

# Solid State Relays

## Industrial, 1-Phase ZS, Standard Range

### Types RA 24.. .. 06/RA 48.. .. 12



- AC Solid State Relay
- Zero switching
- Direct copper bonding technology
- Rated operational current: 25, 50 and 90 AACrms
- Blocking voltage: Up to 1200 V<sub>p</sub>
- Rated operational voltage: Up to 480 VACrms
- 3 input ranges: 3 to 32 VDC, 10 to 90 VAC/DC and 90 to 280 VAC/DC
- Isolation: OPTO (input-output) 4000 VACrms



### Product Description

The zero switching relay with antiparallel thyristor output is the most widely used industrial SSR due to its multiple application possibilities. The relay can be used for resistive, inductive and capacitive loads. The zero switching relay switches ON when the sine curve just crosses zero and switches OFF when the current crosses zero.

### Ordering Key

**RA 24 25 LA 06**

Solid State Relay \_\_\_\_\_  
 Switching mode \_\_\_\_\_  
 Rated operational voltage \_\_\_\_\_  
 Rated operational current \_\_\_\_\_  
 Control voltage \_\_\_\_\_  
 Blocking voltage \_\_\_\_\_

### Type Selection

| Switching mode    | Rated operational voltage        | Rated operational current                       | Control voltage   | Blocking voltage  |
|-------------------|----------------------------------|---|---|---|
| A: Zero switching | 24: 230 VACrms<br>48: 480 VACrms | 25: 25 AACrms<br>50: 50 AACrms<br>90: 90 AACrms | D: 3 to 32 VDC<br>LA: 10 to 90 VAC/DC<br>HA: 90 to 280 VAC/DC | 06: 650 V <sub>p</sub><br>08: 850 V <sub>p</sub><br>12: 1200 V <sub>p</sub> |

### Selection Guide

| Rated operational voltage | Blocking voltage    | Control voltage  | Rated operational current<br>25 AACrms | 50 AACrms     | 90 AACrms     |
|---------------------------|---------------------|------------------|--|---------------|---------------|
| 230 VACrms                | 650 V <sub>p</sub>  | 3 to 32 VDC      | RA 2425 -D 06                          | RA 2450 -D 06 | RA 2490 -D 06 |
|                           |                     | 10 to 90 VAC/DC  | RA 2425 LA 06                          | RA 2450 LA 06 | RA 2490 LA 06 |
|                           |                     | 90 to 280 VAC/DC | RA 2425 HA 06                          | RA 2450 HA 06 | RA 2490 HA 06 |
| 480 VACrms                | 1200 V <sub>p</sub> | 3 to 32 VDC      | RA 4825 -D 12                          | RA 4850 -D 12 | RA 4890 -D 12 |
|                           |                     | 10 to 90 VAC/DC  | RA 4825 LA 12                          | RA 4850 LA 12 | RA 4890 LA 12 |
|                           |                     | 90 to 280 VAC/DC | RA 4825 HA 12                          | RA 4850 HA 12 | RA 4890 HA 12 |

## General Specifications

|                             | RA 24... 06             | RA 48... 12             |
|-----------------------------|-------------------------|-------------------------|
| Operational voltage range   | 24 to 280 VACrms        | 42 to 530 VACrms        |
| Blocking voltage            | $\geq 650 V_p$          | $\geq 1200 V_p$         |
| Zero voltage turn-on        | $\leq 20 V$             | $\leq 40 V$             |
| Operational frequency range | 45 to 65 Hz             | 45 to 65 Hz             |
| Power factor                | $\geq 0.5 @ 230 VACrms$ | $\geq 0.5 @ 480 VACrms$ |
| Approvals                   | CE, cURus, CSA, EAC     | CE, cURus, CSA, EAC     |

