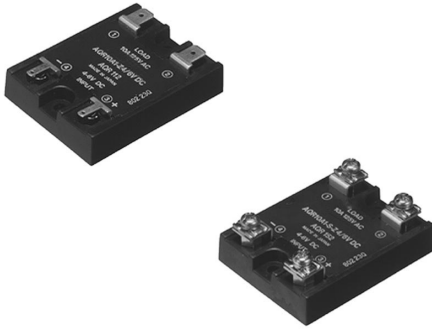




# NAIS

## AQ-R SOLID STATE RELAY

# AQ-R RELAYS



### FEATURES

- Two types of terminal shape: Plug-in terminal and Screw terminal  
 Plug-in terminal (output side): #250  
 (input side): #110
- Flat type of SSR realized by aluminium printed circuit board  
 Plug-in terminal: height max. 15 mm .591 inch  
 Screw terminal: height max. 17 mm .669 inch
- High dielectric strength: 1500 V AC (between input and output)
- Heat sink and DIN mounting rail are available as accessories

### TYPICAL APPLICATIONS

- Photocopiers
- Air conditioners
- Vending machines
- Machine tools

### TYPES

Plug-in terminal type

Type	Load voltage	Input voltage	Part No.
Zero-cross 10 A	75 to 125 V AC	4 to 6 V DC	AQR10A1-Z4/6VDC
		10 to 18 V DC	AQR10A1-Z10/18VDC
		18 to 28 V DC	AQR10A1-Z18/28VDC
	75 to 250 V AC	4 to 6 V DC	AQR10A2-Z4/6VDC
		10 to 18 V DC	AQR10A2-Z10/18VDC
		18 to 28 V DC	AQR10A2-Z18/28VDC
Zero-cross 15 A	75 to 125 V AC	4 to 6 V DC	AQR15A1-Z4/6VDC
		10 to 18 V DC	AQR15A1-Z10/18VDC
		18 to 28 V DC	AQR15A1-Z18/28VDC
	75 to 250 V AC	4 to 6 V DC	AQR15A2-Z4/6VDC
		10 to 18 V DC	AQR15A2-Z10/18VDC
		18 to 28 V DC	AQR15A2-Z18/28VDC
Zero-cross 20 A	75 to 125 V AC	4 to 6 V DC	AQR20A1-Z4/6VDC
		10 to 18 V DC	AQR20A1-Z10/18VDC
		18 to 28 V DC	AQR20A1-Z18/28VDC
	75 to 250 V AC	4 to 6 V DC	AQR20A2-Z4/6VDC
		10 to 18 V DC	AQR20A2-Z10/18VDC
		18 to 28 V DC	AQR20A2-Z18/28VDC

Screw-terminal type

Type	Load voltage	Input voltage	Part No.
Zero-cross 10 A	75 to 125 V AC	4 to 6 V DC	AQR10A1-S-Z4/6VDC
		10 to 18 V DC	AQR10A1-S-Z10/18VDC
		18 to 28 V DC	AQR10A1-S-Z18/28VDC
	75 to 250 V AC	4 to 6 V DC	AQR10A2-S-Z4/6VDC
		10 to 18 V DC	AQR10A2-S-Z10/18VDC
		18 to 28 V DC	AQR10A2-S-Z18/28VDC
Zero-cross 15 A	75 to 125 V AC	4 to 6 V DC	AQR15A1-S-Z4/6VDC
		10 to 18 V DC	AQR15A1-S-Z10/18VDC
		18 to 28 V DC	AQR15A1-S-Z18/28VDC
	75 to 250 V AC	4 to 6 V DC	AQR15A2-S-Z4/6VDC
		10 to 18 V DC	AQR15A2-S-Z10/18VDC
		18 to 28 V DC	AQR15A2-S-Z18/28VDC
Zero-cross 20 A	75 to 125 V AC	4 to 6 V DC	AQR20A1-S-Z4/6VDC
		10 to 18 V DC	AQR20A1-S-Z10/18VDC
		18 to 28 V DC	AQR20A1-S-Z18/28VDC
	75 to 250 V AC	4 to 6 V DC	AQR20A2-S-Z4/6VDC
		10 to 18 V DC	AQR20A2-S-Z10/18VDC
		18 to 28 V DC	AQR20A2-S-Z18/28VDC

