-in type (with diode and LED indication)

Coil voltage	1 Form C	2 Form C
	Part No.	Part No.
6V DC	AHK12306	AHK22306
12V DC	AHK12312	AHK22312
24V DC	AHK12324	AHK22324
48V DC	AHK12348	AHK22348
100/110V DC	AHK123X0	AHK223X0

Standard packing: Carton: 20 pcs.; Case: 200 pcs.

### 5. Plug-in type (with CR)

Coil voltage	1 Form C	2 Form C
	Part No.	Part No.
100/110V AC	AHK114X0	AHK214X0
110/120V AC	AHK114X1	AHK214X1
200/220V AC	AHK114Y0	AHK214Y0
220/240V AC	AHK114Y2	AHK214Y2

Standard packing: Carton: 20 pcs.; Case: 200 pcs.

### 6. Plug-in type (with CR and LED indication)

Coil voltage	1 Form C	2 Form C
	Part No.	Part No.
100/110V AC	AHK115X0	AHK215X0
110/120V AC	AHK115X1	AHK215X1
200/220V AC	AHK115Y0	AHK215Y0
220/240V AC	AHK115Y2	AHK215Y2

Standard packing: Carton: 20 pcs.; Case: 200 pcs.

## 7. Accessories

Type	No. of poles	Item	Part No.
Terminal socket	1/2 poles (common)	HK screw terminal socket	AHKA21
		HK screw terminal socket (Finger protect type)	AHKA21P

Standard packing: Carton: 10 pcs.; Case: 100 pcs.

Notes: 1. Use the retainer that is shipped with the terminal socket.

2. Products conform to UL, C-UL and TÜV, as standard.

3. In order to prevent breakage and disfiguring, the screw tightening torque for the terminal socket should be within the range of 0.784 to 0.98 N-m.

4. When attaching directly to a chassis, please use an M4 × 12 metric coarse screw thread, a spring washer, and a hexagonal nut.

Type	No. of poles	Item	Part No.
Plug-in socket	1-pole	HL1 socket	HL1-SS-K
	2-pole	HL2 socket	HL2-SS-K
PC board socket	1-pole	HL1 PC board socket	HL1-PS-K
	2-pole	HL2 PC board socket	HL2-PS-K

Standard packing: Carton: 20 pcs.; Case: 200 pcs.

Notes: 1. Use the retainer that is shipped with the terminal socket.

2. Products conform to UL/CSA as standard (TÜV is unacquired.)

**RATING**

**1. Coil data**

1) AC coils

Coil voltage	Nominal coil current, mA		Nominal operating power, V A		Pick-up voltage (at 20°C 68°F)	Drop-out voltage (at 20°C 68°F)	Inductance, H		Max. allowable voltage
	50Hz	60Hz	50Hz	60Hz			When drop-out	When operating	
12V AC	111	100	1.3	1.2	80%V or less of nominal voltage (Initial)	30%V or more of nominal voltage (Initial)	0.312	0.295	110%V of nominal voltage
24V AC	56	50	1.3	1.2			1.243	1.181	
48V AC	28	25	1.3	1.2			4.974	4.145	
100/110V AC	13.4/14.7	12/13.2	1.3	1.2			23.75	20.63	
110/120V AC	12.2/13.5	10.9/11.9	1.3	1.2			27.19	25.57	
200/220V AC	6.7/7.4	6/6.6	1.3	1.2			85.98	81.76	

Notes: 1. The relay operates in a range of 80% to 110 % V of the voltage rating, but ideally, in consideration of temporary voltage fluctuations, it should be operated at the rated voltage. In particular, for AC operation, if the impressed voltage drops to 80% V or more below the rated voltage, humming will occur and a large current will flow leading possibly to coil burnout.

2. The maximum allowable voltage is the maximum voltage fluctuation value for the coil power supply. This value is not a permissible value for continuous operation. (This value differs depending on the ambient temperature. Please contact us for details.)

