

# Solid State Relays System Monitoring Relays (Sense Relay) Type RA.... ..S

CARLO GAVAZZI



- System (line and load) monitoring relay
- Zero switching
- Rated operational current: 25, 50, 90 and 110 AACrms
- Rated operational voltage: 120, 230, 400 and 480 VACrms
- High surge current capability
- Alarm output signal
- LED indication for alarm and supply

## Product Description

The system monitoring solid state relay (sense relay) provides an alarm output in the event of a circuit failure. Internal circuits monitor:

- line voltage/line current
- correct functioning of the SSR
- SSR input status

The relay is designed for applications where immediate fault detection is required. A red LED indicates an alarm, a green LED indicates DC control supply OK (half LED light intensity) resp. relay switched ON (full LED light intensity).

## Ordering Key

**RA 23 25 H 06 NO S**

Solid State Relay  
Switching mode  
Rated operational voltage  
Rated operational current  
Control input  
Non-rep. peak voltage  
Alarm output type  
Sense SSR

## Type Selection

| Switching mode    | Rated operational voltage                                            | Rated operational current input                                    | Control voltage                 | Non-rep. peak type                                                           | Alarm output type                                        |
|-------------------|----------------------------------------------------------------------|--------------------------------------------------------------------|---------------------------------|------------------------------------------------------------------------------|----------------------------------------------------------|
| A: Zero switching | 12: 120 VACrms<br>23: 230 VACrms<br>40: 400 VACrms<br>48: 480 VACrms | 25: 25 AACrms<br>50: 50 AACrms<br>90: 90 AACrms<br>110: 110 AACrms | H: Active high<br>L: Active low | 06: 650 V <sub>p</sub><br>10: 1000 V <sub>p</sub><br>12: 1200 V <sub>p</sub> | NO: NPN, NO<br>NC: NPN, NC<br>PO: PNP, NO<br>PC: PNP, NC |

## Selection Guide

| Rated op. voltage | Control input | Alarm output type | Rated operational current |                |                |                 |
|-------------------|---------------|-------------------|---------------------------|----------------|----------------|-----------------|
|                   |               |                   | 25 AACrms                 | 50 AACrms      | 90 AACrms      | 110 AACrms      |
| 120 VACrms        | Active high   | NPN, NO           | RA 1225 H06NOS            | RA 1250 H06NOS | RA 1290 H06NOS | RA 12110 H06NOS |
|                   |               | NPN, NC           | RA 1225 H06NCS            | RA 1250 H06NCS | RA 1290 H06NCS | RA 12110 H06NCS |
|                   |               | PNP, NO           | RA 1225 H06POS            | RA 1250 H06POS | RA 1290 H06POS | RA 12110 H06POS |
|                   |               | PNP, NC           | RA 1225 H06PCS            | RA 1250 H06PCS | RA 1290 H06PCS | RA 12110 H06PCS |
|                   | Active low    | NPN, NO           | RA 1225 L06NOS            | RA 1250 L06NOS | RA 1290 L06NOS | RA 12110 L06NOS |
|                   |               | NPN, NC           | RA 1225 L06NCS            | RA 1250 L06NCS | RA 1290 L06NCS | RA 12110 L06NCS |
|                   |               | PNP, NO           | RA 1225 L06POS            | RA 1250 L06POS | RA 1290 L06POS | RA 12110 L06POS |
|                   |               | PNP, NC           | RA 1225 L06PCS            | RA 1250 L06PCS | RA 1290 L06PCS | RA 12110 L06PCS |
|                   | Active high   | NPN, NO           | RA 2325 H06NOS            | RA 2350 H06NOS | RA 2390 H06NOS | RA 23110 H06NOS |
|                   |               | NPN, NC           | RA 2325 H06NCS            | RA 2350 H06NCS | RA 2390 H06NCS | RA 23110 H06NCS |
|                   |               | PNP, NO           | RA 2325 H06POS            | RA 2350 H06POS | RA 2390 H06POS | RA 23110 H06POS |
|                   |               | PNP, NC           | RA 2325 H06PCS            | RA 2350 H06PCS | RA 2390 H06PCS | RA 23110 H06PCS |
| 230 VACrms        | Active low    | NPN, NO           | RA 2325 L06NOS            | RA 2350 L06NOS | RA 2390 L06NOS | RA 23110 L06NOS |
|                   |               | NPN, NC           | RA 2325 L06NCS            | RA 2350 L06NCS | RA 2390 L06NCS | RA 23110 L06NCS |
|                   |               | PNP, NO           | RA 2325 L06POS            | RA 2350 L06POS | RA 2390 L06POS | RA 23110 L06POS |
|                   |               | PNP, NC           | RA 2325 L06PCS            | RA 2350 L06PCS | RA 2390 L06PCS | RA 23110 L06PCS |
|                   | Active high   | NPN, NO           | RA 2325 H06NOS            | RA 2350 H06NOS | RA 2390 H06NOS | RA 23110 H06NOS |
|                   |               | NPN, NC           | RA 2325 H06NCS            | RA 2350 H06NCS | RA 2390 H06NCS | RA 23110 H06NCS |
|                   |               | PNP, NO           | RA 2325 H06POS            | RA 2350 H06POS | RA 2390 H06POS | RA 23110 H06POS |
|                   |               | PNP, NC           | RA 2325 H06PCS            | RA 2350 H06PCS | RA 2390 H06PCS | RA 23110 H06PCS |