### ORDERING INFORMATION

Ex. AQR 10A 1 S Z 4/6VDC

Load current	Load voltage	Terminal shape	Type	Input voltage
10 A, 15 A, 20 A	1: 75 to 125 V AC 2: 75 to 250 V AC	Nil: Plug-in terminal S: Screw terminal	Z: Zero-cross type	4/6, 10/18, 18/28 V DC

## SPECIFICATIONS

Ratings (at 20°C 68°F, Input ripple: 1% or less)

10 A type

Items		Part No.		AQR10A1-Z		AQR10A2-Z		Remarks
		4/6VDC	10/18VDC	18/28VDC	4/6VDC	10/18VDC	18/28VDC	
		AQR10A1-S-Z	AQR10A1-S-Z	AQR10A1-S-Z	AQR10A2-S-Z	AQR10A2-S-Z	AQR10A2-S-Z	
		4/6VDC	10/18VDC	18/28VDC	4/6VDC	10/18VDC	18/28VDC	
Input side	Input voltage	4 to 6 V DC	10 to 18 V DC	18 to 28 V DC	4 to 6 V DC	10 to 18 V DC	18 to 28 V DC	
	Input impedance	Approx. 0.26 k $\Omega$	Approx. 0.86 k $\Omega$	Approx. 1.36 k $\Omega$	Approx. 0.26 k $\Omega$	Approx. 0.86 k $\Omega$	Approx. 1.36 k $\Omega$	
	Drop-out voltage,min.	1 V						
Load side	Max. load current	10 A						See "REFERENCE DATA 1"
	Load voltage	75 to 125 V AC			75 to 250 V AC			
	Frequency	45 to 65 Hz						
	Repetitive peak voltage	400 V			600 V			
	Non-repetitive-surge current	100 A						In one cycle at 60 Hz
	Max. "OFF-state" leakage current	2.5 mA (when 100 V AC applied)			5 mA (when 200 V AC applied)			at 60 Hz
	Max. "ON-state" voltage drop	1.6 V						at max. carrying current
	Min. load current	100 mA						
OFF-state dV/dt	100 V/ $\mu$ s							

15 A type

Items		Part No.		AQR15A1-Z		AQR15A2-Z		Remarks
		4/6VDC	10/18VDC	18/28VDC	4/6VDC	10/18VDC	18/28VDC	
		AQR15A1-S-Z	AQR15A1-S-Z	AQR15A1-S-Z	AQR15A2-S-Z	AQR15A2-S-Z	AQR15A2-S-Z	
		4/6VDC	10/18VDC	18/28VDC	4/6VDC	10/18VDC	18/28VDC	
Input side	Input voltage	4 to 6 V DC	10 to 18 V DC	18 to 28 V DC	4 to 6 V DC	10 to 18 V DC	18 to 28 V DC	
	Input impedance	Approx. 0.26 k $\Omega$	Approx. 0.86 k $\Omega$	Approx. 1.36 k $\Omega$	Approx. 0.26 k $\Omega$	Approx. 0.86 k $\Omega$	Approx. 1.36 k $\Omega$	
	Drop-out voltage,min.	1 V						
Load side	Max. load current	15 A						See "REFERENCE DATA 1"
	Load voltage	75 to 125 V AC			75 to 250 V AC			
	Frequency	45 to 65 Hz						
	Repetitive peak voltage	400 V			600 V			
	Non-repetitive-surge current	150 A						In one cycle at 60 Hz
	Max. "OFF-state" leakage current	2.5 mA (when 100 V AC applied)			5 mA (when 200 V AC applied)			at 60 Hz
	Max. "ON-state" voltage drop	1.6 V						at max. carrying current
	Min. load current	100 mA						
OFF-state dV/dt	100 V/ $\mu$ s							