2) DC coils (at 20°C 68°F)

Coil voltage	Nominal coil current, mA	Nominal operating power, W	Coil resistance, Ω	Pick-up voltage (at 20°C 68°F)	Drop-out voltage (at 20°C 68°F)	Max. allowable voltage (at 70°C 158°F)
6V DC	150	0.9	40	80%V or less of nominal voltage (Initial)	10%V or more of nominal voltage (Initial)	110%V of nominal voltage
12V DC	75	0.9	160			
24V DC	37	0.9	650			
48V DC	18.5	0.9	2,600			
100/110V DC	10	1.0	10,000			

Notes) 1. The rated excitation current is ±10% (20°C 68°F).

2. The coil resistance for DC operation is the value measured when the coil temperature is 20°C 68°F. Compensate ±0.4% for every ±1°C change in temperature.

3. The relay operates in a range of 80% to 110 % V of the voltage rating, but ideally, in consideration of temporary voltage fluctuations, it should be operated at the rated voltage.

4. For use with 200 V DC, connect a 10 KΩ (5W) resistor, in series, to the 100 V DC relay.

5. The maximum allowable voltage is the maximum voltage fluctuation value for the coil power supply. This value is not a permissible value for continuous operation. (This value differs depending on the ambient temperature. Please contact us for details.)

**2. Specifications**

Characteristics	Item	Specifications	
Contact	Initial contact resistance, max	Max. 50 mΩ (By voltage drop 6 V DC 1A)	
	Contact material	AgSnO <sub>2</sub> type	
Rating	Nominal switching capacity	1 Form C: 15A 125V AC 2 Form C: 10A 125V AC	
	Max. switching voltage	250V AC, 125V DC	
	Max. switching current	15A (1 Form C), 10A (2 Form C)	
	Min. switching capacity (Reference value)*1	100mA 5V DC	
Electrical characteristics	Insulation resistance (Initial)	Min. 100MΩ (at 500V DC) Measurement at same location as "Initial breakdown voltage" section.	
	Breakdown voltage (Initial)	Between open contacts	1,000 Vrms for 1min. (Detection current: 10mA.)
		Between contact sets	2,000 Vrms for 1min. (Detection current: 10mA.)
		Between contact and coil	2,000 Vrms for 1min. (Detection current: 10mA.)
	Temperature rise	Max. 80°C (By resistive method, nominal voltage)	
Operate time (at 20°C 68°F)*2	Max. 25ms (Nominal voltage applied to the coil, excluding contact bounce time.)		
Release time (at 20°C 68°F)*2	Max. 25ms (Nominal voltage applied to the coil, excluding contact bounce time.) (without diode)		
Mechanical characteristics	Shock resistance	Functional	Min. 196 m/s <sup>2</sup> (Half-wave pulse of sine wave: 11 ms; detection time: 10μs.)
		Destructive	Min. 980 m/s <sup>2</sup> (Half-wave pulse of sine wave: 6 ms.)
	Vibration resistance	Functional	10 to 55 Hz at double amplitude of 1 mm (Detection time: 10μs.)
		Destructive	10 to 55 Hz at double amplitude of 2 mm
Expected life	Mechanical	AC type: 5×10 <sup>7</sup> (at 180 cpm), DC type: 10 <sup>8</sup> (at 180 cpm)	
	Electrical	AC load 1 Form C: 15A 125V AC (cosφ=1), Min. 2×10 <sup>5</sup> 2 Form C: 10A 125V AC (cosφ=1), Min. 5×10 <sup>5</sup>	
Conditions	Conditions for operation, transport and storage*3	Ambient temperature: -50°C to +70°C -58°F to +158°F (Without LED indication); -50°C to +60°C -58°F to +140°F (With LED indication) Humidity: 5 to 85% R.H. (Not freezing and condensing at low temperature)	
	Max. Operating speed	20 cpm (at max. rating)	
Unit weight		Approx. 35g 1.23 oz	

Notes: If integrating into electrical appliances that will be subject to compliance to the Electrical Appliance and Material Safety Law, please use in an ambient temperature between -50°C to +40°C -58°F to +104°F (AC type).

