Panasonic
ideas for life

**1c 15 A and 2c 10 A space saving power relay**

# HL RELAYS

## FEATURES

**1. Compact high-capacity control relay**
In the same external dimensions as an HC relay, this compact power relay enables high-capacity control:
15 A for 1 Form C, 10 A for 2 Form C.
**2. Designed for high reliability**
High operational reliability is achieved by solder-less construction, in which all connections between lead wires and the contact springs and terminal plate are welded.
**3. Various types provided in rich lineup. LED indicator type also available.**
**4. The terminals are compatible with #187 series tab terminals.**
**5. UL, CSA approval is standard**

## TYPICAL APPLICATIONS

**Suitable for factory automation equipment and automotive devices**
**1. Control panels, power supply equipment, molding equipment, machine tools, welding equipment, agricultural equipment, etc.**
**2. Office equipment, automatic vending machines, telecommunications equipment, disaster prevention equipment, copiers, measuring devices, medical equipment, amusement devices, etc.**
**3. All types of household appliance**

**About Cd-free contacts**
We have introduced Cadmium free type products to reduce Environmental Hazardous Substances. (The suffix “F” should be added to the part number.) Please replace parts containing Cadmium with Cadmium-free products and evaluate them with your actual application before use because the life of a relay depends on the contact material and load.

## ORDERING INFORMATION

**HL** □ - □ - □ - **F**

Contact arrangement
1: 1 Form C
2: 2 Form C

Terminal arrangement
H: Plug-in type
L: Plug-in with LED indication
HP: PC board type
PL: PC board with LED indication
HTM: TM type

Coil voltage
AC 6, 12, 24, 48, 100 (100/110), 120 (110/120), 200 (200/220), 240 (220/240) V
DC 6, 12, 24, 48, 100 (100/110) V

Contact material
F: $AgSnO_2$ type

Notes: UL/CSA approved type is standard.
Please inquire about TV approved products.

# TYPES

### 1. Plug-in type

| Coil voltage | 1 Form C | 2 Form C |
|---|---|---|
| | Part No. | Part No. |
| 6V AC | HL1-H-AC6V-F | HL2-H-AC6V-F |
| 12V AC | HL1-H-AC12V-F | HL2-H-AC12V-F |
| 24V AC | HL1-H-AC24V-F | HL2-H-AC24V-F |
| 48V AC | HL1-H-AC48V-F | HL2-H-AC48V-F |
| 100/110V AC | HL1-H-AC100V-F | HL2-H-AC100V-F |
| 110/120V AC | HL1-H-AC120V-F | HL2-H-AC120V-F |
| 200/220V AC | HL1-H-AC200V-F | HL2-H-AC200V-F |
| 220/240V AC | HL1-H-AC240V-F | HL2-H-AC240V-F |
| 6V DC | HL1-H-DC6V-F | HL2-H-DC6V-F |
| 12V DC | HL1-H-DC12V-F | HL2-H-DC12V-F |
| 24V DC | HL1-H-DC24V-F | HL2-H-DC24V-F |
| 48V DC | HL1-H-DC48V-F | HL2-H-DC48V-F |
| 100/110V DC | HL1-H-DC100V-F | HL2-H-DC100V-F |

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 AC | HL1-L-AC6V-F | HL2-L-AC6V-F |
| 12V AC | HL1-L-AC12V-F | HL2-L-AC12V-F |
| 24V AC | HL1-L-AC24V-F | HL2-L-AC24V-F |
| 48V AC | HL1-L-AC48V-F | HL2-L-AC48V-F |
| 100/110V AC | HL1-L-AC100V-F | HL2-L-AC100V-F |
| 110/120V AC | HL1-L-AC120V-F | HL2-L-AC120V-F |
| 200/220V AC | HL1-L-AC200V-F | HL2-L-AC200V-F |
| 220/240V AC | HL1-L-AC240V-F | HL2-L-AC240V-F |
| 6V DC | HL1-L-DC6V-F | HL2-L-DC6V-F |
| 12V DC | HL1-L-DC12V-F | HL2-L-DC12V-F |
| 24V DC | HL1-L-DC24V-F | HL2-L-DC24V-F |
| 48V DC | HL1-L-DC48V-F | HL2-L-DC48V-F |
| 100/110V DC | HL1-L-DC100V-F | HL2-L-DC100V-F |

