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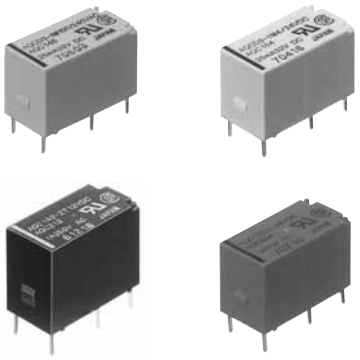
**Miniature DIL 1A control type for PCBs**

# AQ-C RELAYS



## FEATURES

- **Compact DIL type: L20 mm × W10 mm × H12.8 mm (.787×.394×.504 inch)**
- **Excellent in noise resistance**
- **Snubber circuit integrated**
- **High dielectric strength: 2,500 V between input and output**
- **Reverse polarity type available**

## TYPICAL APPLICATIONS

- **Compact AC motor, Solenoid, Magnet, Driver of magnetic valve**
- **Copying equipment**
- **NC machine, Robot**
- **Programmable controller**
- **Air conditioners**

**Compliance with RoHS Directive**

## ORDERING INFORMATION

**AQC** □ □ - □ □ - □

Load current
Nil: Input module
1A: Output module

Load voltage
1: 75 to 125 V AC (Output module)
2: 75 to 250 V AC (Output module)
D1: 3 to 60 V DC (Output module)
D3: 4 to 32 V DC (Input module)

Type
Nil: DC output
IM: Input module
T: AC output Random
ZT: AC output Zero-cross

Input voltage
Output module: 5, 12, 24 V DC
Input module: 4/24 V DC, 100/240 V AC

Input polarity
Nil: Standard polarity
R: Reverse polarity (Only for output module)

## TYPES

**1. Input module**

| Type | Output voltage | Input voltage | Part No. |
|---|---|---|---|
| AC input | 4 to 32 V DC | 80 to 250 V AC | AQCD3-IM 100/240 V AC |
| DC input | 4 to 32 V DC | 3 to 32 V DC | AQCD3-IM 4/24 V DC |

Standard packing: Carton: 50 pcs.; Case: 500 pcs.

### 2. Output module

| Type | Load voltage | Input voltage | Part No. |
|---|---|---|---|
| AC output Zero-cross | 75 to 125 V AC | 5 V DC | AQC1A1 - ZT5 V DC |
| | | 12 V DC | AQC1A1 - ZT12 V DC |
| | | 24 V DC | AQC1A1 - ZT24 V DC |
| | 75 to 250 V AC | 5 V DC | AQC1A2 - ZT5 V DC |
| | | 12 V DC | AQC1A2 - ZT12 V DC |
| | | 24 V DC | AQC1A2 - ZT24 V DC |
| AC output Random | 75 to 125 V AC | 5 V DC | AQC1A1 - T 5 V DC |
| | | 12 V DC | AQC1A1 - T 12 V DC |
| | | 24 V DC | AQC1A1 - T 24 V DC |
| | 75 to 250 V AC | 5 V DC | AQC1A2 - T 5 V DC |
| | | 12 V DC | AQC1A2 - T 12 V DC |
| | | 24 V DC | AQC1A2 - T 24 V DC |
| DC output | 3 to 60 V DC | 5 V DC | AQC1AD1- 5 V DC |
| | | 12 V DC | AQC1AD1- 12 V DC |
| | | 24 V DC | AQC1AD1- 24 V DC |

Standard packing: Carton: 50 pcs.; Case: 500 pcs.
Note: Reverse polarity type (AQC5∗∗ and AQC6∗∗) is also produced by lot after receipt of order.

