

Solid State Relays

Low Electromagnetic Noise Emission

Types RA 24.. -D 06 L, RA 40.. -D 08 L

CARLO GAVAZZI



- AC Solid State Relay
- Zero switching
- For ohmic load applications
- Rated operational current: 10 and 25 AACrms
- Rated operational voltage: Up to 400 VACrms
- 10 A type meets CISPR 22 B requirements

Product Description

This relay is designed for use in applications where low electromagnetic emission is essential.

Today, household and electrical appliances, information technology- and medical equipment must conform with the latest EN standards. These new EN standards define general and product related requirements for noise immunity and noise emission. The RA24..-D06L and RA40..-D08L are relays for applica-

tions where the noise emission must be low and where the customer does not want to relinquish all Solid State Relay features. The relay is available with zero crossing function. It is designed for resistive loads, i.e. power factor = 1.

Predestined applications for this relay are office machines, ovens and cookers for domestic and industrial use, theatre or stage lighting systems, film processing and copying machines or medical equipment.

Ordering Key

RA 24 25 -D 06 L

Solid State Relay _____
 Switching mode _____
 Rated operational voltage _____
 Rated operational current _____
 Control voltage _____
 Non-rep. peak voltage _____
 Low RFI _____

Type Selection

| Switching mode | Rated operational voltage | Rated operational current | Control voltage | Non-rep. voltage | Electromagnetic noise emission |
|-------------------|----------------------------------|--------------------------------|-----------------|--|--------------------------------|
| A: Zero switching | 24: 230 VACrms 40: 400 VACrms | 10: 10 AACrms 25: 25 AACrms | -D: 3 to 32 VDC | 06: 650 V _p 08: 850 V _p | L: Low RFI |

Selection Guide

| Rated operational voltage | Non-rep. voltage | Electromagnetic noise emission | Control voltage | Rated operational current 10 AACrms | Rated operational current 25 AACrms |
|---------------------------|--------------------|--------------------------------|-----------------|-------------------------------------|-------------------------------------|
| 230 VACrms | 650 V _p | Low RFI | 3 to 32 VDC | RA 2410 -D 06 L | RA 2425 -D 06 L |
| 400 VACrms | 850 V _p | Low RFI | 3 to 32 VDC | RA 4010 -D 08 L | RA 4025 -D 08 L |

General Specifications

| | RA 24.. -D 06 L | RA 40.. -D 08 L |
|-----------------------------|----------------------|----------------------|
| Operational voltage range | 180 to 265 VACrms | 340 to 530 VACrms |
| Non-rep. peak voltage | ≥ 650 V _p | ≥ 850 V _p |
| Operational frequency range | 45 to 65 Hz | 45 to 65 Hz |
| Power factor | 1 | 1 |
| Approvals | UL, cUL, CSA, VDE | UL, cUL, CSA, VDE |
| CE-marking | Yes | Yes |



Input Specifications

| | |
|-----------------------|-------------|
| Control voltage range | 3 to 32 VDC |
| Pick-up voltage | ≤ 3 V |
| Drop-out voltage | ≥ 1 V |
| Reverse voltage | ≤ 32 VDC |
| Input impedance | 1 kΩ |
| Response time | ≤ 1/2 cycle |

Insulation

| | |
|---|---------------|
| Rated insulation voltage Input to output | ≥ 4000 VACrms |
| Rated insulation voltage Output to case | ≥ 4000 VACrms |
| Reference voltage | 500 VACrms |
| Insulation meets VDE 0700 requirements | |

