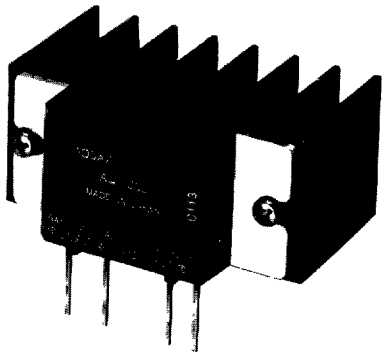
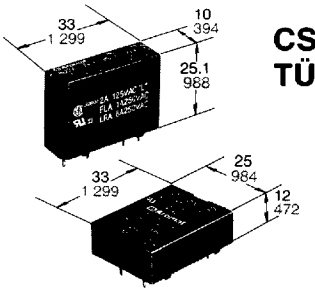
NAiS

AQ1 SOLID STATE RELAY

AQ1-RELAYS





mm inch

UL File No.: E57521 (DC output type)
E57520 (AC output type)
CSA File No.: LR26550
TÜV File No.: 85011645510

- **Strong against high inrush current and long life**
  Optical isolation: 5×10^7 operations
- **No chattering or bouncing and no arc generation**
- **Both slim and flat package available**
- **SIL (single in line) terminal layout**
- **Zero-voltage turn-ON and Zero-current turn-OFF for eliminating surge and reducing inrush currents and EMI**

TYPES

1. AQ1 Solid State Relays

Load	Isolation	Zero-cross function	Type		Input voltage	Load current Load voltage	Part No.
AC	Optically coupled isolation	Zero-cross	Standard type	2 A	3 to 28 V DC	2 A, 75 to 250 V AC	AQ2A2-ZP3/28VDC
				2 A (flat)	3 to 28 V DC	2 A, 75 to 250 V AC	AQ2A2-J-ZP3/28VDC
				5 A	3 to 28 V DC	5 A, 75 to 250 V AC (3 A without heat sink)	AQ5A2-ZP3/28VDC
DC	Optically coupled isolation	—	1 A		3 to 28 V DC	1 A, 10 to 200 V DC	AQ1AD2-3/28VDC
			2 A		3 to 28 V DC	2 A, 3 to 60 V DC	AQ2AD1-3/28VDC

2. Heat sink for AQ1 solid state relay (for 5 A types): AQ-HS-5A

ORDERING INFORMATION

AQ [2A] [2] — [J] — [ZP] [3/28 VDC]

Load current	Load voltage	Shape	Type	Input voltage
1 A 2 A 5 A	2: 75 to 250 V AC D1: 3 to 60 V DC D2: 10 to 200 V DC	Nil: Vertical type J: Flat type	Nil: DC output ZP: AC output (Zero-cross)	3/28 V DC: 3 to 28 V DC

APPLICATIONS

- Traffic signal control
- Terminal equipment of data processing
- Computer peripherals
- NC machines
- Automatic ticket punchers

SPECIFICATIONS

Rating (at 20°C 68°F, Ripple factor: less than 1%)

1. AC output type

		Standard type		Remarks
		2 A	5 A	
Input side	Input voltage	3 to 28 V DC		
	Input impedance	Approx. 1.6 kΩ (3 to 28 V DC)		
	Drop-out voltage, min.	0.8 V		
Load side	Max. load current	2 A	5 A*	*5 A with heat sink 3 A without heat sink See "Data 4"
	Load voltage	75 to 250 V AC		
	Non-repetitive surge current	80 A	100 A	See "Data 1" In one cycle at 60 Hz
	Max. "OFF-state" leakage current	5 mA		at 200 V AC 60 Hz
	Max. "ON-state" voltage drop	1.6 V		at Max. carrying current
	Min. load current	50 mA		

UL/CSA rating	
AQ2A type	2 A 125 V AC, 250 V AC 2 A 125 V AC "L" FLA 1 A 125 V, 250 V AC LRA 6 A 125 V, 250 V AC
AQ5A type	5 A 125 V AC, 250 V AC 5 A 125 V AC "L" FLA 2.5 A 125 V, 250 V AC LRA 15 A 125, 250 V AC

2. DC output type

		1 A type	2 A type	Remarks
Input side	Input voltage	3 to 28 V DC		
	Input impedance	Approx. 1.6 kΩ		
	Drop-out voltage, min.	0.8 V		
Load side	Max. load current	1 A	2 A	at ambient temperature 40°C 104°F
	Load voltage	10 to 200 V DC	3 to 60 V DC	
	Non-repetitive surge current	5 A (1 sec.)		
	Max. "OFF-state" leakage current	1 mA		
	Max. "ON-state" voltage drop	2.3 V	1.6 V	
	Min. load current	5 mA		