# SPECIFICATIONS

**Rating** [at 20°C 68°F; Input voltage ripple (output module) and output voltage ripple (input module): max. 1%]

### 1. Input module

| Item | Type | AC input | DC input | Remarks |
|---|---|---|---|---|
| | | AQCD3-M 100/240 V AC | AQCD3-IM 4/24 V DC | |
| Input side | Input voltage | 80 to 250 V AC | 3 to 32 V DC | |
| | Input current | Max. 5 mA | Max. 5 mA | |
| | Pick-up voltage | Max. 80 V AC | Max. 3 V DC | |
| | Drop-out voltage | Min. 10 V AC | Min. 1 V DC | |
| Output side | Load voltage | 4 to 32 V DC | 4 to 32 V DC | |
| | Load current | 0.1 to 25 mA | 0.1 to 25 mA | |
| | Max. “OFF-state” leakage current | Max. 5μA | Max. 5μA | When 32 V DC applied |
| | Max. “ON-state” voltage drop | Max. 1.6 V | Max. 1.6 V | at max. carrying current |

### 2. Output module

(1) AC output type

| Item | Type | AQC1A1-ZT5VDC AQC1A1-T5VDC | AQC1A1-ZT12VDC AQC1A1-T12VDC | AQC1A1-ZT24VDC AQC1A1-T24VDC | AQC1A2-ZT5VDC AQC1A2-T5VDC | AQC1A2-ZT12VDC AQC1A2-T12VDC | AQC1A2-ZT24VDC AQC1A2-T24VDC | Remarks |
|---|---|---|---|---|---|---|---|---|
| Input side | Input voltage | (5 V type) 4 to 6 V DC | (12 V type) 9.6 to 14.4 V DC | (24 V type) 21.6 to 26.4 V DC | (5 V type) 4 to 6 V DC | (12 V type) 9.6 to 14.4 V DC | (24 V type) 21.6 to 26.4 V DC | *3 |
| | Input impedance (Approx.) | 0.3 kΩ | 0.8 kΩ | 1.8 kΩ | 0.3 kΩ | 0.8 kΩ | 1.8 kΩ | |
| | Drop-out voltage, min | 0.5 V | 1.2 V | 2.4 V | 0.5 V | 1.2 V | 2.4 V | |
| Load side | Max. load current | 1 A*1 | | | | | | Ta = Max. 40°C 104°F |
| | Load voltage | 75 to 125 V AC | | | 75 to 250 V AC | | | |
| | Non-repetitive surge current | 20 A*2 | | | | | | In one cycle at 60 Hz |
| | Max. “OFF-state” leakage current | 0.6 m A (When 100 V AC applied) | | | 1.1 m A (When 200 V AC applied) | | | at 60 Hz |
| | Max. “ON-state” voltage drop | 1.6 A | | | | | | at max. carrying current |
| | Min. load current | 10 mA*4 | | | 20 mA*4 | | | |

(2) DC output type

| Item | Type | AQC1AD1-5VDC | AQC1AD1-12VDC | AQC1AD1-24VDC | Remarks |
|---|---|---|---|---|---|
| Input side | Input voltage | (5 V type) 4 to 6 V DC | (12 V type) 9.6 to 14.4 V DC | (24 V type) 21.6 to 26.4 V DC | *3 |
| | Input impedance (Approx.) | 0.43 kΩ | 1.2 kΩ | 2.8 kΩ | |
| | Drop-out voltage, min | 0.8 V | | | |
| Load side | Max. load current | 1 A*1 | | | Ta = Max. 40°C 104°F |
| | Load voltage | 3 to 60 V DC | | | |
| | Non-repetitive surge current | 1.5 A*2 | | | at 1s |
| | Max. “OFF-state” leakage current | 0.1 m A (When 60 V DC applied) | | | |
| | Max. “ON-state” voltage drop | 1.6 V | | | at max. carrying current |
| | Min. load current | 1 mA*4 | | | |

Notes: *1. Refer to REFERENCE DATA “1. Load current vs. ambient temperature”.
*2. Refer to REFERENCE DATA “2. Non-repetitive surge current vs. carrying time”.
*3. Refer to REFERENCE DATA “3. Input current vs. input voltage characteristics”.
*4. When the load current is less than the rated minimum load current, please refer to “Cautions for Use of SSR”.