## Selection Guide (cont.)

| Rated op. voltage | Control input | Alarm output type | Rated operational current |                |                |                 |
|-------------------|---------------|-------------------|---------------------------|----------------|----------------|-----------------|
|                   |               |                   | 25 AACrms                 | 50 AACrms      | 90 AACrms      | 110 AACrms      |
| 400 VACrms        | Active high   | NPN, NO           | RA 4025 H10NOS            | RA 4050 H10NOS | RA 4090 H10NOS | RA 40110 H10NOS |
|                   |               | NPN, NC           | RA 4025 H10NCS            | RA 4050 H10NCS | RA 4090 H10NCS | RA 40110 H10NCS |
|                   |               | PNP, NO           | RA 4025 H10POS            | RA 4050 H10POS | RA 4090 H10POS | RA 40110 H10POS |
|                   |               | PNP, NC           | RA 4025 H10PCS            | RA 4050 H10PCS | RA 4090 H10PCS | RA 40110 H10PCS |
|                   | Active low    | NPN, NO           | RA 4025 L10NOS            | RA 4050 L10NOS | RA 4090 L10NOS | RA 40110 L10NOS |
|                   |               | NPN, NC           | RA 4025 L10NCS            | RA 4050 L10NCS | RA 4090 L10NCS | RA 40110 L10NCS |
|                   |               | PNP, NO           | RA 4025 L10POS            | RA 4050 L10POS | RA 4090 L10POS | RA 40110 L10POS |
|                   |               | PNP, NC           | RA 4025 L10PCS            | RA 4050 L10PCS | RA 4090 L10PCS | RA 40110 L10PCS |
|                   | Active high   | NPN, NO           | RA 4825 H12NOS            | RA 4850 H12NOS | RA 4890 H12NOS | RA 48110 H12NOS |
|                   |               | NPN, NC           | RA 4825 H12NCS            | RA 4850 H12NCS | RA 4890 H12NCS | RA 48110 H12NCS |
|                   |               | PNP, NO           | RA 4825 H12POS            | RA 4850 H12POS | RA 4890 H12POS | RA 48110 H12POS |
|                   |               | PNP, NC           | RA 4825 H12PCS            | RA 4850 H12PCS | RA 4890 H12PCS | RA 48110 H12PCS |
| 480 VACrms        | Active low    | NPN, NO           | RA 4825 L12NOS            | RA 4850 L12NOS | RA 4890 L12NOS | RA 48110 L12NOS |
|                   |               | NPN, NC           | RA 4825 L12NCS            | RA 4850 L12NCS | RA 4890 L12NCS | RA 48110 L12NCS |
|                   |               | PNP, NO           | RA 4825 L12POS            | RA 4850 L12POS | RA 4890 L12POS | RA 48110 L12POS |
|                   |               | PNP, NC           | RA 4825 L12PCS            | RA 4850 L12PCS | RA 4890 L12PCS | RA 48110 L12PCS |