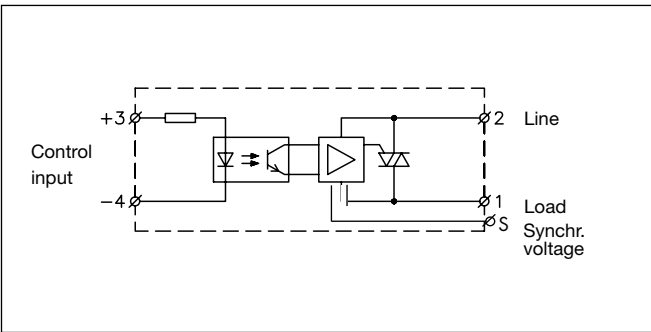
Output Specifications

| | RA ..10 -D 0. L | RA ..25 -D 0. L |
|---------------------------------|---------------------|---------------------|
| Rated operational current AC 51 | 10 Arms | 25 Arms |
| Min. operational current AC 51 | 1 Arms | 2 Arms |
| Rep. overload current t=1 s | ≤ 30 A _p | ≤ 50 A _p |
| Non-rep. surge current t=20 ms | 90 A _p | 200 A _p |
| Off-state leakage current | ≤ 1 mArms | ≤ 1 mArms |
| I²t for fusing t=1-10 ms | ≤ 120 A²s | ≤ 200 A²s |
| On-state voltage drop | ≤ 1.2 Vrms | ≤ 1.2 Vrms |
| Critical dV/dt off-state | ≥ 250 V/μs | ≥ 250 V/μs |
| Synchronization current | ≤ 20 mArms | ≤ 20 mArms |

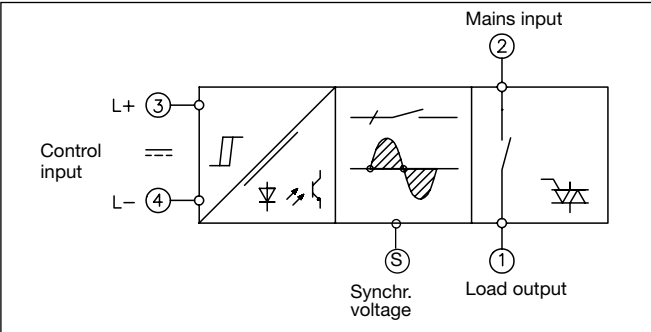
Thermal Specifications

| | RA ..10 -D 0. L | RA ..25 -D 0. L |
|----------------------------------|---------------------------------|---------------------------------|
| Operating temperature range | -20° to +70°C (-4° to +158°F) | -20° to +70°C (-4° to +158°F) |
| Storage temperature range | -40° to +100°C (-40° to +212°F) | -40° to +100°C (-40° to +212°F) |
| Junction temperature | ≤ 125°C (257°F) | ≤ 125°C (257°F) |
| R _{th} junction to case | ≤ 2.5 K/W | ≤ 1.8 K/W |

Wiring Diagram



Functional Diagram



Heatsink Dimensions (load current versus ambient temperature)

RA ..10 -D 0. L

| Load current [A] | Thermal resistance [K/W] | | | | | | Power dissipation [W] |
|------------------|--------------------------|------|------|------|------|------|-----------------------|
| | 20 | 30 | 40 | 50 | 60 | 70 | T _A |
| 10 | 5.7 | 5.0 | 4.3 | 3.6 | 2.8 | 2.0 | 14 |
| 9 | 6.2 | 5.4 | 4.6 | 3.9 | 3.1 | 2.2 | 12 |
| 8 | 7.4 | 6.4 | 5.5 | 4.6 | 3.7 | 2.7 | 11 |
| 7 | 8.5 | 7.4 | 6.3 | 5.3 | 4.2 | 3.1 | 9 |
| 6 | 9.8 | 8.6 | 7.4 | 6.1 | 4.9 | 4.9 | 8 |
| 5 | - | 10.2 | 8.7 | 7.2 | 5.8 | 6.2 | 7 |
| 4 | - | - | 10.5 | 8.7 | 7.0 | 5.7 | 6 |
| 3 | - | - | - | 10.7 | 8.5 | 4.7 | 5 |
| 2 | - | - | - | - | 10.8 | 8.1 | 4 |
| 1 | - | - | - | - | - | 10.7 | 3 |

Ambient temp. [°C]