20 A type

Items		Part No.		AQR20A1-Z		AQR20A2-Z		Remarks
		4/6VDC	10/18VDC	18/28VDC	4/6VDC	10/18VDC	18/28VDC	
		AQR20A1-S-Z	AQR20A1-S-Z	AQR20A1-S-Z	AQR20A2-S-Z	AQR20A2-S-Z	AQR20A2-S-Z	
		4/6VDC	10/18VDC	18/28VDC	4/6VDC	10/18VDC	18/28VDC	
Input side	Input voltage	4 to 6 V DC	10 to 18 V DC	18 to 28 V DC	4 to 6 V DC	10 to 18 V DC	18 to 28 V DC	
	Input impedance	Approx. 0.26 k $\Omega$	Approx. 0.86 k $\Omega$	Approx. 1.36 k $\Omega$	Approx. 0.26 k $\Omega$	Approx. 0.86 k $\Omega$	Approx. 1.36 k $\Omega$	
	Drop-out voltage,min.	1 V						
Load side	Max. load current	20 A						See "REFERENCE DATA 1"
	Load voltage	75 to 125 V AC			75 to 250 V AC			
	Frequency	45 to 65 Hz						
	Repetitive peak voltage	400 V			600 V			
	Non-repetitive-surge current	200 A						In one cycle at 60 Hz
	Max. "OFF-state" leakage current	2.5 mA (when 100 V AC applied)			5 mA (when 200 V AC applied)			at 60 Hz
	Max. "ON-state" voltage drop	1.6 V						at max. carrying current
	Min. load current	100 mA						
OFF-state dV/dt	100 V/ $\mu$ s							

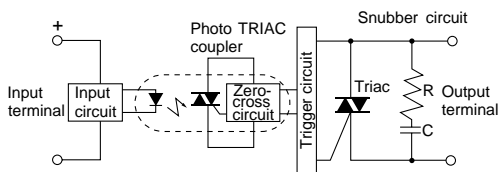
# AQ-R

**Characteristics** (at 20°C 68°F, Input ripple: 1% or less)

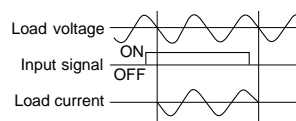
Item	Type	Zero-cross type	Remarks
Operate time, max.		(1/2 cycle of voltage sine wave) + 1 ms	
Release time, max.		(1/2 cycle of voltage sine wave) + 1 ms	
Insulation resistance, min., Initial		100 M Ω between input, output and case	by 500 V DC
Breakdown voltage		1,500 V AC between input, output and case	For 1 min.
Vibration resistance	Functional	10 to 55 Hz at double amplitude of 2 mm	10 minutes for X, Y, Z axes
	Destructive	10 to 55 Hz at double amplitude of 2 mm	1 hour for X, Y, Z axes
Shock resistance	Functional	Min. 980 m/s <sup>2</sup> {100 G}	4 time each for X, Y, Z axes
	Destructive	Min. 980 m/s <sup>2</sup> {100 G}	5 time each for X, Y, Z axes
Ambient temperature		-20°C to +80°C -4°F to +176°F	
Storage temperature		-25°C to +85°C -13°F to +185°F	
Operational method		Zero-cross (Turn-ON and Turn-OFF)	

## OPERATING PRINCIPLE

Internal circuit



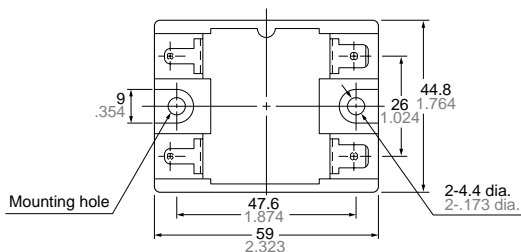
Wave form of input and output (Resistive load)



## DIMENSIONS

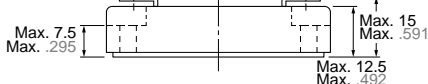
mm inch

**Plug-in terminal**

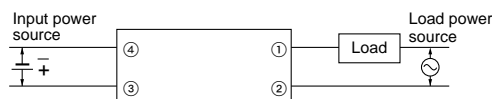


Conform to AMP plug-in terminal #110 series receptacle

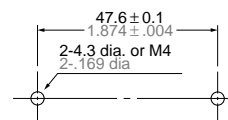
Conform to AMP plug-in terminal #250 series receptacle