# AQ-C

**Characteristics** [at 20°C 68°F; Input voltage ripple (output module) and output voltage ripple (input module): max. 1%]

**Input module**

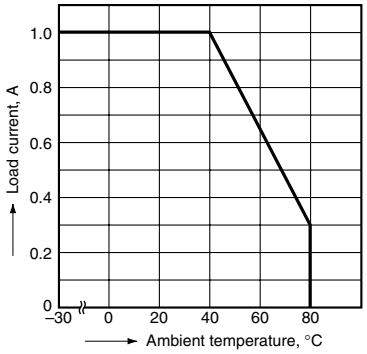
| Item \ Type | | AC Input | DC Input | Remarks |
|---|---|---|---|---|
| Operate time, max. | | 20 ms | 0.5 ms | Input voltage: 24 V DC or 100V AC<br>Output voltage: 24 V DC<br>Output current: 25mA |
| Release time, max | | 20 ms | 0.5 ms | |
| Insulation resistance, min. | | $10^9$ Ω between input and output | | at 500 V DC |
| Breakdown voltage | | 2,500 Vrms between input and output | | For 1 minute |
| Vibration resistance | Destructive | 10 to 55Hz double amplitude of 3 mm | | 1 hour for X,Y, Z, axis |
| | Functional | 10 to 55Hz double amplitude of 3 mm | | 10 minutes for X,Y, Z, axis |
| Shock resistance | Destructive | Min. 980 m/s² {100 G} | | 5 time each for X,Y,Z axis |
| | Functional | Min. 980 m/s² {100 G} | | 4 time each for X,Y,Z axis |
| Ambient temperature | | –30°C to +80°C –22°F to +176°F | | |
| Storage temperature | | –30°C to +100°C –22°F to +212°F | | |

**Output module**

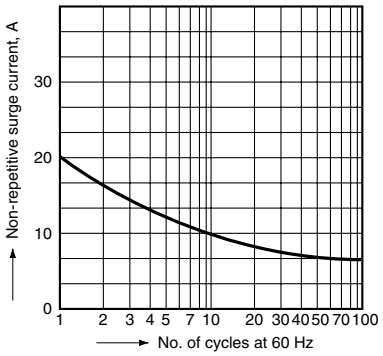
| Type \ Item | | AC output | | DC output | Conditions |
|---|---|---|---|---|---|
| | | Random | Zero-cross | | |
| Operate time, max. | | 1 ms | 1/2 cycle of voltage sine wave + 1ms | 0.5 ms | |
| Release time, max. | | 1/2 cycle of voltage sine wave + 1ms | | 1 ms | |
| Insulation resistance, min. | | $10^9$Ω between input and output | | | at 500 V DC |
| Breakdown voltage | | 2,500 Vrms between input and output | | | For 1 minute |
| Vibration resistance | Destructive | 10 to 55Hz double amplitude of 3 mm | | | 1 hour for X,Y, Z, axis |
| | Functional | 10 to 55Hz double amplitude of 3 mm | | | 10 minutes for X,Y, Z, axis |
| Shock resistance | Destructive | Min. 980 m/s² {100 G} | | | 5 time each for X,Y,Z axis |
| | Functional | Min. 980 m/s² {100 G} | | | 4 time each for X,Y,Z axis |
| Ambient temperature | | –30°C to +80°C –22°F to +176°F | | | |
| Storage temperature | | –30°C to +100°C –22°F to +212°F | | | |
| Operational method | | Random Turn-ON, Zero-cross Turn-OFF | Zero-cross (Turn-ON and Turn-OFF) | — | |

# REFERENCE DATA

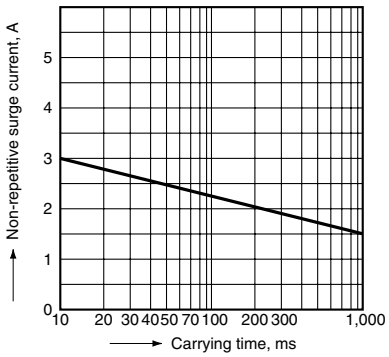
1. Load current vs. ambient temperature (AC/DC output)