RA ..25 -D 0. L

| Load current [A] | Thermal resistance [K/W] | | | | | | Power dissipation [W] |
|------------------|--------------------------|-----|-----|------|------|-----|-----------------------|
| | 20 | 30 | 40 | 50 | 60 | 70 | T _A |
| 25 | 1.0 | 0.8 | 0.5 | 0.25 | - | - | 38 |
| 22.5 | 1.5 | 1.1 | 0.8 | 0.5 | 0.26 | - | 33 |
| 20 | 1.9 | 1.6 | 1.2 | 0.9 | 0.5 | - | 29 |
| 17.5 | 2.5 | 2.1 | 1.7 | 1.3 | 0.9 | 0.5 | 25 |
| 15 | 3.3 | 2.9 | 2.4 | 1.9 | 1.4 | 1.0 | 21 |
| 12.5 | 4.4 | 3.9 | 3.3 | 2.7 | 2.1 | 1.5 | 17 |
| 10 | 5.7 | 5.0 | 4.3 | 3.6 | 2.9 | 2.1 | 14 |
| 7.5 | 7.5 | 6.6 | 5.6 | 4.7 | 3.7 | 2.8 | 11 |
| 5 | 10.6 | 9.3 | 8.0 | 6.6 | 5.3 | 4.0 | 8 |
| 2.5 | - | - | - | 10.7 | 8.5 | 6.4 | 5 |

Ambient temp. [°C]

Heatsink Selection

| Carlo Gavazzi Heatsink (see Accessories) | Thermal resistance |
|---|--------------------------|
| No heatsink required | $R_{th\ s-a} > 12.5$ K/W |
| RHS 100 Assy | 3.0 K/W |
| RHS 301 Assy | 0.8 K/W |
| RHS 301 F Assy | 0.25 K/W |
| Consult your distributor | < 0.25 K/W |

Compare the value found in the current versus temperature chart with the standard heatsink values and select the heatsink with the next lower value.

Accessories

Heatsinks
DIN rail adapter
Varistors
Fuses

For further information refer to "General Accessories".

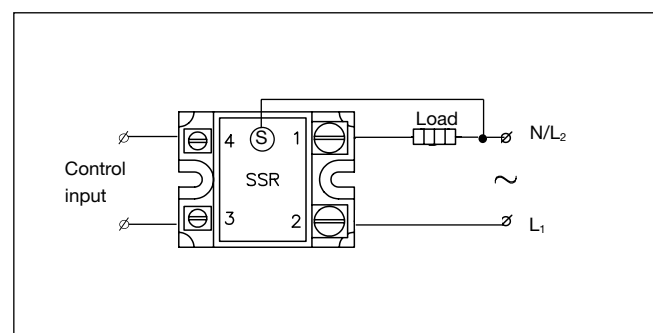
Applications

The very low, wire-conducted RFI feature of this relay is obtained by synchronized firing of the output triac in the zero crossing of the mains voltage. Therefore the relay must have the synchronization input connected to the mains, either to neutral or to the phase depending on how the load is connected.

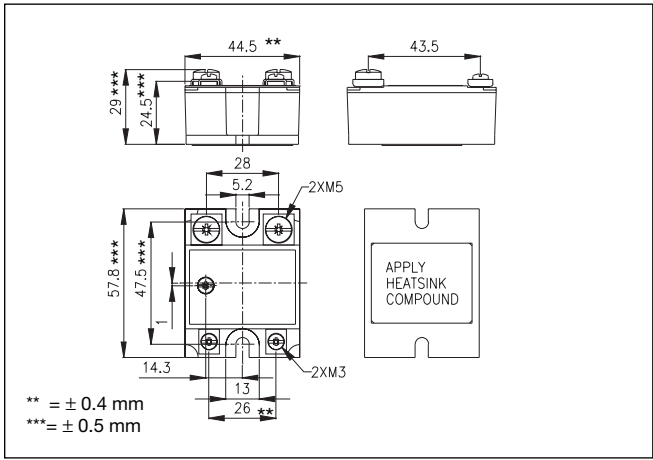
The relay can only switch resistive loads with a power factor of 1.

A minimal load current of 1A for the RA ..10 -D 0. L and 2 A for the RA ..25 -D 0. L is required as long as the control input is activated.