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

### 3. PC board type

| Coil voltage | 1 Form C | 2 Form C |
|---|---|---|
| | Part No. | Part No. |
| 6V AC | HL1-HP-AC6V-F | HL2-HP-AC6V-F |
| 12V AC | HL1-HP-AC12V-F | HL2-HP-AC12V-F |
| 24V AC | HL1-HP-AC24V-F | HL2-HP-AC24V-F |
| 48V AC | HL1-HP-AC48V-F | HL2-HP-AC48V-F |
| 100/110V AC | HL1-HP-AC100V-F | HL2-HP-AC100V-F |
| 110/120V AC | HL1-HP-AC120V-F | HL2-HP-AC120V-F |
| 200/220V AC | HL1-HP-AC200V-F | HL2-HP-AC200V-F |
| 220/240V AC | HL1-HP-AC240V-F | HL2-HP-AC240V-F |
| 6V DC | HL1-HP-DC6V-F | HL2-HP-DC6V-F |
| 12V DC | HL1-HP-DC12V-F | HL2-HP-DC12V-F |
| 24V DC | HL1-HP-DC24V-F | HL2-HP-DC24V-F |
| 48V DC | HL1-HP-DC48V-F | HL2-HP-DC48V-F |
| 100/110V DC | HL1-HP-DC100V-F | HL2-HP-DC100V-F |

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

### 4. PC board type (with LED indication)

| Coil voltage | 1 Form C | 2 Form C |
|---|---|---|
| | Part No. | Part No. |
| 6V AC | HL1-PL-AC6V-F | HL2-PL-AC6V-F |
| 12V AC | HL1-PL-AC12V-F | HL2-PL-AC12V-F |
| 24V AC | HL1-PL-AC24V-F | HL2-PL-AC24V-F |
| 48V AC | HL1-PL-AC48V-F | HL2-PL-AC48V-F |
| 100/110V AC | HL1-PL-AC100V-F | HL2-PL-AC100V-F |
| 110/120V AC | HL1-PL-AC120V-F | HL2-PL-AC120V-F |
| 200/220V AC | HL1-PL-AC200V-F | HL2-PL-AC200V-F |
| 220/240V AC | HL1-PL-AC240V-F | HL2-PL-AC240V-F |
| 6V DC | HL1-PL-DC6V-F | HL2-PL-DC6V-F |
| 12V DC | HL1-PL-DC12V-F | HL2-PL-DC12V-F |
| 24V DC | HL1-PL-DC24V-F | HL2-PL-DC24V-F |
| 48V DC | HL1-PL-DC48V-F | HL2-PL-DC48V-F |
| 100/110V DC | HL1-PL-DC100V-F | HL2-PL-DC100V-F |

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

### 5. TM type

| Coil voltage | 1 Form C | 2 Form C |
|---|---|---|
| | Part No. | Part No. |
| 6V AC | HL1-HTM-AC6V-F | HL2-HTM-AC6V-F |
| 12V AC | HL1-HTM-AC12V-F | HL2-HTM-AC12V-F |
| 24V AC | HL1-HTM-AC24V-F | HL2-HTM-AC24V-F |
| 48V AC | HL1-HTM-AC48V-F | HL2-HTM-AC48V-F |
| 100/110V AC | HL1-HTM-AC100V-F | HL2-HTM-AC100V-F |
| 110/120V AC | HL1-HTM-AC120V-F | HL2-HTM-AC120V-F |
| 200/220V AC | HL1-HTM-AC200V-F | HL2-HTM-AC200V-F |
| 220/240V AC | HL1-HTM-AC240V-F | HL2-HTM-AC240V-F |
| 6V DC | HL1-HTM-DC6V-F | HL2-HTM-DC6V-F |
| 12V DC | HL1-HTM-DC12V-F | HL2-HTM-DC12V-F |
| 24V DC | HL1-HTM-DC24V-F | HL2-HTM-DC24V-F |
| 48V DC | HL1-HTM-DC48V-F | HL2-HTM-DC48V-F |
| 100/110V DC | HL1-HTM-DC100V-F | HL2-HTM-DC100V-F |