## General Specifications

|                             | RA12...06..S       | RA23...06..S       | RA40...10..S        | RA48...12..S        |
|-----------------------------|--------------------|--------------------|---------------------|---------------------|
| Operational voltage range   | 60 to 140 VACrms   | 170 to 250 VACrms  | 150 to 440 VACrms   | 180 to 530 VAC      |
| Non-rep. peak voltage       | 600 V <sub>p</sub> | 600 V <sub>p</sub> | 1000 V <sub>p</sub> | 1200 V <sub>p</sub> |
| Zero voltage turn-on        | ≤ 15 V             | ≤ 15 V             | ≤ 15 V              | ≤ 25 V              |
| Operational frequency range | 45 to 65 Hz        | 45 to 65 Hz        | 45 to 65 Hz         | 45 to 65 Hz         |
| Power factor cos φ          | ≥ 0.5 @ 120 VACrms | ≥ 0.5 @ 230 VACrms | ≥ 0.5 @ 400 VACrms  | ≥ 0.5 @ 400 VACrms  |
| Approvals                   | UL, CSA            | UL, CSA            | UL, CSA             | UL, CSA             |
| CE-marking                  | Yes                | Yes                | Yes                 | Yes                 |

## Control Specifications

|                                        |                               |                                                                                                        |                                              |
|----------------------------------------|-------------------------------|--------------------------------------------------------------------------------------------------------|----------------------------------------------|
| Supply voltage range                   | 20 to 32 VDC                  | PNP Alarm output<br>Alarm output voltage open<br>Alarm output voltage @ 100 mA<br>Alarm output current | 0 VDC<br>V <sub>cc</sub> - 2 VDC<br>≤ 100 mA |
| Supply current @ 24 VDC                | ≤ 40 mA DC                    |                                                                                                        |                                              |
| Response time pick-up @ 50 Hz          | ≤ 10 ms                       | NPN Alarm output<br>Alarm output voltage open<br>Alarm output voltage @ 100 mA<br>Alarm output current | ≤ 32 VDC<br>2 VDC<br>≤ 100 mA                |
| Response time drop-out @ 50 Hz         | ≤ 10 ms                       |                                                                                                        |                                              |
| Active high control input              |                               |                                                                                                        |                                              |
| Pick-up voltage                        | Typ. 7 VDC                    |                                                                                                        |                                              |
| Drop-out voltage                       | Typ. 6.8 VDC                  |                                                                                                        |                                              |
| Input current (V <sub>c</sub> = 32 V)  | ≤ 4 mA                        |                                                                                                        |                                              |
| Active low control input               |                               |                                                                                                        |                                              |
| Pick-up voltage                        | Typ. V <sub>cc</sub> - 10 VDC |                                                                                                        |                                              |
| Drop-out voltage                       | Typ. V <sub>cc</sub> - 10 VDC |                                                                                                        |                                              |
| Input current (V <sub>cc</sub> = 32 V) | ≤ 4 mA                        |                                                                                                        |                                              |

## Output Specifications

|                                                         | RA..25.06..S           | RA..50.06..S            | RA..90.10..S            | RA..110.12..S            |
|---------------------------------------------------------|------------------------|-------------------------|-------------------------|--------------------------|
| Rated operational current AC 1                          | ≤ 25 Arms              | ≤ 50 Arms               | ≤ 90 Arms               | ≤ 110 Arms               |
| Min. operational load current                           | ≤ 200 mA               | ≤ 200 mA                | ≤ 200 mA                | ≤ 200 mA                 |
| Non-rep. surge current t=10 ms                          | ≤ 250 A <sub>p</sub>   | ≤ 600 A <sub>p</sub>    | ≤ 1000 A <sub>p</sub>   | ≤ 1500 A <sub>p</sub>    |
| Off-state leakage current @ rated voltage and frequency | ≤ 6 mA                 | ≤ 6 mA                  | ≤ 6 mA                  | ≤ 6 mA                   |
| I <sup>2</sup> t for fusing t=1-10 ms                   | ≤ 310 A <sup>2</sup> s | ≤ 1800 A <sup>2</sup> s | ≤ 5000 A <sup>2</sup> s | ≤ 11250 A <sup>2</sup> s |
| Critical dv/dt                                          | ≥ 500 V/μs             | ≥ 500 V/μs              | ≥ 500 V/μs              | ≥ 500 V/μs               |