\*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.

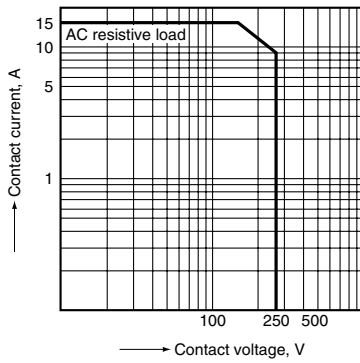
\*2 For the AC coil types, the operate/release time will differ depending on the phase.

\*3 The upper operation ambient temperature limit is the maximum temperature that can satisfy the coil temperature rise value. Refer to 4. Conditions for operation, transport and storage mentioned in AMBIENT ENVIRONMENT.

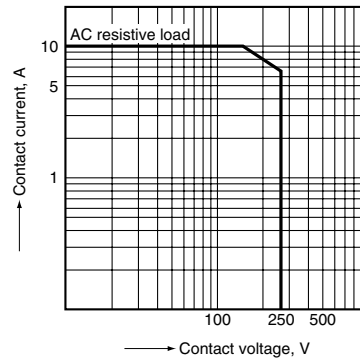
# HK (AHK)

## REFERENCE DATA

1-(1). Max. switching capacity (1 Form C type)

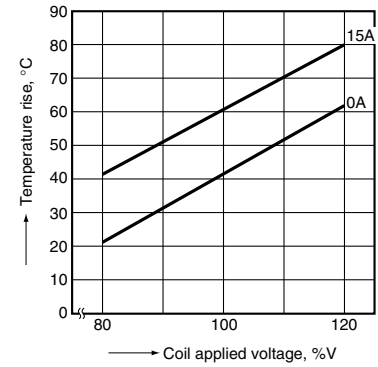


1-(2). Max. switching capacity (2 Form C type)



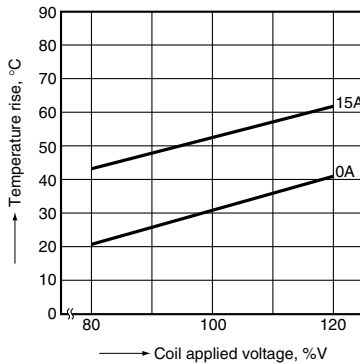
2-(1). Coil temperature rise (1 Form C/AC type)

Measured portion: Inside the coil  
Ambient temperature: 70°C 158°F



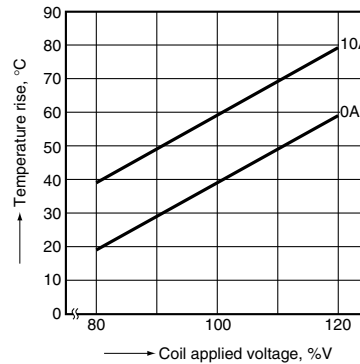
2-(2). Coil temperature rise (1 Form C/DC type)

Measured portion: Inside the coil  
Ambient temperature: 70°C 158°F



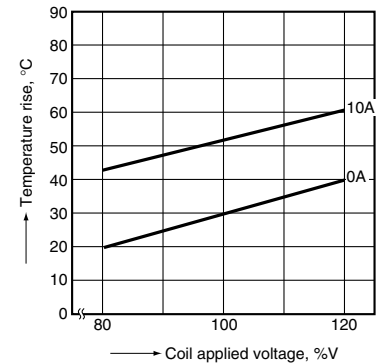
2-(3). Coil temperature rise (2 Form C/AC type)