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

# RATING

## 1. Coil data

### 1) AC coils

| Nominal coil voltage | Nominal coil current (mA) | | Nominal operating power (VA) | | 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 | |
| 6V AC | 224 | 200 | 1.3 | 1.2 | 80%V or less of nominal voltage (Initial) | 30%V or more of nominal voltage (Initial) | 0.078 | 0.074 | 110%V of nominal voltage |
| 12V AC | 111 | 100 | 1.3 | 1.2 | | | 0.312 | 0.295 | |
| 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 applied 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)

| Nominal 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

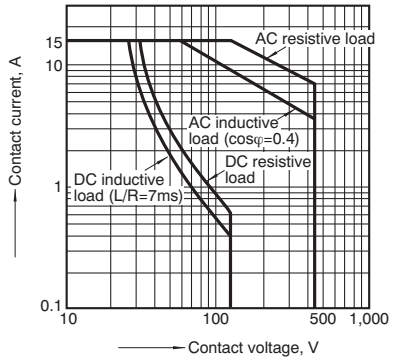
| Characteristics | Item | | Specifications |
|---|---|---|---|
| Contact | Initial contact resistance, max | | Max. 50 mΩ (By voltage drop 6 V DC 1A) |
| | Contact material | | $AgSnO_2$ type |
| Rating | Nominal switching capacity | | 1 Form C: 15A 125V AC, 10A 250V AC (resistive load)<br>2 Form C: 10A 125V AC (resistive load) |
| | Min. switching capacity (Reference value)*1 | | 100mA 5V DC |
| Electrical characteristics | Insulation resistance (Initial) | | Min. 100MΩ (at 500V DC)<br>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 | 1,500 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 | | DC type/AC type: Max. 25ms (Nominal voltage applied to the coil, excluding contact bounce time.) |
| | Release time (at 20°C 68°F)*2 | | DC type/AC type: Max. 25ms (Nominal voltage applied to the coil, excluding contact bounce time.) (without diode) |
| Mechanical characteristics | Shock resistance | Functional | Min. 196 m/s² (Half-wave pulse of sine wave: 11 ms; detection time: 10μs.) |
| | | Destructive | Min. 980 m/s² (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: $5\times10^7$ (at 180 cpm), DC type: $10^8$ (at 180 cpm) |
| | Electrical | AC load | 1 Form C: 15A 125V AC, 10A 250V AC resistive load ($\cos\varphi=1$) Life switching cycle: Min. $5\times10^5$<br>2 Form C: 10A 250V AC resistive load ($\cos\varphi=1$) Life switching cycle: Min. $3\times10^5$ |
| | | DC load | 1 Form C: 3A 30V DC resistive load ($\cos\varphi=1$) Life switching cycle: Min. $5\times10^5$<br>2 Form C: 3A 30V DC resistive load ($\cos\varphi=1$) Life switching cycle: Min. $5\times10^5$ |
| Conditions | Conditions for operation, transport and storage*3 | | Ambient temperature: –50°C to +70°C –58°F to +158°F (Without LED indication);<br>–50°C to +60°C –58°F to +140°F (With LED indication)<br>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).

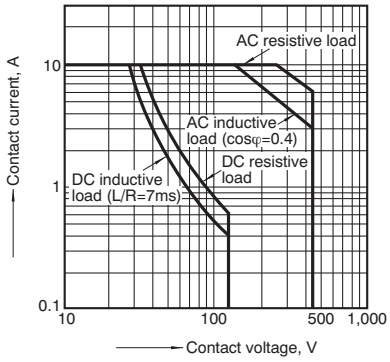
*1 This value can change due to the switching frequency, environmental conditions and desired reliability level, therefore it is recommended to check this with the actual load.
*2 For the AC coil types, the operate/release time will differ depending on the phase.
*3 The upper operation ambient temperature limit is the maximum temperature that can satisfy the coil temperature rise value. Refer to “6. Usage, Storage and Transport Conditions“ in AMBIENT ENVIRONMENT section in Relay Technical Information.