## Sense Specifications

|                                          | RA..25.....S   | RA..50.....S   | RA..90.....S   | RA..110.....S  |
|------------------------------------------|----------------|----------------|----------------|----------------|
| Current                                  |                |                |                |                |
| Sensed load current                      | ≥ 50 mA        | ≥ 50 mA        | ≥ 50 mA        | ≥ 50 mA        |
| Non-sensed leakage current               | ≤ 20 mA        | ≤ 20 mA        | ≤ 20 mA        | ≤ 20 mA        |
| Voltage                                  |                |                |                |                |
| Sensed line voltage                      | ≥ 60 Vrms      | ≥ 120 Vrms     | ≥ 150 Vrms     | ≥ 180 Vrms     |
| Non-sensed line voltage                  | ≤ 30 Vrms      | ≤ 50 Vrms      | ≤ 80 Vrms      | ≤ 100 Vrms     |
| Timing                                   |                |                |                |                |
| Response time from fault to alarm output | ≤ 100 ms       | ≤ 100 ms       | ≤ 100 ms       | ≤ 100 ms       |
| Short-circuit of semiconductor           | Will be sensed | Will be sensed | Will be sensed | Will be sensed |

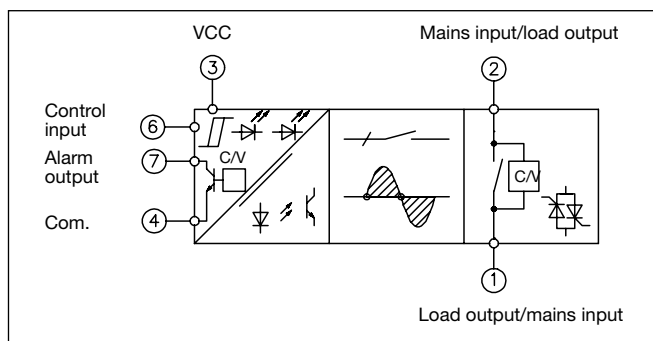
## Thermal Specifications

|                                     | RA..25.....S                       | RA..50.....S                       | RA..90.....S                       | RA..110.....S                      |
|-------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|
| 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)   | -20° to +70°C<br>(-4° to +158°F)   |
| Storage temperature                 | -40° to +100°C<br>(-40° to +212°C) | -40° to +100°C<br>(-40° to +212°C) | -40° to +100°C<br>(-40° to +212°C) | -40° to +100°C<br>(-40° to +212°C) |
| Junction temperature                | ≤ 125°C (257°F)                    | ≤ 125°C (257°F)                    | ≤ 125°C (257°F)                    | ≤ 125°C (257°F)                    |
| R <sub>th</sub> junction to case    | ≤ 1.25 K/W                         | ≤ 0.65 K/W                         | ≤ 0.35 K/W                         | ≤ 0.30 K/W                         |
| R <sub>th</sub> junction to ambient | ≤ 12 K/W                           | ≤ 12 K/W                           | ≤ 12 K/W                           | ≤ 12 K/W                           |

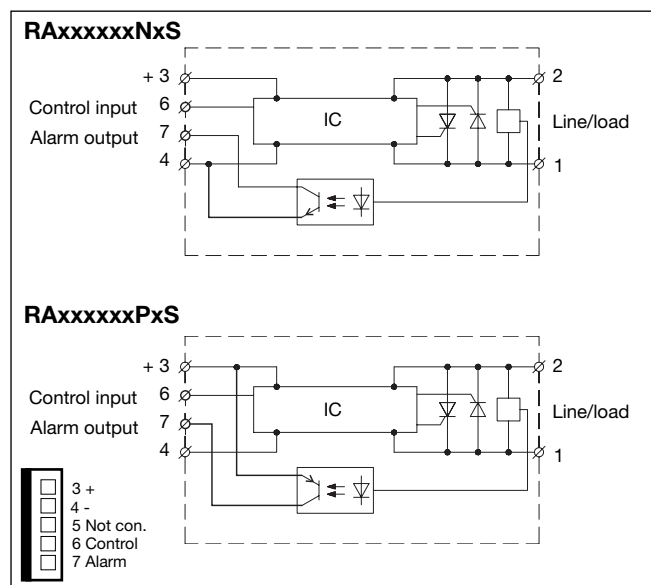
## Insulation

|                          |               |
|--------------------------|---------------|
| Rated insulation voltage |               |
| Input to output          | ≥ 4000 VACrms |
| Rated insulation voltage |               |
| Output to case           | ≥ 4000 VACrms |