Measured portion: Inside the coil  
Ambient temperature: 70°C 158°F

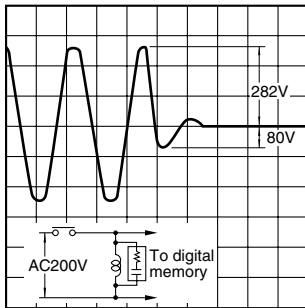


2-(4). Coil temperature rise (2 Form C/DC type)

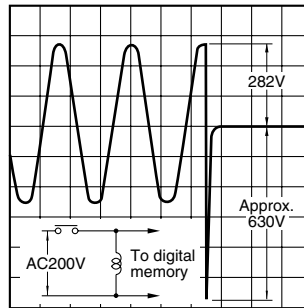
Measured portion: Inside the coil  
Ambient temperature: 70°C 158°F



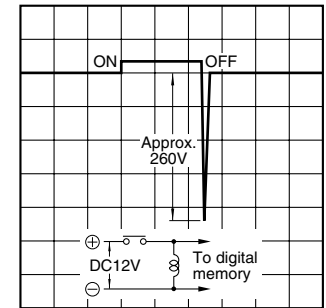
3-(1). AC coil surge voltage waveform (With CR)



3-(2). AC coil surge voltage waveform (Without CR)

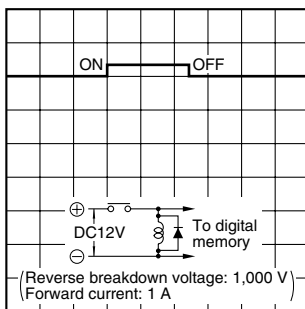


4-(1). DC coil surge voltage waveform (Without diode)



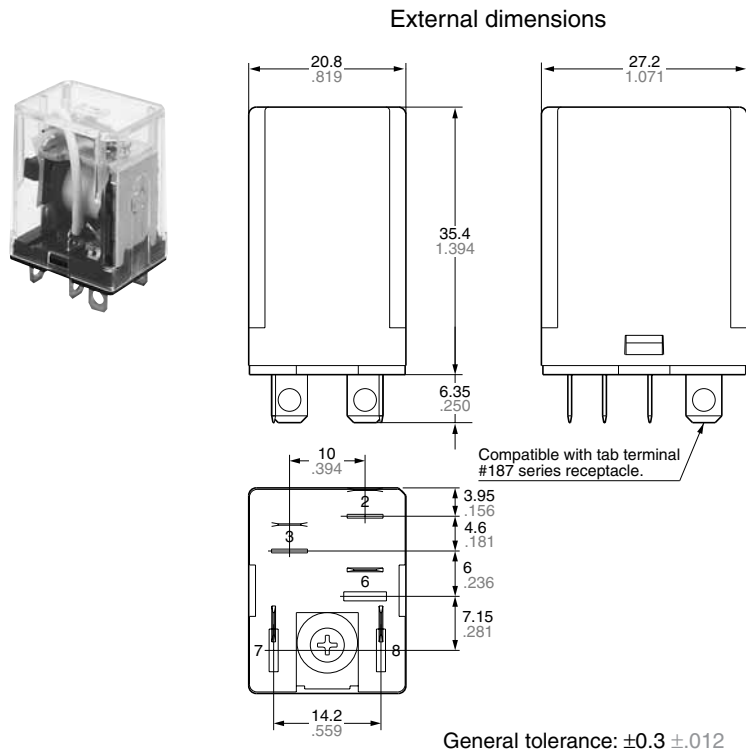
4-(2). DC coil surge voltage waveform (With diode)

Diode characteristics:  
Reverse breakdown voltage: 1,000 V  
Forward current: 1 A