## Output Specifications

|  | RA..25 ...            | RA ..50 ...           | RA ..90 ...           |
|--|-----------------------|-----------------------|-----------------------|
| Rated operational current AC 51<br>AC 53a                  | 25 Arms<br>5 Arms     | 50 Arms<br>15 Arms    | 90 Arms<br>20 Arms    |
| Minimum operational current                                | 150 mArms             | 250 mArms             | 400 mArms             |
| Rep. overload current t=1 s                                | $\leq 55$ Arms        | $\leq 125$ Arms       | $\leq 150$ Arms       |
| Non-rep. surge current t=10 ms                             | 325 A <sub>p</sub>    | 600 A <sub>p</sub>    | 1150 A <sub>p</sub>   |
| Off-state leakage current<br>@ rated voltage and frequency | $\leq 3$ mArms        | $\leq 3$ mArms        | $\leq 3$ mArms        |
| I <sup>2</sup> t for fusing t=10 ms                        | $\leq 525 A^2s$       | $\leq 1800 A^2s$      | $\leq 6600 A^2s$      |
| On-state voltage drop<br>@ rated current                   | $\leq 1.6$ Vrms       | $\leq 1.6$ Vrms       | $\leq 1.6$ Vrms       |
| Critical dV/dt commuting                                   | $\geq 500$ V/ $\mu$ s | $\geq 500$ V/ $\mu$ s | $\geq 500$ V/ $\mu$ s |
| Critical dV/dt off-state                                   | $\geq 500$ V/ $\mu$ s | $\geq 500$ V/ $\mu$ s | $\geq 500$ V/ $\mu$ s |

## Input Specifications

|                        | RA .... -D ..    | RA .... LA ..    | RA .... HA ..    |
|------------------------|------------------|------------------|------------------|
| Control voltage range  | 3 to 32 VDC      | 10 to 90 VAC/DC  | 90 to 280 VAC/DC |
| Pick-up voltage        | $\geq 3$ VDC     | $\leq 10$ VAC/DC | $\leq 90$ VAC/DC |
| Drop-out voltage       | $\leq 1$ VDC     | $\geq 1$ VAC/DC  | $\geq 10$ VAC/DC |
| Reverse voltage        | $\leq 32$ VDC    |                  |                  |
| Input impedance        | 1.5 k $\Omega$   | 5.4 k $\Omega$   | 44 k $\Omega$    |
| Response time pick-up  | $\leq 1/2$ cycle | $\leq 1$ cycle   | $\leq 1$ cycle   |
| Control pulse width    | $\geq 0.5$ ms    | $\geq 0.5$ ms    | $\geq 0.5$ ms    |
| Response time drop-out | $\leq 1/2$ cycle | $\leq 1/2$ cycle | $\leq 1/2$ cycle |

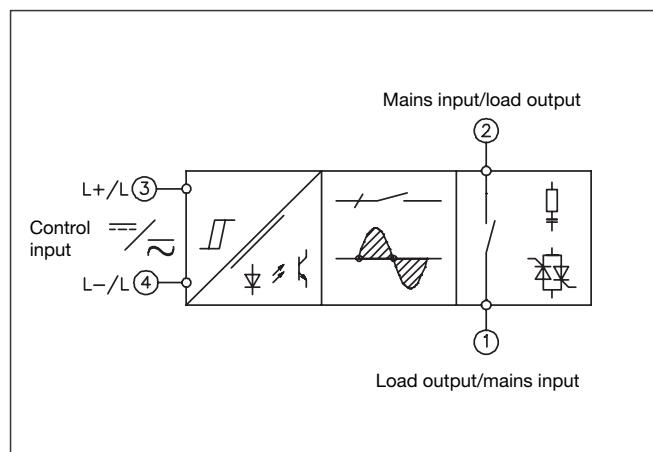
## Isolation

|  |                         |
|--|-------------------------|
| Rated isolation voltage<br>Input to output | $\geq 4000$ VACrms      |
| Rated isolation voltage<br>Output to case  | $\geq 4000$ VACrms      |
| Insulation resistance<br>Input to output   | $\geq 10^{10}$ $\Omega$ |
| Insulation resistance<br>Output to case    | $\geq 10^{10}$ $\Omega$ |
| Insulation capacitance<br>Input to output  | $\leq 8$ pF             |
| Insulation capacitance<br>Output to case   | $\leq 100$ pF           |