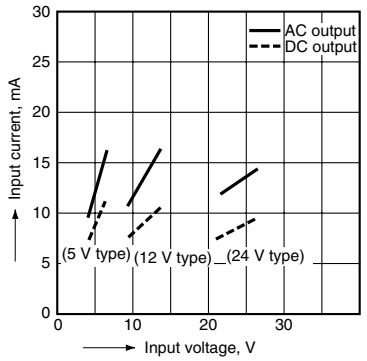

2.-(1) Non-repetitive surge current vs. carrying time (AC output)



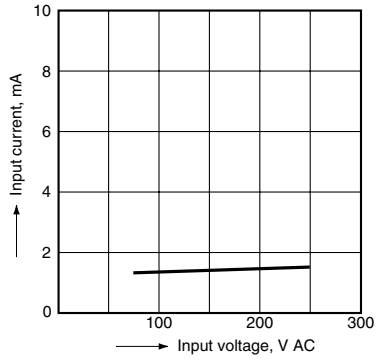

2.-(2) Non-repetitive surge current vs. carrying time (DC output)



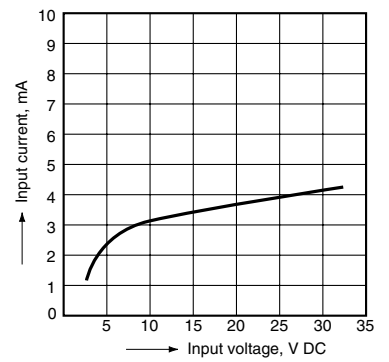

3. Input current vs. input voltage characteristics (AC/DC output)



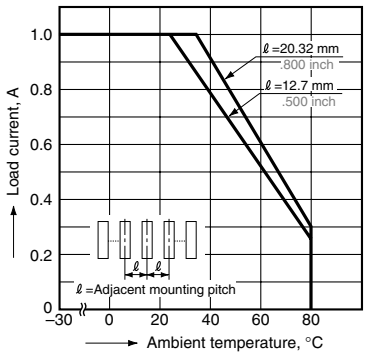

4.-(1) Input current vs. input voltage characteristics (AC input)
Tested sample: AQCD3-IM100/240 V AC, 5 pcs.




4.-(2) Input current vs. input voltage characteristics (DC input)
Tested sample: AQCD3-IM4/24 V DC



5. Load current vs. ambient temperature characteristics for adjacent mounting

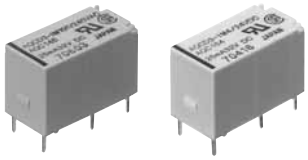


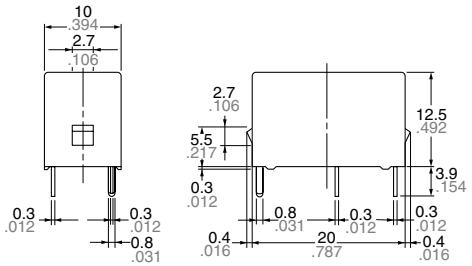

# DIMENSIONS (mm inch)

The CAD data of the products with a **CAD Data** mark can be downloaded from: http://panasonic-electric-works.net/ac

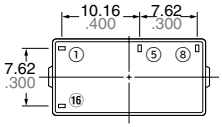
## 1. Input module (AC, DC)

**CAD Data**



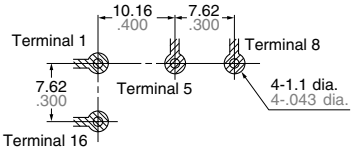



| AC input | DC input |
|---|---|
| ⑤···Output: DC– | ⑤···Output: DC– |
| ⑧···Output: DC+ | ⑧···Output: DC+ |
| ⑯···Input: AC | ⑯···Input: DC+ |
| ①···Input: AC | ①···Input: DC– |
| Case color: Yellow | Case color: White |