# REFERENCE DATA

Switching capacity range (1 Form C)




Switching capacity range (2 Form C)




# DIMENSIONS(mm inch)

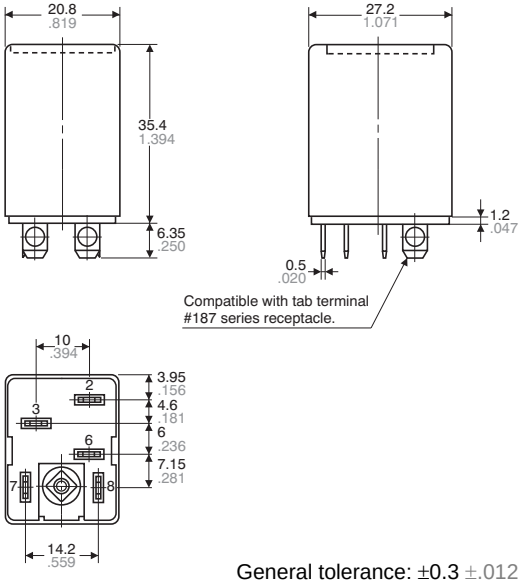
Download CAD Data from our Web site.

## 1. Plug-in type

1 Form C

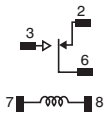
CAD Data

External dimensions

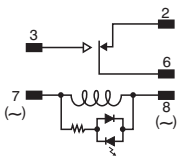



Schematic (Bottom view)

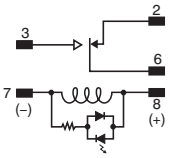
Standard type



LED AC type



LED DC type

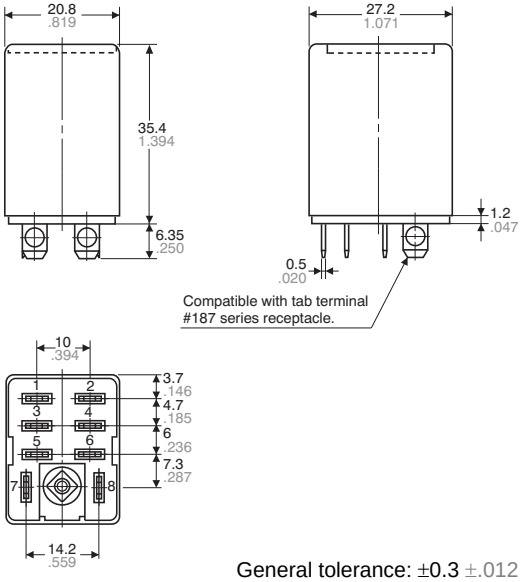


General tolerance: ±0.3 ±.012

2 Form C

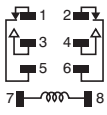
CAD Data

External dimensions

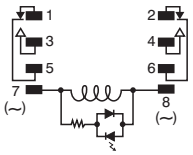



Schematic (Bottom view)

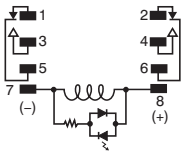
Standard type



LED AC type



LED DC type



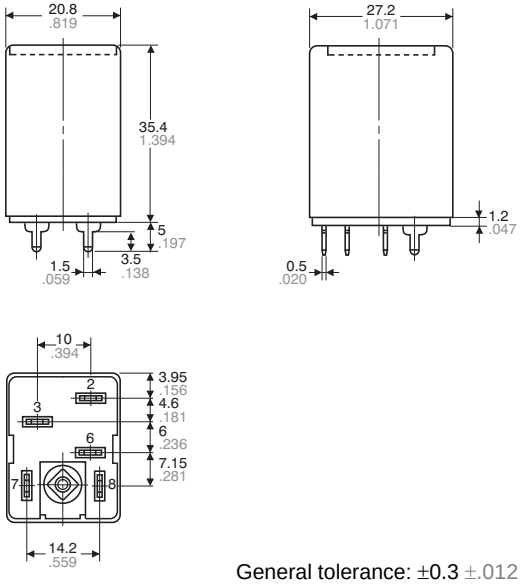
General tolerance: ±0.3 ±.012

## 2. PC board type

1 Form C

CAD Data

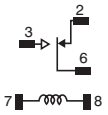
External dimensions



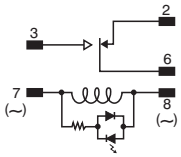

General tolerance: ±0.3 ±.012

Schematic (Bottom view)