Characteristics (at 20°C 68°F, Ripple factor: less than 1%)

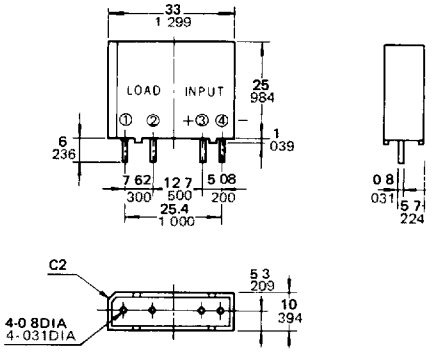
		AC output, Zero-cross, Standard type		DC output	Remarks
		2 A	5 A		
Operate time, Max.		(1/2 cycle of voltage sine wave) +1 msec.		0.5 msec.	
Release time, Max.		(1/2 cycle of voltage sine wave) + 1 msec.		2 msec.	
Insulation resistance, Min.		100 MΩ for input, output and case		100 MΩ for input-output	by 500 V DC
Breakdown voltage		3,000 Vrms for input- output	3,000 Vrms for input-output 1,500 Vrms for input, output-case	3,000 Vrms for input-output	
Vibration resistance	Destructive	12 G, 10 to 55 Hz at double amplitude of 2 mm			1 hour for X, Y, Z axis
	Functional	12 G, 10 to 55 Hz at double amplitude of 2 mm			10 minutes for X, Y, Z axis
Shock resistance	Destructive	100 G		100 G	5 times each for X, Y, Z axis
	Functional	100 G		100 G	4 times each for X, Y, Z axis
Ambient temperature		−30°C to +80°C −22°F to +176°F		−30°C to +80°C −22°F to +176°F	
Storage temperature		−30°C to +100°C −22°F to +212°F			
Operational method		Zero-cross (Turn-ON and Turn-OFF)		—	

DIMENSIONS

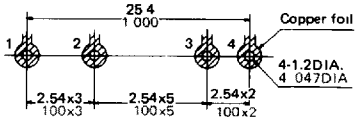
mm inch

2 A type

Zero-cross (standard)
DC type (1 A, 2 A)



PC board pattern (Copper-side view)

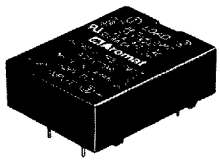


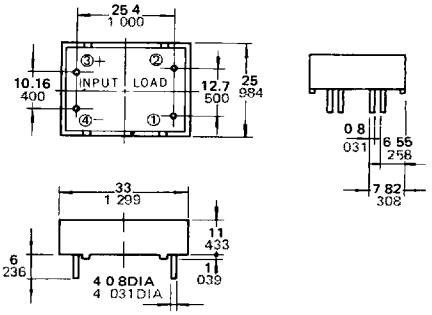
General tolerance: ±0.5 ± 020

Tolerance: ±0.1 ±.004

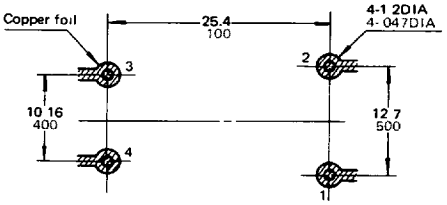
2 A type

Zero-cross (standard, flat)





PC board pattern (Copper side view)

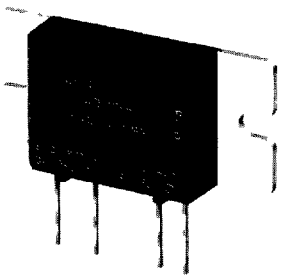


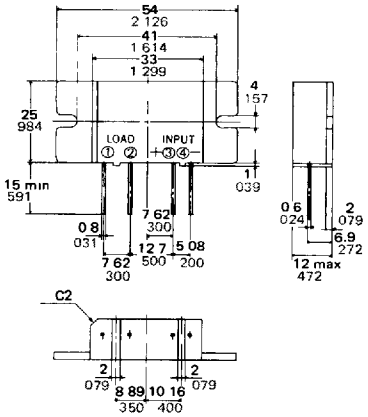
General tolerance: ±0.5 ± 020

Tolerance: ±0.1 ± 004

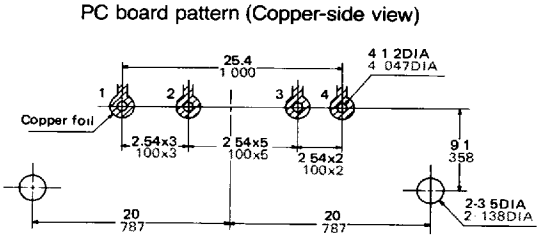
5A type

Zero-cross (low leakage, standard)