## Functional Diagram

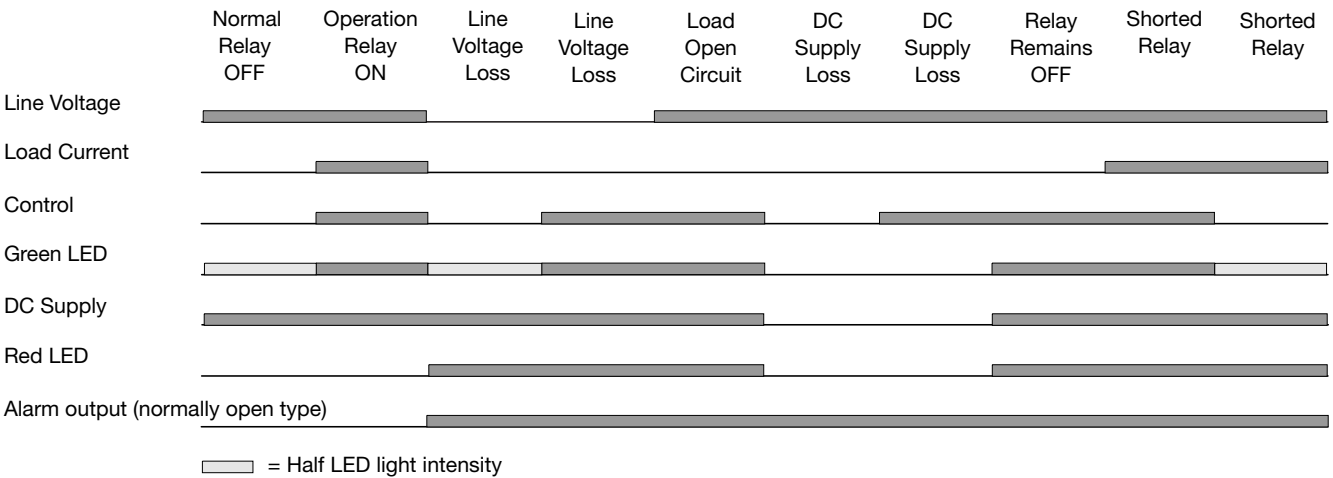


## Wiring Diagrams





Operation Diagram



Heatsink Dimensions (load current versus ambient temperature)

RA ..25 .....S

| Load current [A] | Thermal resistance [K/W] |      |      |      |      |      | Power dissipation [W] |
|------------------|--------------------------|------|------|------|------|------|-----------------------|
|                  | 20                       | 30   | 40   | 50   | 60   | 70   |                       |
| 25               | 2                        | 1.7  | 1.4  | 1    | 0.71 | 0.40 | 32                    |
| 22.5             | 2.5                      | 2.1  | 1.8  | 1.4  | 1    | 0.66 | 27                    |
| 20               | 3.1                      | 2.7  | 2.3  | 1.9  | 1.4  | 1    | 23                    |
| 17.5             | 4                        | 3.5  | 3    | 2.5  | 2    | 1.4  | 20                    |
| 15               | 4.9                      | 4.3  | 3.7  | 3.1  | 2.5  | 1.9  | 16                    |
| 12.5             | 6.2                      | 5.4  | 4.6  | 3.9  | 3.1  | 2.3  | 13                    |
| 10               | 8.1                      | 7.1  | 6.1  | 5.1  | 4    | 3    | 10                    |
| 7.5              | 11.3                     | 9.9  | 8.5  | 7.1  | 5.6  | 4.2  | 7                     |
| 5                | -                        | 15.6 | 13.3 | 11.1 | 8.9  | 6.7  | 5                     |
| 2.5              | -                        | -    | -    | -    | 18.7 | 14   | 2                     |
| T <sub>A</sub>   |                          |      |      |      |      |      | Ambient temp. [°C]    |