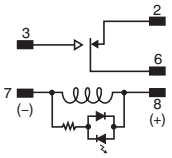
Standard type



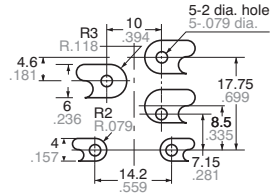

LED AC type




LED DC type




PC board pattern (Bottom view)

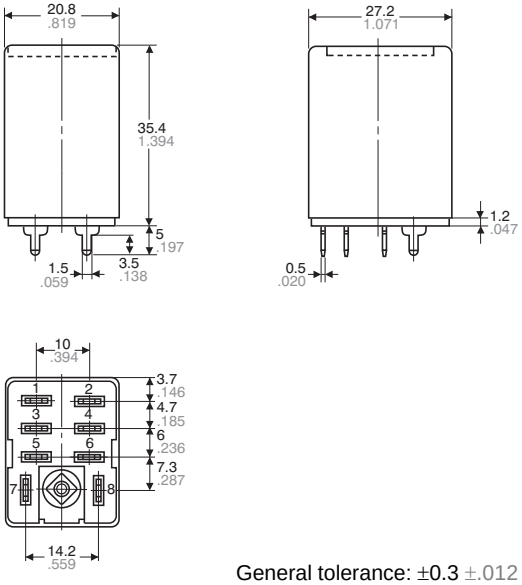



Tolerance: ±0.1 ±.004

2 Form C

CAD Data

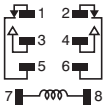
External dimensions



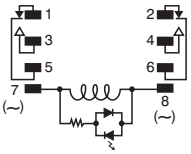

General tolerance: ±0.3 ±.012

Schematic (Bottom view)

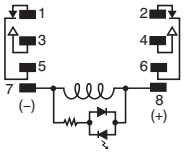
Standard type



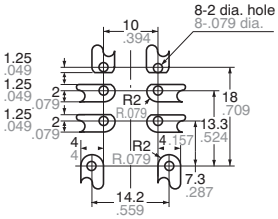

LED AC type




LED DC type




PC board pattern (Bottom view)



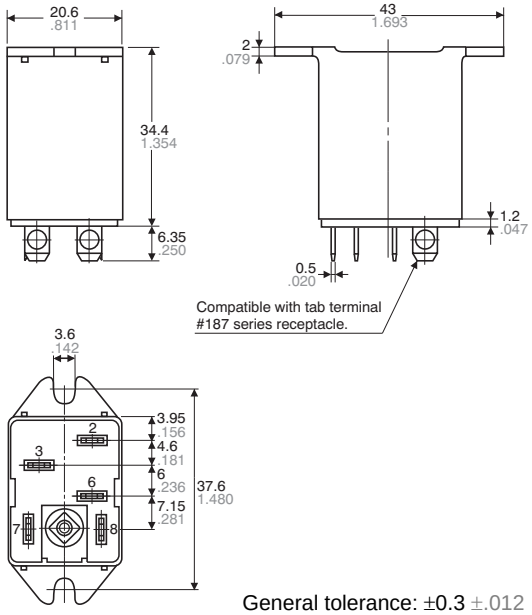

Tolerance: ±0.1 ±.004

### 3. TM type

1 Form C

CAD Data

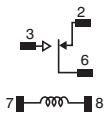
External dimensions



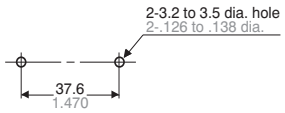

General tolerance: ±0.3 ±.012

Schematic (Bottom view)