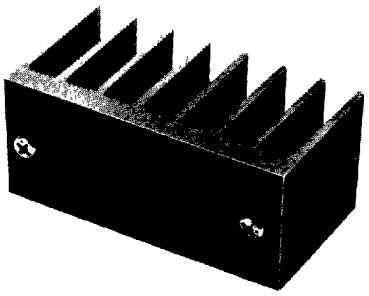
PC board pattern (Copper-side view)

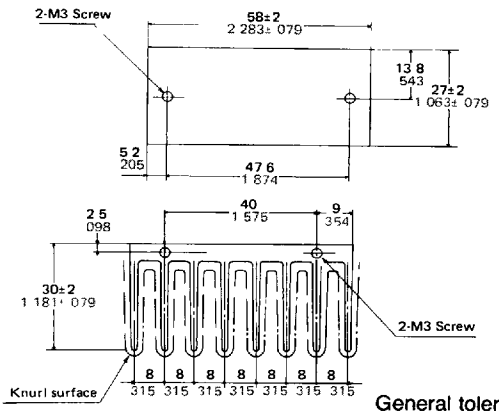


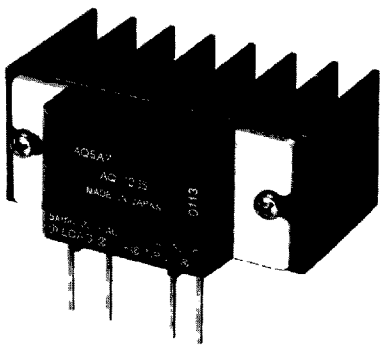
General tolerance: ±0.50 ±.020

Tolerance: ±0.1 ±.004

Heat sink (for 5 A types)





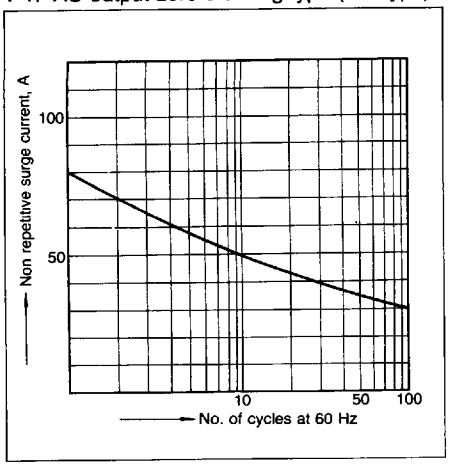


General tolerance: ±0.5 ± 020

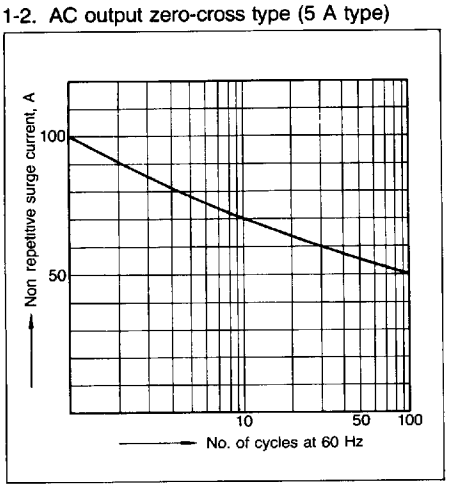
DATA

1. Non-repetitive surge current vs carrying time

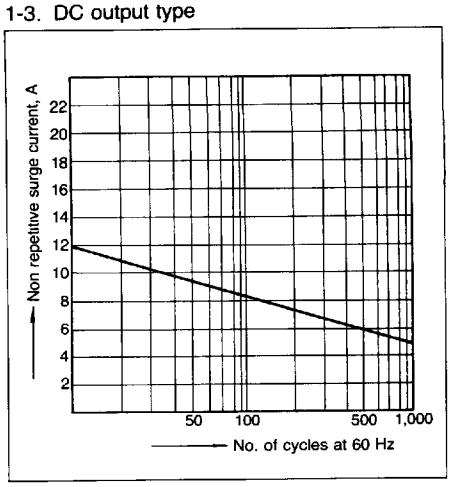
1-1. AC output zero-crossing type (2 A type)



1-2. AC output zero-cross type (5 A type)