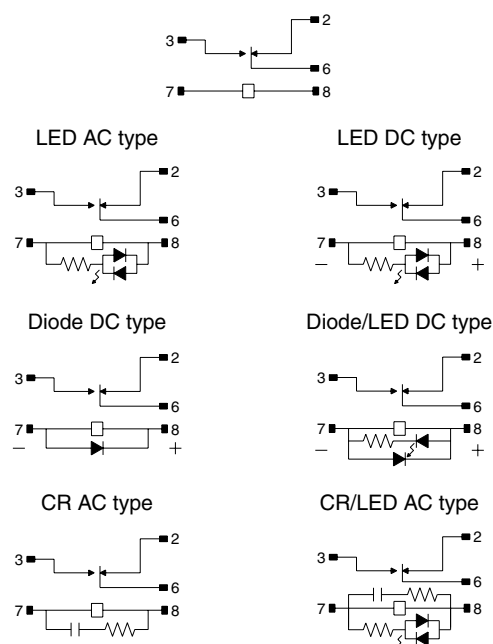


## DIMENSIONS (Unit: mm inch)

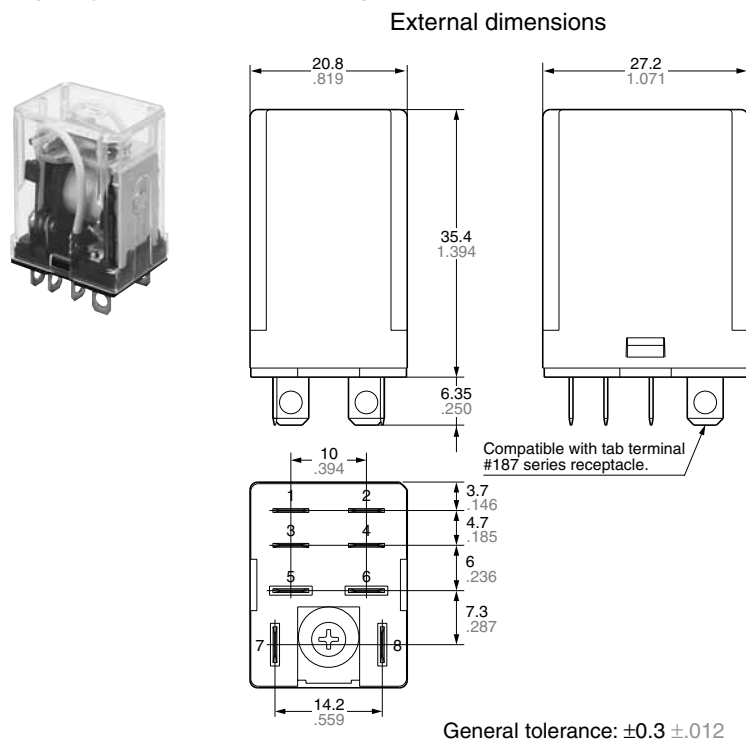
### 1. Plug-in type (1 Form C) including diode/CR



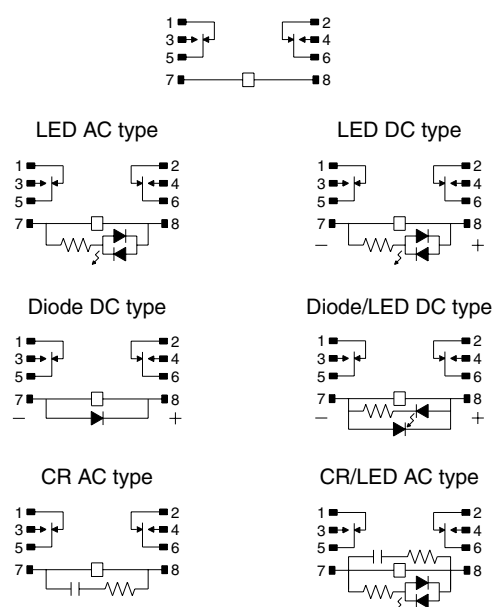
### Schematic (Bottom view)