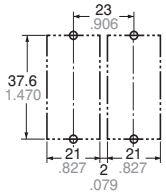
Standard type




Chassis (Panel) cutout




Chassis (Panel) cutout in tandem mounting



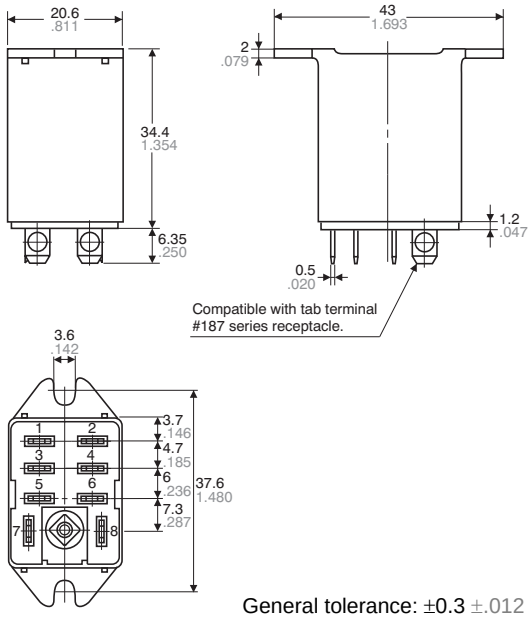

Tolerance: ±0.1 ±.004

Notes:
1. If connecting to #187 series tab terminals, use AMP Faston #187 series or #187 tab terminals conforming to UL or CSA inch-standard dimensions.
2. In mounting, use M3 screws and M3 washers.
3. When mounting TM types, use washers to prevent damage or distortion to the polycarbonate cover.
4. When tightening fixing screws, the optimum torque range should be 0.294 to 0.49 N·m, (3 to 5 kgf·cm). Moreover, use washers to prevent loosening.

2 Form C

CAD Data

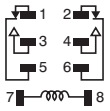
External dimensions



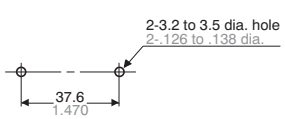

General tolerance: ±0.3 ±.012

Schematic (Bottom view)

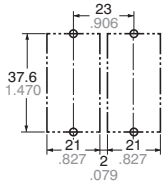
Standard type




Chassis (Panel) cutout




Chassis (Panel) cutout in tandem mounting




Tolerance: ±0.1 ±.004

Notes:
1. If connecting to #187 series tab terminals, use AMP Faston #187 series or #187 tab terminals conforming to UL or CSA inch-standard dimensions.
2. In mounting, use M3 screws and M3 washers.
3. When mounting TM types, use washers to prevent damage or distortion to the polycarbonate cover.
4. When tightening fixing screws, the optimum torque range should be 0.294 to 0.49 N·m, (3 to 5 kgf·cm). Moreover, use washers to prevent loosening.

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

# TYPES

**1. HL relay connection accessories include plug-in sockets, PC board sockets, and terminal socket for DIN rails.**
**2. UL/CSA approval is standard.**

**3. A hold-down clip is included in the package.**

The fixing method is the same as for HL sockets, HC sockets and ordinary HC terminal sockets.

HC/HL-LEAF-SPRING-MK

The fixing method is the same as for the HL DIN rail terminal sockets and the HC DIN terminal sockets.

HC/HL-LEAF-SPRING-K

| Type | No. of poles | Item | Part No. | Packing quantity | |
|---|---|---|---|---|---|
| | | | | Carton | Case |
| Plug-in socket | 1-pole | HL1 socket | HL1-SS-K | 20 pcs. | 200 pcs. |
| | 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 | | |
| ⓘ DIN rail terminal socket | 1/2-pole (common) | ⓘ HL2-DIN terminal socket | ⓘ HL2-SFD-K | 10 pcs. | 100 pcs. |

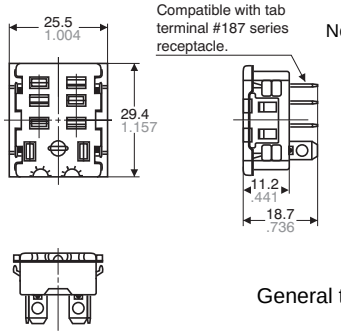
# DIMENSIONS (Unit: mm inch)

**1. Plug-in type sockets**

HL1 Socket (HL1-SS-K)

HL2 Socket (HL2-SS-K)

HL1 socket External dimensions



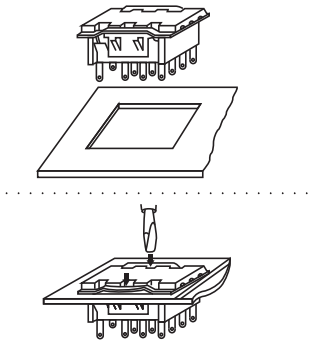

Note: The external and mounting dimensions of HL2 socket are the same for HL1 socket types. Only the number of terminals varies.