RA ..50 .....S

| Load current [A] | Thermal resistance [K/W] |      |      |      |      |      | Power dissipation [W] |
|------------------|--------------------------|------|------|------|------|------|-----------------------|
|                  | 20                       | 30   | 40   | 50   | 60   | 70   |                       |
| 50               | 0.92                     | 0.76 | 0.60 | 0.45 | 0.29 | -    | 63                    |
| 45               | 1.2                      | 0.99 | 0.80 | 0.62 | 0.44 | 0.26 | 55                    |
| 40               | 1.5                      | 1.3  | 1.1  | 0.85 | 0.63 | 0.42 | 47                    |
| 35               | 1.9                      | 1.6  | 1.4  | 1.1  | 0.89 | 0.63 | 40                    |
| 30               | 2.4                      | 2.1  | 1.8  | 1.5  | 1.2  | 0.91 | 33                    |
| 25               | 3                        | 2.7  | 2.3  | 1.9  | 1.5  | 1.1  | 26                    |
| 20               | 3.9                      | 3.5  | 3    | 2.5  | 2    | 1.5  | 20                    |
| 15               | 5.5                      | 4.8  | 4.1  | 3.4  | 2.7  | 2.1  | 15                    |
| 10               | 8.6                      | 7.5  | 6.4  | 5.4  | 4.3  | 3.2  | 9                     |
| 5                | 17.9                     | 15.6 | 13.4 | 11.2 | 8.9  | 6.7  | 4                     |
| T <sub>A</sub>   |                          |      |      |      |      |      | Ambient temp. [°C]    |

RA ..90 .....S

| Load current [A] | Thermal resistance [K/W] |      |      |      |      |      | Power dissipation [W] |
|------------------|--------------------------|------|------|------|------|------|-----------------------|
|                  | 20                       | 30   | 40   | 50   | 60   | 70   |                       |
| 90               | 0.63                     | 0.53 | 0.42 | 0.32 | -    | -    | 97                    |
| 80               | 0.81                     | 0.69 | 0.57 | 0.45 | 0.33 | -    | 84                    |
| 70               | 1                        | 0.89 | 0.75 | 0.61 | 0.47 | 0.33 | 71                    |
| 60               | 1.3                      | 1.2  | 1    | 0.83 | 0.66 | 0.49 | 59                    |
| 50               | 1.7                      | 1.5  | 1.3  | 1.1  | 0.85 | 0.64 | 47                    |
| 40               | 2.2                      | 1.9  | 1.7  | 1.4  | 1.1  | 0.83 | 36                    |
| 30               | 3.1                      | 2.7  | 2.3  | 1.9  | 1.5  | 1.2  | 26                    |
| 20               | 4.8                      | 4.2  | 3.6  | 3    | 2.4  | 1.8  | 17                    |
| 10               | 10                       | 8.8  | 7.5  | 6.3  | 5    | 3.8  | 8                     |
| T <sub>A</sub>   |                          |      |      |      |      |      | Ambient temp. [°C]    |

RA ..110 .....S

| Load current [A] | Thermal resistance [K/W] |      |      |      |      |      | Power dissipation [W] |
|------------------|--------------------------|------|------|------|------|------|-----------------------|
|                  | 20                       | 30   | 40   | 50   | 60   | 70   |                       |
| 110              | 0.43                     | 0.35 | 0.27 | -    | -    | -    | 126                   |
| 90               | 0.63                     | 0.53 | 0.42 | 0.32 | -    | -    | 97                    |
| 80               | 0.81                     | 0.69 | 0.57 | 0.45 | 0.33 | -    | 84                    |
| 70               | 1                        | 0.89 | 0.75 | 0.61 | 0.47 | 0.33 | 71                    |
| 60               | 1.3                      | 1.2  | 1    | 0.83 | 0.66 | 0.49 | 59                    |
| 50               | 1.7                      | 1.5  | 1.3  | 1.1  | 0.85 | 0.64 | 47                    |
| 40               | 2.2                      | 1.9  | 1.7  | 1.4  | 1.1  | 0.83 | 36                    |
| 30               | 3.1                      | 2.7  | 2.3  | 1.9  | 1.5  | 1.2  | 26                    |
| 20               | 4.8                      | 4.2  | 3.6  | 3    | 2.4  | 1.8  | 17                    |
| 10               | 10                       | 8.8  | 7.5  | 6.3  | 5    | 3.8  | 8                     |
| T <sub>A</sub>   |                          |      |      |      |      |      | Ambient temp. [°C]    |