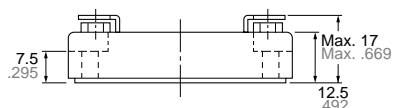
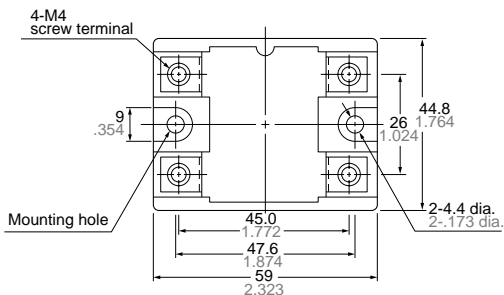
Schematic



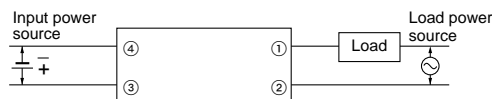
Mounting dimensions (Bottom view)



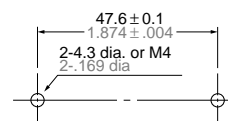
**Screw terminal**



Schematic



Mounting dimensions (Bottom view)



**AQ-R SOLID STATE RELAY ACCESSORIES**

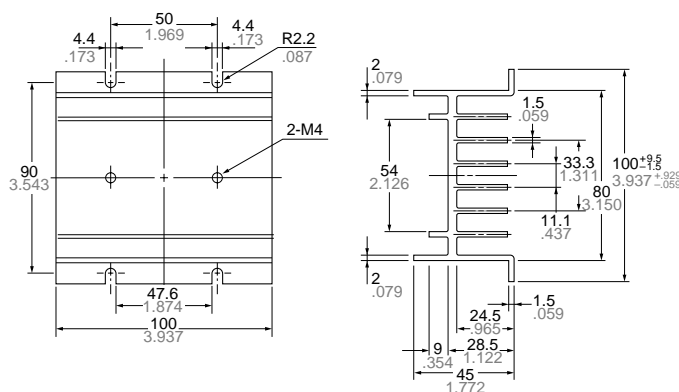
**AQP-HS-20A**

Heat sink

Mounting dimensions (Bottom view)



AQP-HS-20A



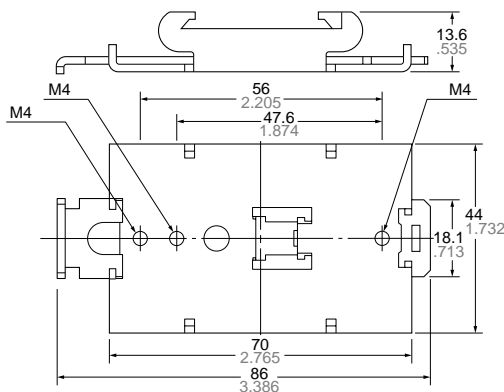
General tolerance:  $\pm 0.5 \pm .020$

**AQP-DP**

DIN rail mounting plate



AQP-DP



General tolerance:  $\pm 0.5 \pm .020$

**AT8-DLA1**

Mounting rail

**ATA4806**

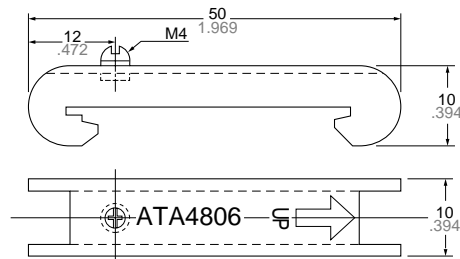
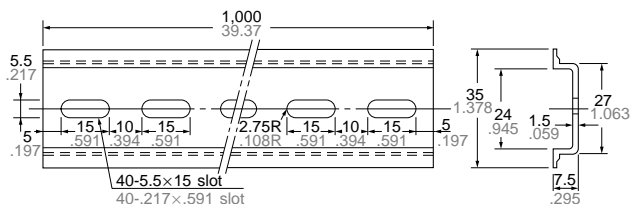
Fastening plate