General tolerance: ±0.3 ±.012

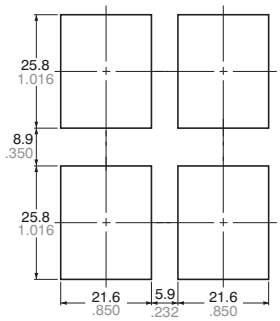
Hold-down clip

Hold-down clip is packaged with the socket.
(Applied to HC sockets and ordinary HC terminal sockets)

Mounting hole diagram



Side-by-side installation




Tolerance: ±0.1 ±.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.

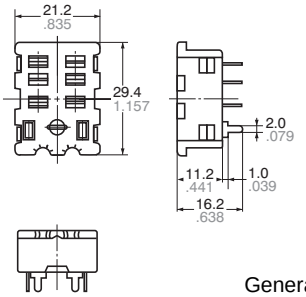
The HL2-DIN terminal socket will be discontinued December 31, 2013.
Please order the HK2-DIN terminal socket instead.

## 2. 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 of HL2 PC board type socket are the same for HL1 PC board type socket. Only the number of terminals varies.

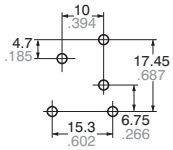
General tolerance: ±0.3 ±.012

Hold-down clip

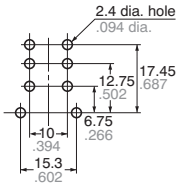
Hold-down clip is packaged with the socket.
(Applied to HC sockets and ordinary HC terminal sockets)

PC board pattern (Bottom view)

1 Form C

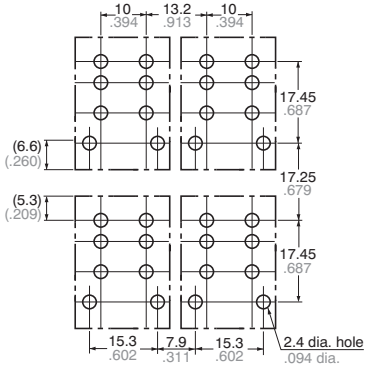



2 Form C




Tolerance: ±0.1 ±.004

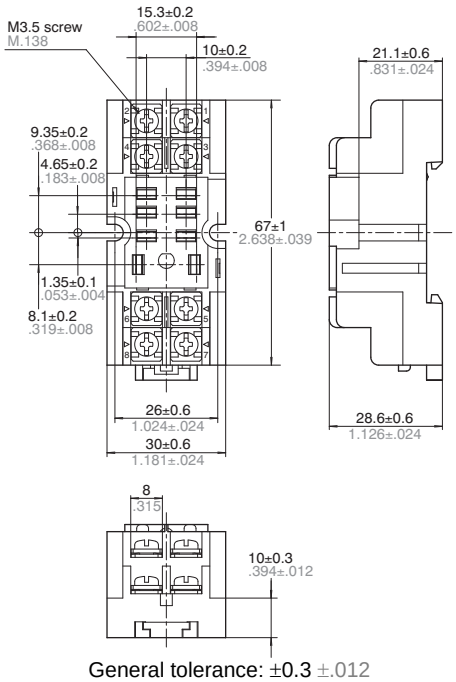
Side-by-side installation (For 2 Form C)




Tolerance: ±0.1 ±.004

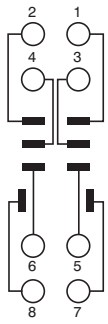
## 3. Terminal sockets for DIN rail assembly (HL2-SFD-K)

HL2-terminal sockets for DIN rail
External dimensions




General tolerance: ±0.3 ±.012

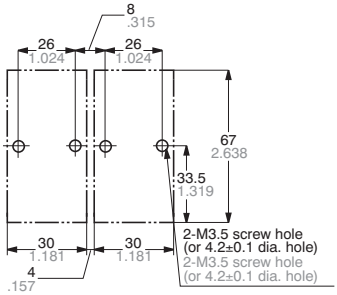
Schematic




With a relay mounted

Hold-down clip is packaged with the terminal socket. (Applied to HC DIN rail terminal sockets)

Mounting hole diagram




Tolerance: ±0.1 ±.004

Chassis (Panel) cutout in tandem (side-by-side) mounting

*To prevent damage or distortion, when tightening fixing screws, the optimum torque range should be 0.784 to 0.98 N·m, (8 to 10 kgf·cm).

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