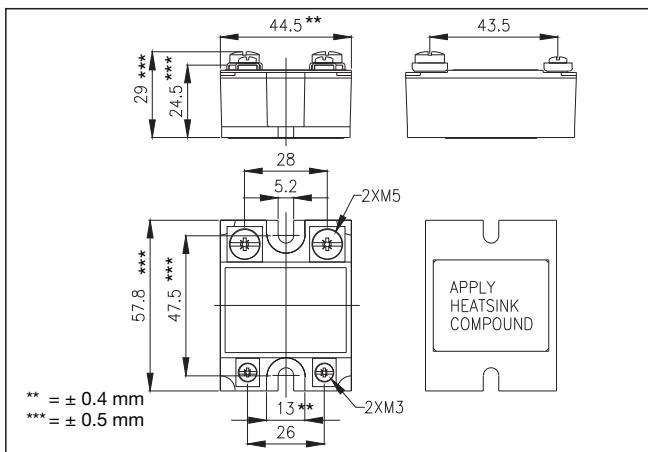
## Housing Specifications

|                  |   |
|------------------|---|
| Weight           | Approx. 110 g                                     |
| Housing material | Noryl GFN 1, black                                |
| Base plate       | 25, 50 A<br>90 A                                  |
|                  | Aluminium, nickel-plated<br>Copper, nickel-plated |
| Potting compound | Polyurethane                                      |
| Relay            |   |
| Mounting screws  | M5  |
| Mounting torque  | $\leq 1.5$ Nm                                     |
| Control terminal |   |
| Mounting screws  | M3 x 6  |
| Mounting torque  | $\leq 0.5$ Nm                                     |
| Power terminal   |   |
| Mounting screws  | M5 x 6  |
| Mounting torque  | $\leq 2.4$ Nm                                     |

## Functional Diagram

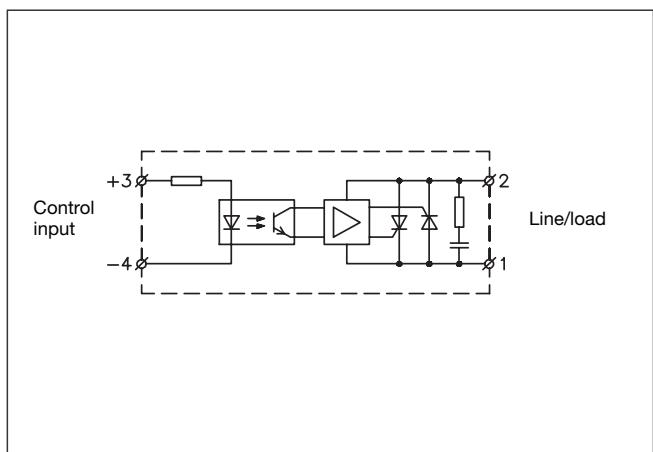


## Dimensions



All dimensions in mm

## Connection Diagram



## Heatsink Dimensions (load current versus ambient temperature)

RA ..25 .. ..

| Load current [A] | Thermal resistance [°C/W] |     |     |   |      |      | Power dissipation [W] |
|------------------|---------------------------|-----|-----|---|------|------|-----------------------|
|                  | 2                         | 1.7 | 1.4 | 1 | 0.71 | 0.40 |                       |
| 25               | 32                        |     |     |   |      |      |                       |
| 22.5             | 27                        |     |     |   |      |      |                       |
| 20               | 23                        |     |     |   |      |      |                       |
| 17.5             | 20                        |     |     |   |      |      |                       |
| 15               | 16                        |     |     |   |      |      |                       |
| 12.5             | 13                        |     |     |   |      |      |                       |
| 10               | 10                        |     |     |   |      |      |                       |
| 7.5              | 7                         |     |     |   |      |      |                       |
| 5                | 5                         |     |     |   |      |      |                       |
| 2.5              | 2                         |     |     |   |      |      |                       |

Ambient temp. [°C]

RA ..50 .. ..

| Load current [A] | Thermal resistance [°C/W] |      |      |      |      |   | Power dissipation [W] |
|------------------|---------------------------|------|------|------|------|---|-----------------------|
|                  | 0.92                      | 0.76 | 0.60 | 0.45 | 0.29 | - |                       |
| 50               | 63                        |      |      |      |      |   |                       |
| 45               | 55                        |      |      |      |      |   |                       |
| 40               | 47                        |      |      |      |      |   |                       |
| 35               | 40                        |      |      |      |      |   |                       |
| 30               | 33                        |      |      |      |      |   |                       |
| 25               | 26                        |      |      |      |      |   |                       |
| 20               | 20                        |      |      |      |      |   |                       |
| 15               | 15                        |      |      |      |      |   |                       |
| 10               | 9                         |      |      |      |      |   |                       |
| 5                | 4                         |      |      |      |      |   |                       |