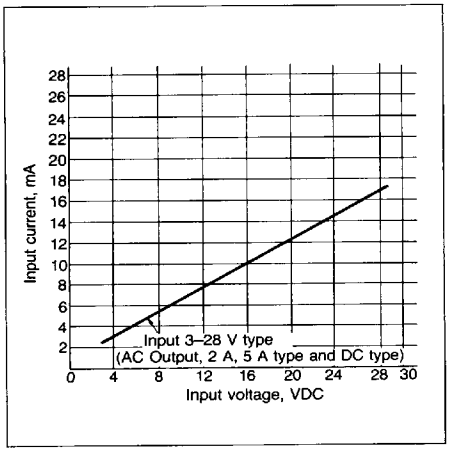


1-3. DC output type



2. Input characteristics

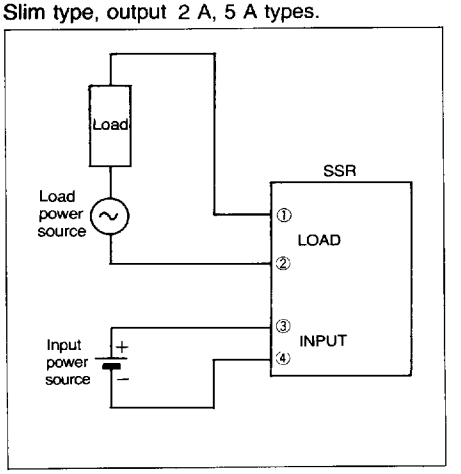
2-1. Input voltage vs input current



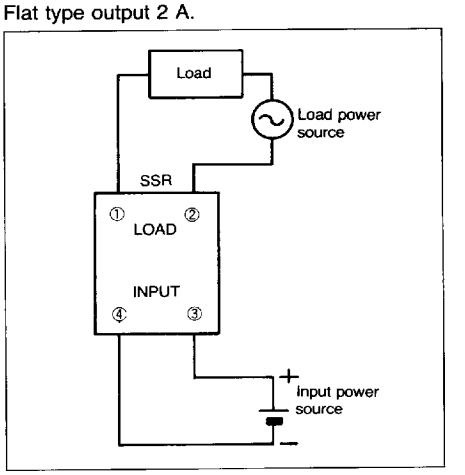
3. Schematic

1) When load is driven directly.

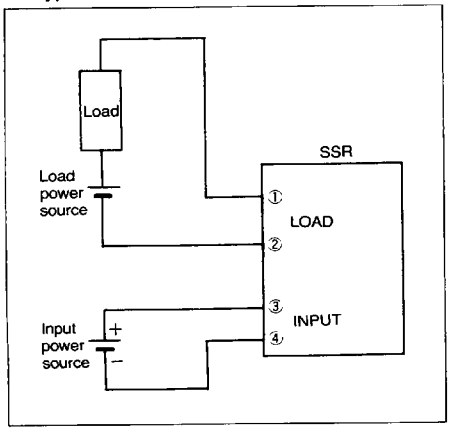
Slim type, output 2 A, 5 A types.



Flat type output 2 A.

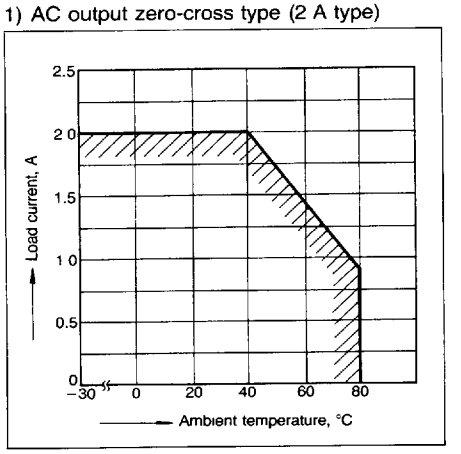


DC type



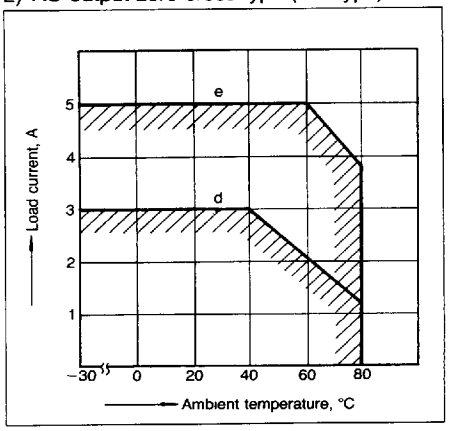
4. Load current vs. ambient temperature

1) AC output zero-cross type (2 A type)