AT8-DLA1



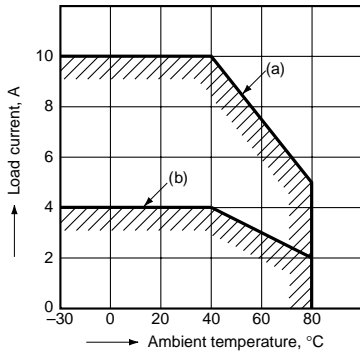
ATA4806



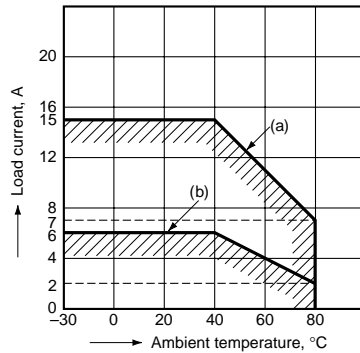
# AQ-R

## REFERENCE DATA

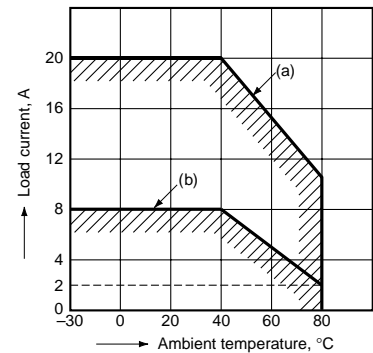
### 1. Load current vs. ambient temperature 10 A type



### 15 A type



### 20 A type

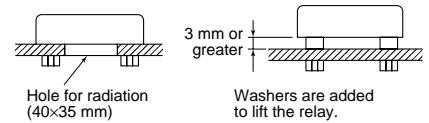


#### (a) With external heat sink

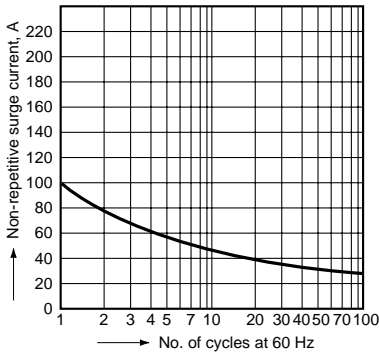
- A heat sink; optional heat sink (AQP-HS-20A) or a 150×150×3.2 mm aluminum sheet (painted black)
- The heat sink surface area is the required area for one solid-state relay.

#### (b) Without external heat sink

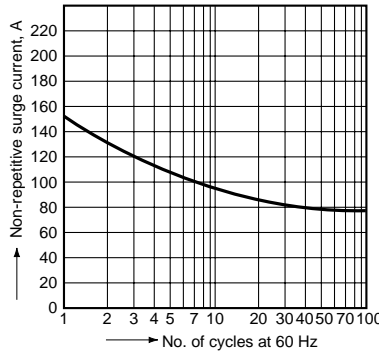
If the mounting surface is not metallic and a heat sink is not used, expose the bottom surface and plate surface to improve heat dissipation. The graphs show the characteristics when the relay is mounted as shown in the right figure.



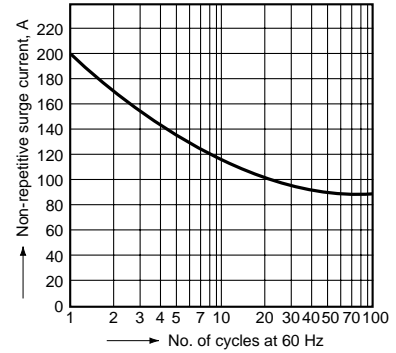
### 2-1. Non-repetitive surge current vs. carrying time (10 A type)



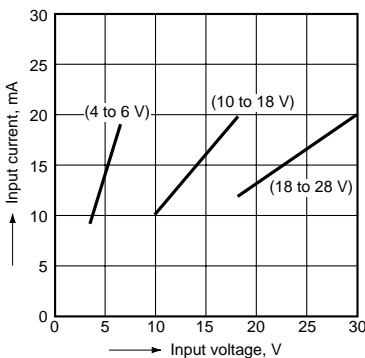
### 2-2. Non-repetitive surge current vs. carrying time (15 A type)



### 2-3. Non-repetitive surge current vs. carrying time (20 A type)



### 3. Input voltage vs. input current (10 A, 15 A, 20 A type)



## NOTE

### Regarding installation

#### DIN Rail Mounting

When the relay is mounted to a rail using the DIN mounting rail (optional), the rated capacity is limited to the characteristics of a relay without a heat sink attached.

**For Cautions for Use, see Page 634 to 637.**