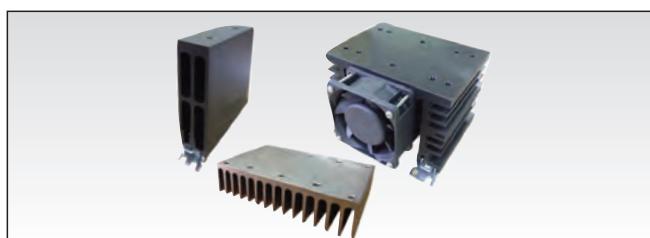
Ambient temp. [°C]

RA ..90 .. ..

| Load current [A] | Thermal resistance [°C/W] |      |      |      |   |   | Power dissipation [W] |
|------------------|---------------------------|------|------|------|---|---|-----------------------|
|                  | 0.63                      | 0.53 | 0.42 | 0.32 | - | - |                       |
| 90               | 97                        |      |      |      |   |   |                       |
| 80               | 84                        |      |      |      |   |   |                       |
| 70               | 71                        |      |      |      |   |   |                       |
| 60               | 59                        |      |      |      |   |   |                       |
| 50               | 47                        |      |      |      |   |   |                       |
| 40               | 36                        |      |      |      |   |   |                       |
| 30               | 26                        |      |      |      |   |   |                       |
| 20               | 17                        |      |      |      |   |   |                       |
| 10               | 8                         |      |      |      |   |   |                       |

Ambient temp. [°C]

## Heatsink Selection



Heatsink Range Overview:

[https://www.gavazziautomation.com/images/PIM/DATASHEET/ENG/SSR\\_Accessories.pdf](https://www.gavazziautomation.com/images/PIM/DATASHEET/ENG/SSR_Accessories.pdf)

Heatsink Selector Tool:

[https://www.gavazziautomation.com/nsc/HQ/EN/heat\\_sink\\_selector\\_tool](https://www.gavazziautomation.com/nsc/HQ/EN/heat_sink_selector_tool)

## Ordering Key

RHS..

- Heatsinks and fans
- 5.40°C/W to 0.12°C/W thermal resistance
- DIN, panel or thru wall mounting
- Single or multiple SSR mounting

## Applications

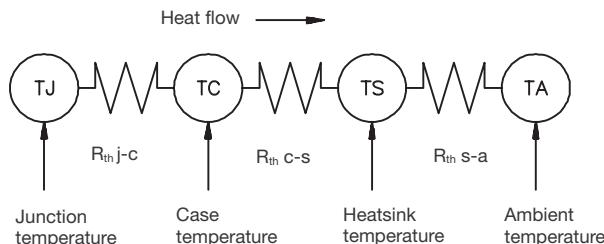
This relay is designed for use in applications in which it is exposed to high surge conditions. Care must be taken to ensure proper heatsinking when the relay is to be used at high sustained currents. Adequate electrical connection between relay terminals and cable must be ensured.

### Thermal characteristics

The thermal design of Solid State Relays is very impor-

tant. It is essential that the user makes sure that cooling is adequate and that the maximum junction temperature of the relay is not exceeded.

If the heatsink is placed in a small closed room, control panel or the like, the power dissipation can cause the ambient temperature to rise. The heatsink is to be calculated on the basis of the ambient temperature and the increase in temperature.



Thermal resistance:  
 $R_{th\ j-c}$  = junction to case

$R_{th\ c-s}$  = case to heatsink  
 $R_{th\ s-a}$  = heatsink to ambient

Direct bonding  
 In the design of the output power semiconductor direct bonding of the copper layer and the ceramic substrate has been applied. This is to ensure uninhibited heat transfer and high thermal fatigue strength.