### 2. Plug-in type (2 Form C) including diode/CR

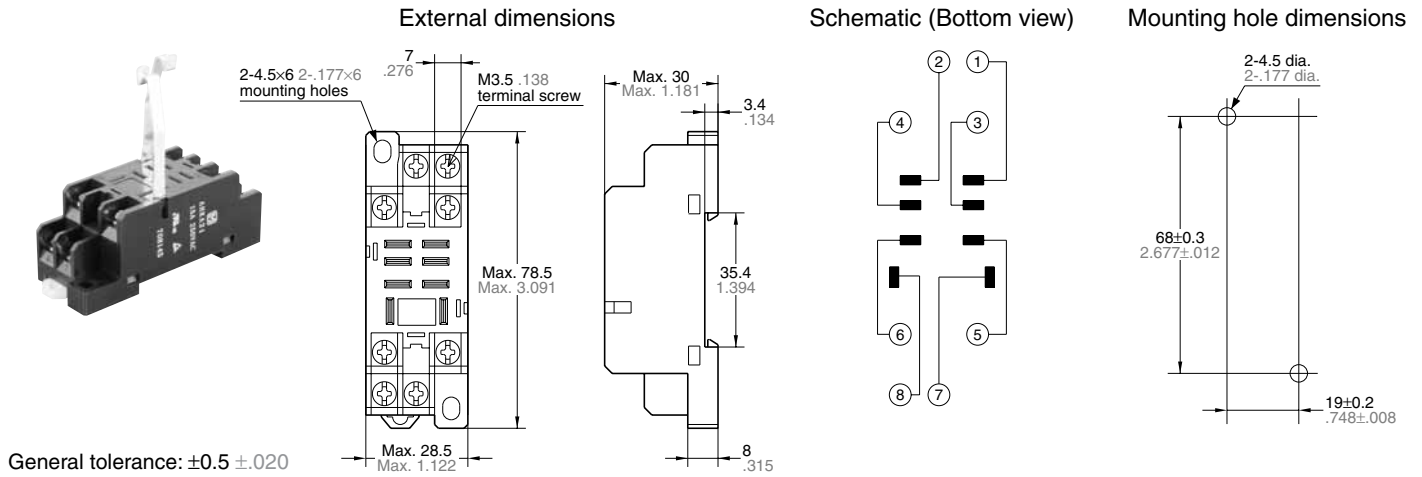


### Schematic (Bottom view)

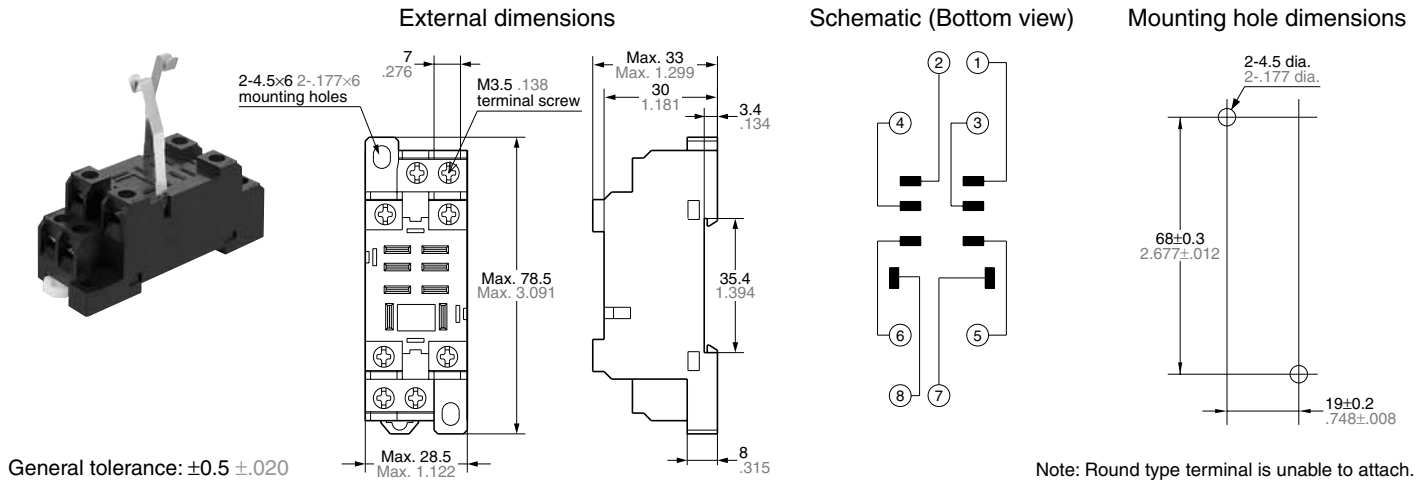


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## 3. Screw terminal socket HK screw terminal socket



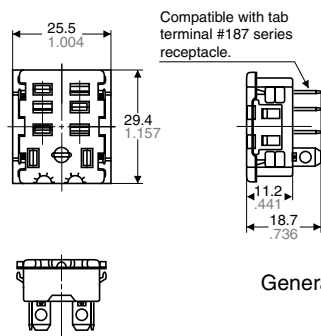
## HK screw terminal socket (Finger protect type)



## 4. Plug-in type sockets



### HL1 socket External dimensions



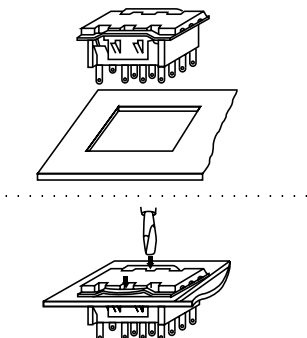
Note: The external and mounting dimensions are the same for HL2 socket (HL2-SS-K). Only the number of terminals varies.

### Hold-down clip

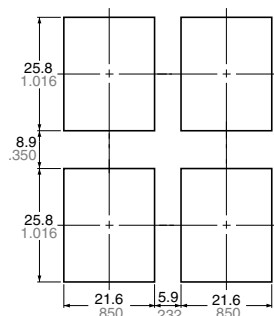


Hold-down clip is packaged with the socket.

### Mounting hole diagram



### Side-by-side installation



Tolerance:  $\pm 0.1 \pm .004$