Allowable ambient temperature:
−30°C to +80°C −22°F to +176°F

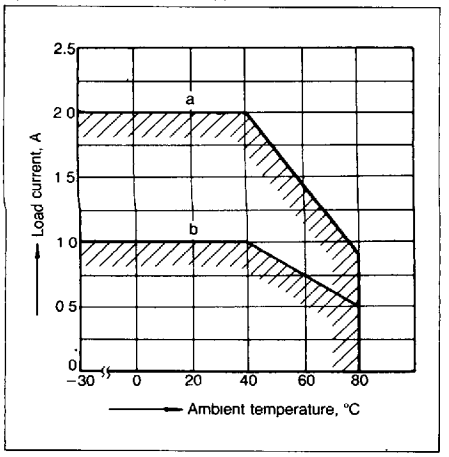
2) AC output zero-cross type (5 A type)



d. External heat sink is not used.

e. In the case of mounting on heat sink (AQ-HS-5A) or 66×66×2.0 thick aluminum plate. The AQ-HS-5A heat sink is mounted on the printed circuit board. The load current is improved compared with the unmounted condition as indicated in the diagram above. When the 5 A type heat sink (AQ-HS-5A) or a heat sink is not use, in order to provide good cooling conditions, the back surface plate should be exposed.

3) DC type (1 A, 2 A type)



a. DC type (2 A type)
Allowable temperature range:
−30°C to +80°C −22°F to +176°F

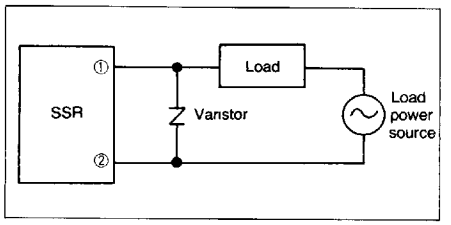
b. DC type (1 A type)
Allowable temperature range:
−30°C to +80°C −22°F to +176 F

REMARKS

1. Regarding the output side

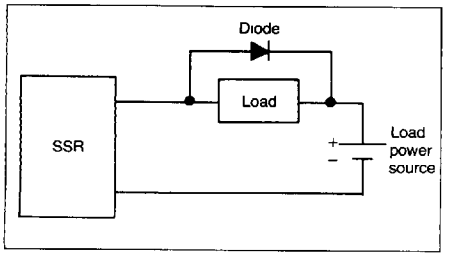
1) AC output type

When large noise and surge are impressed on the load side, there is the possibility of the occurence of miscontact or damage. In such a case, a varistor should be inserted in the circuit.



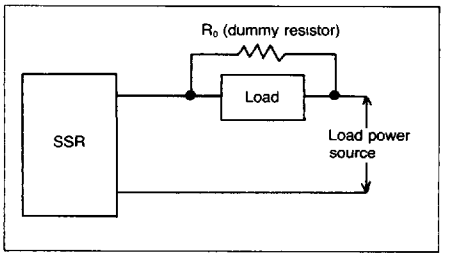
2) DC output type

In the case of solenoids, motors, electromagnetic valves, etc., as inductive loads, a diode should be connected at both ends of the load to prevent counter EMF.



3) When loads lower than the rated value are used

Because there is the possibility of the occurence of miscontact, a dummy resistor should be used.

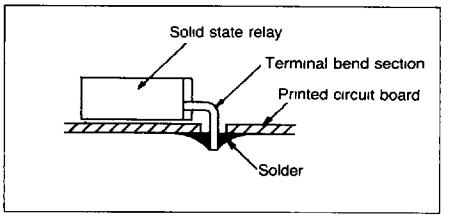


Rated value of load

Type		Rated value
AC	2 A, 5 A	Min. 50 mA
DC	1 A, 2 A	Min. 5 mA

2. When using bent output terminals

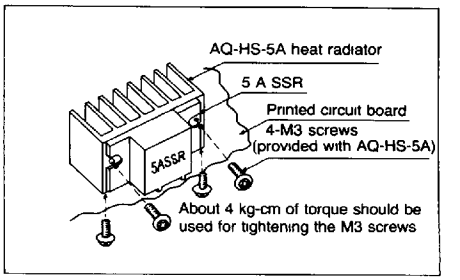
To avoid applying mechanical stress on the main unit and molded section of the solid state relay, radio pliers should be used to grasp the terminals between the point of bending and the molded case when making the bends.



3. When a heat sink is mounted on the 5 A type

The heat sink (AQ-HS-5A) or a heat sink which can make good contact should be used.

If a heat sink is used in which the contact condition is bad, a heat conducting compound should be used to improve the heat radiation. (A silicon compound is a typical example.) The compound should be coated on the heat sink and the AQ1.



4. Other points

1) With heat generating units or other SSR units mounted adjacent, because there can be a rise in the ambient temperature, consideration should be given to the layout and to circulation around the units.

2) Terminal soldering should be done at 260°C, 500°F within 5 seconds.