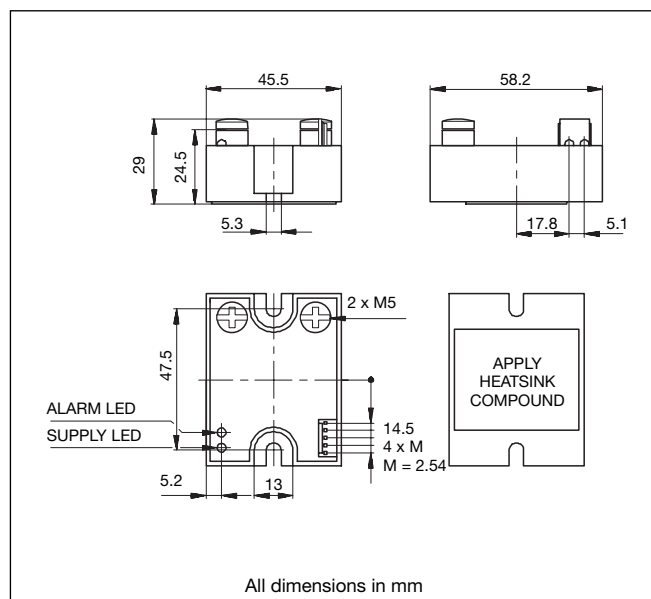
## Heatsink Selection

| <b>Carlo Gavazzi Heatsink</b><br>(See "General Accessories") | <b>Thermal<br/>resistance..</b> | <b>...for power<br/>dissipation</b> |
|--------------------------------------------------------------|---------------------------------|-------------------------------------|
| No heatsink required                                         | ---                             | N/A                                 |
| RHS 300                                                      | 5.00 K/W                        | > 0 W                               |
| RHS 100                                                      | 3.00 K/W                        | > 25 W                              |
| RHS 45A                                                      | 2.70 K/W                        | > 60 W                              |
| RHS 45B                                                      | 2.00 K/W                        | > 60 W                              |
| RHS 90                                                       | 1.35 K/W                        | > 60 W                              |
| RHS 45A plus fan                                             | 1.25 K/W                        | > 0 W                               |
| RHS 45B plus fan                                             | 1.20 K/W                        | > 0 W                               |
| RHS 112                                                      | 1.10 K/W                        | > 100 W                             |
| RHS 301                                                      | 0.80 K/W                        | > 70 W                              |
| RHS 90 plus fan                                              | 0.45 K/W                        | > 0 W                               |
| RHS 112 plus fan                                             | 0.40 K/W                        | > 0 W                               |
| RHS 301 plus fan                                             | 0.25 K/W                        | > 0 W                               |
| Consult your distributor                                     | > 0.25 K/W                      | N/A                                 |
| Infinite heatsink - No solution                              | ---                             | N/A                                 |

## Housing Specifications

|                   |                                    |
|-------------------|------------------------------------|
| Weight            | Approx. 110 g                      |
| Housing material  | Noryl GFN 1, black                 |
| Base plate        | Aluminium, nickel-plated           |
| Potting compound  | Polyurethane                       |
| Relay             |                                    |
| Mounting screws   | M5                                 |
| Mounting torque   | ≤ 1.5 Nm                           |
| Power terminal    |                                    |
| Mounting screws   | M5 x 6                             |
| Mounting torque   | ≤ 2.4 Nm                           |
| Control connector | 5 pole,<br>centre distance 2.54 mm |

## Dimensions



## Accessories

## Heatsinks

DIN rail adapter

## Varistors

## Fuses

Connector for ribbon cable:

Header for PCB mounting:

Ribbon cable:

Methode 1300-105-424

Methode 1100-8-105-01

5 x 0.5 mm<sup>2</sup>,  
centre distance 2.54 mm

## Ribbon Cable Selection

**RCS 5-200-0\***

## R-System

### Cable sense

**5-wire**

Cable length in cm

\* 0: No connector mounted (Method 1300-105-424)

1: 1 connector mounted

2: 2 connectors mounted