- Notes: 1. Applicable chassis board thickness is 1.0 to 2.0 mm.
- 2. Installation is easy by inserting the socket from the top into the holes and by depressing the two down arrows on the retention fitting from the front.

## 5. PC board type sockets

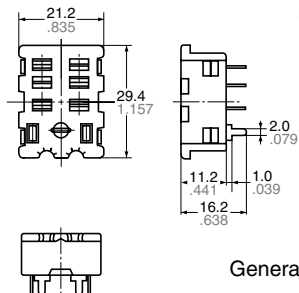


HL1 PC board type socket (HL1-PS-K)



HL2 PC board type socket (HL2-PS-K)

### HL2 PC board type socket External dimensions



Note: The external and mounting dimensions are the same for HL1 PC board type socket (HL1-PS-K). Only the number of terminals varies.

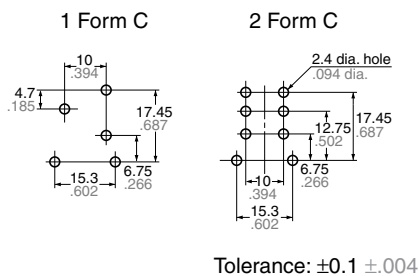
General tolerance:  $\pm 0.3 \pm 0.12$

### Hold-down clip

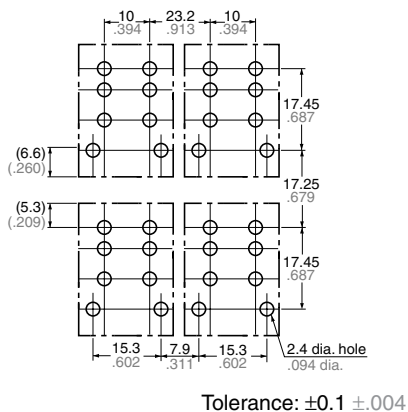


Hold-down clip is packaged with the socket.