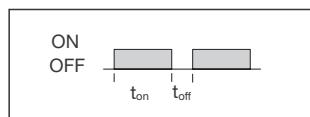
The relay has been designed for applications requiring large numbers of load cycles.

$$I_{rms} = \sqrt{\frac{I_{ON}^2 \times t_{ON}}{t_{ON} + t_{OFF}}}$$

Ex: RA 24 50 -D 06:  
 Load current = 45 A  
 $t_{ON} = 30$  s  
 $t_{OFF} = 15$  s

$$I_{rms} = \sqrt{\frac{45^2 \times 30}{30 + 15}}$$

The rms current will be 36.7 A.



## Thermal Specifications

|                              | RA ..25 .. ..                      | RA ..50 .. ..                      | RA ..90 .. ..                      |
|------------------------------|------------------------------------|------------------------------------|------------------------------------|
| Operating temperature        | -20° to +70°C<br>(-4° to +158°F)   | -20° to +70°C<br>(-4° to +158°F)   | -20° to +70°C<br>(-4° to +158°F)   |
| Storage temperature          | -40° to +100°C<br>(-40° to +212°F) | -40° to +100°C<br>(-40° to +212°F) | -40° to +100°C<br>(-40° to +212°F) |
| Junction temperature         | ≤ 125°C (≤ 257°F)                  | ≤ 125°C (≤ 257°F)                  | ≤ 125°C (≤ 257°F)                  |
| $R_{th}$ junction to case    | ≤ 1.25°C/W                         | ≤ 0.65°C/W                         | ≤ 0.3°C/W                          |
| $R_{th}$ junction to ambient | ≤ 12°C/W                           | ≤ 12°C/W                           | ≤ 12°C/W                           |

## Environmental Specifications

|                      |   |
|----------------------|---|
| Pollution degree     | 2 (non-conductive pollution with possibilities of condensation) |
| EU RoHS compliant    | Yes   |
| China RoHS compliant | Refer to Environmental Information (Page 6)                     |

## Environmental Information

The declaration in this section is prepared in compliance with People's Republic of China Electronic Industry Standard SJ/T11364-2014: Marking for the Restricted Use of Hazardous Substances in Electronic and Electrical Products.

| Part Name   | Toxic or Harardous Substances and Elements |              |              |                              |                                |                                       |
|---|--|--------------|--------------|------------------------------|--------------------------------|---------------------------------------|
|   | Lead (Pb)                                  | Mercury (Hg) | Cadmium (Cd) | Hexavalent Chromium (Cr(VI)) | Polybrominated biphenyls (PBB) | Polybrominated diphenyl ethers (PBDE) |
| Power Unit Assembly   | x  | o            | o            | o                            | o                              | o                                     |
| o: Indicates that said hazardous substance contained in homogeneous materials for this part are below the limit requirement of GB/T 26572.                |  |              |              |                              |                                |                                       |
| x: Indicates that said hazardous substance contained in one of the homogeneous materials used for this part is above the limit requirement of GB/T 26572. |  |              |              |                              |                                |                                       |

## 环境特性

这份申明根据中华人民共和国电子工业标准  
SJ/T11364-2014 : 标注在电子电气产品中限定使用的有害物质

| 零件名称                              | 有毒或有害物质与元素 |        |        |              |             |              |
|-----------------------------------|------------|--------|--------|--------------|-------------|--------------|
|                                   | 铅 (Pb)     | 汞 (Hg) | 镉 (Cd) | 六价铬 (Cr(VI)) | 多溴化联苯 (PBB) | 多溴联苯醚 (PBDE) |
| 功率单元                              | x          | o      | o      | o            | o           | o            |
| o:此零件所有材料中含有的该有害物低于GB/T 26572的限定。 |            |        |        |              |             |              |
| x:此零件某种材料中含有的该有害物高于GB/T 26572的限定。 |            |        |        |              |             |              |



## Accessories



- Graphite thermal pad with adhesive on one side
- Type KK071CUT
- Dimensions: 35 x 43 x 0.25 mm
- Packing quantity: 50 pcs.

All accessories can be ordered pre-assembled with Solid State Relays.  
Other accessories include DIN rail adaptors and varistors

For further information refer to Accessories datasheets at:  
[https://www.gavazziautomation.com/images/PIM/DATASHEET/ENG/SSR\\_Accessories.pdf](https://www.gavazziautomation.com/images/PIM/DATASHEET/ENG/SSR_Accessories.pdf)