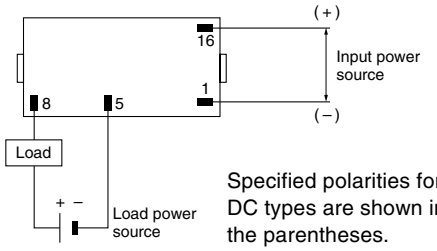

General tolerance: ±0.5 ±.020

PC board pattern (Copper-side view)




Tolerance: ±0.1 ±.004

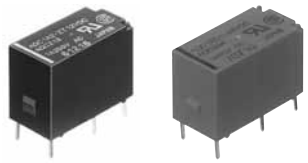
Schematic

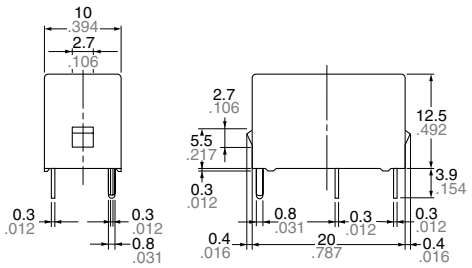



Specified polarities for DC types are shown in the parentheses.

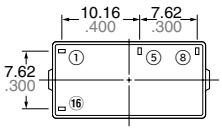
## 2. Output module (AC, DC)

**CAD Data**



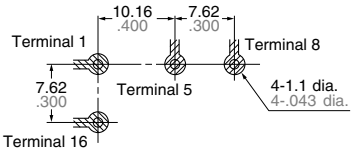



| AC output | DC output |
|---|---|
| ⑤···Output: AC | ⑤···Output: DC– |
| ⑧···Output: AC | ⑧···Output: DC+ |
| ⑯···Input: DC+ | ⑯···Input: DC+ |
| ①···Input: DC– | ①···Input: DC– |
| Case color: Black | Case color: Red |



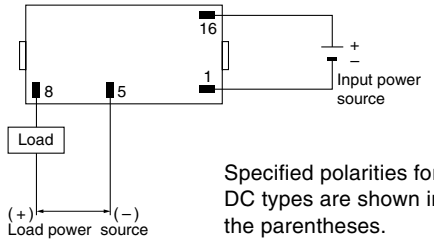

General tolerance: ±0.5 ±.020

PC board pattern (Copper-side view)




Tolerance: ±0.1 ±.004

Schematic




Specified polarities for DC types are shown in the parentheses.

# ACCESSORY

PC1A-PS

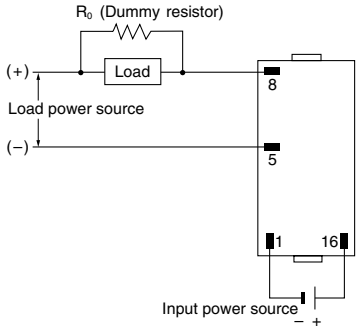
# NOTE

**When used for the load less than rated**

In the case of the load current less than rated, malfunction may result from the residual voltage across the both ends of the load even if the solid state relay is turned off.

Use a dummy resistor as a countermeasure.

The total of the current through the resistor and the load current must exceed the min. rated load current.



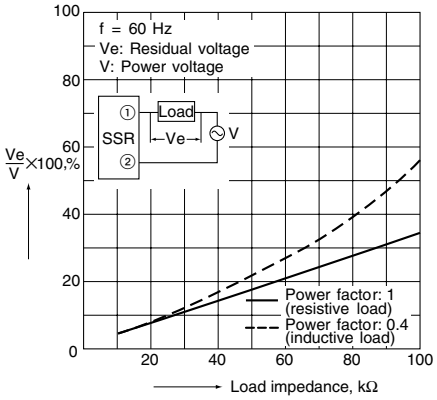

In case the dummy resistor is not used, keep in mind that the residual voltage becomes as follows:

Example:

For the inductive load by the 5 mA load current and the 200 V AC load voltage, the load impedance becomes 40 kW and Ve/V = 16% is estimated from the below graph.

Accordingly, the 32 V voltage remains across the both ends of the load when the solid state relay is turned off.

**• Characteristics of residual voltage vs. load impedance**




## For Cautions for Use.