Connection Diagram



Dimensions



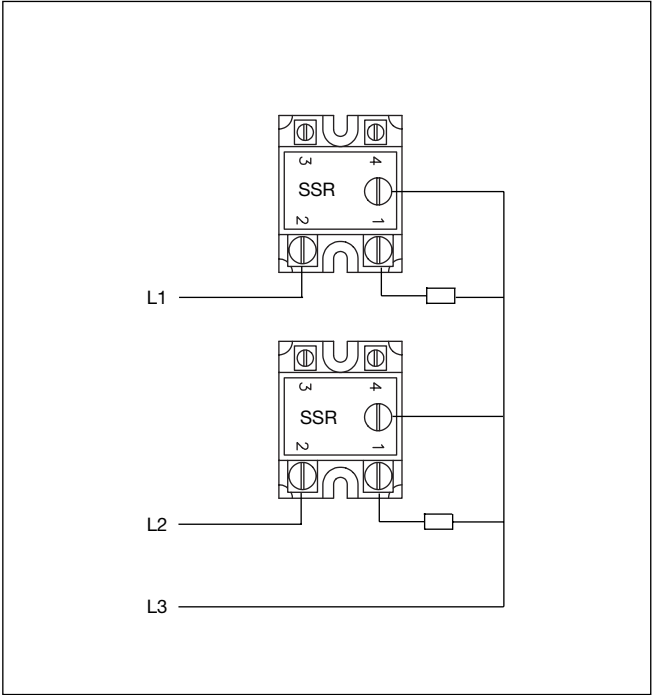
Housing Specifications

| | |
|------------------------------|--------------------|
| Weight | Approx. 110 g |
| Housing material | Noryl GFN 1, black |
| Base plate | Aluminium |
| Potting compound | Polyurethane |
| Relay | |
| Mounting screws | M5 |
| Mounting torque | ≤ 1.5 Nm |
| Control and Synchr. terminal | |
| Mounting screws | M3 x 6 |
| Mounting torque | ≤ 0.5 Nm |
| Power terminal | |
| Mounting screws | M5 x 6 |
| Mounting torque | ≤ 2.4 Nm |

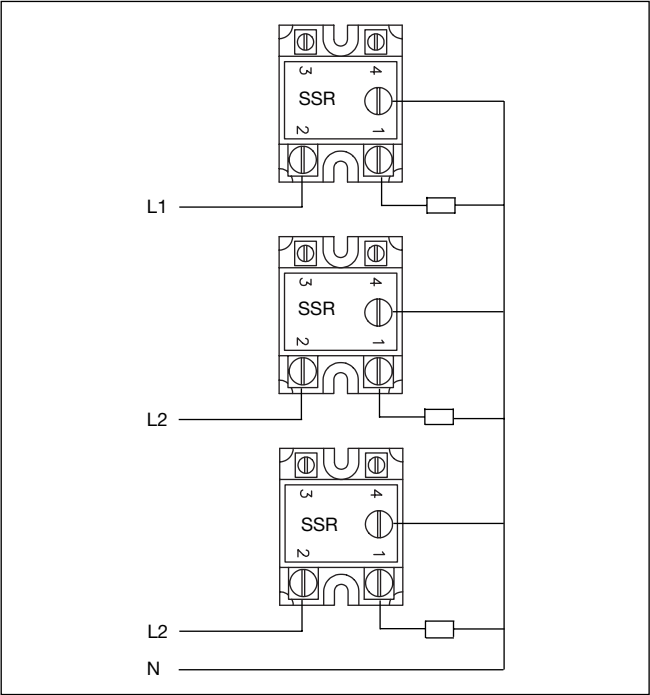
Connection Examples

RA24xx-D06L and RA40xx-D08L

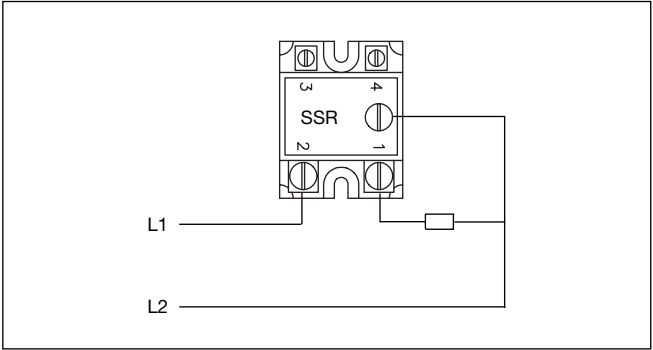
3-phase application with two heat elements without ground.



3-phase application with three heat elements.



2-phase application with one heat element.



1-phase application without ground.