### PC board pattern (Bottom view)



### Side-by-side installation (For 2 Form C)



## NOTES

### 1. Coil operating power

#### 1) DC coil

To ensure proper operation, the voltage applied to both terminals of the coil should be  $\pm 5\%$  (at 20°C 68°F) the rated operating voltage of the coil. Also, be aware that the pick-up and dropout voltages will fluctuate depending on the ambient temperature and operating conditions.

#### 2) AC Coil

To enable stable operation of the relay, apply the nominal voltage. Ensure that the fluctuation range of the power source voltage remains, in principle, within +10% to -15% of the value of the nominal current. Moreover, the ideal waveform for the voltage applied to the coil is a sine curve. If commercially provided power source is used, the waveform should be checked. If a stabilized AC power source is used, the conditioning equipment may distort the waveform, and abnormal heating may result. With AC coils, hum can be normally stopped by the use of a shading coil. If the waveform is distorted, however, the shading coil may be ineffective.

### 2. LED indications

The light of the light emitting diode is what displays operation. If voltage remains after relay might illuminate briefly.

### 3. Switching lifetime

The switching lifetime is defined under the standard test condition specified in the JIS C 5442(\*2) standard (temperature 15 to 35°C 59 to 95°F, humidity 25 to 75% R.H.). Check this with the real device as it is affected by coil driving circuit, load type, activation frequency, activation phase, ambient conditions and other factors. Also, be especially careful of loads such as those listed below.

1) When used for AC load-operating and the operating phase is synchronous. Rocking and fusing can easily occur due to contact shifting.

2) High-frequency load operating  
When high-frequency opening and closing of the relay is performed with a load that causes arcs at the contacts, nitrogen and oxygen in the air is fused by the arc energy and HNO<sub>3</sub> is formed. This can corrode metal materials.

Three countermeasures for these are listed here.

(1) Incorporate an arc-extinguishing circuit.

(2) Lower the operating frequency

(3) Lower the ambient humidity

4. Conditions for operation, transport and storage

1) Ambient temperature, humidity, and atmospheric pressure during usage, transport, and storage of the relay:

(1) Temperature:

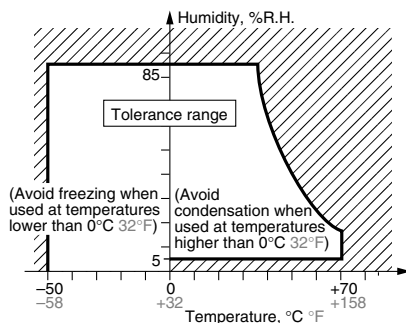
-50 to +70°C (without LED)

-50 to +60°C (with LED)

(2) Humidity: 5 to 85% RH (Avoid freezing and condensation.)

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



(3) Atmospheric pressure: 86 to 106kPa

### 2) Condensation

Condensation forms when there is a sudden change in temperature under high temperature and high humidity conditions. Condensation will cause deterioration of the relay insulation.

### 3) Freezing

Condensation or other moisture may freeze on the relay when the temperatures is lower than 0°C 32°F. This causes problems such as sticking of movable parts or operational time lags.

### 4) Low temperature, low humidity environments

The plastic becomes brittle if the relay is exposed to a low temperature, low humidity environment for long periods of time.

### 5. Diode characteristics

1) Reverse breakdown voltage: 1,000 V

2) Forward current: 1 A

### 6. Diode and CR built-in type

Since the diode and CR inside the relay coil are designed to absorb the counter emf, the element may be damaged if a large surge, etc., is applied to the diode and CR.

If there is the possibility of a large surge voltage from the outside, please implement measures to absorb it

**For Cautions for Use, see Relay Technical Information.**