

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

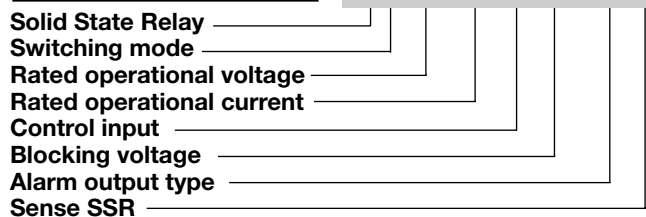
The system monitoring solid state relay (sense relay) provides an alarm output in the event of a circuit failure. Internal circuits monitor:

- 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



Type Selection

| Switching mode | Rated operational voltage | Rated operational current input | Control voltage | Blocking Voltage | Alarm output |
|-------------------|--|--|-----------------|--|--|
| A: Zero switching | 12: 120 VACrms 23: 230 VACrms 40: 400 VACrms 48: 480 VACrms | 25: 25 AACrms 50: 50 AACrms 90: 90 AACrms 110: 110 AACrms | H: Active high | 06: 650 V _p 10: 1000 V _p 12: 1200 V _p | NO: NPN, NO NC: NPN, NC PO: PNP, NO 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 |
| 230 VACrms | 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 |
| 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 |
| 480 VACrms | 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 |

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 |
| Blocking voltage | 650 V _p | 650 V _p | 1000 V _p | 1200 V _p |
| 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 @ 480 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 Alarm output voltage open Alarm output voltage @ 100 mA Alarm output current | 0 VDC V _{cc} - 2 VDC ≤ 100 mA |
| Supply current @ 24 VDC | ≤ 40 mA DC | | |
| Response time pick-up @ 50 Hz | ≤ 10 ms | | |
| Response time drop-out @ 50 Hz | ≤ 10 ms | | |
| Active high control input | | NPN Alarm output Alarm output voltage open Alarm output voltage @ 100 mA Alarm output current | ≤ 32 VDC 2 VDC ≤ 100 mA |
| Pick-up voltage | Typ. 7 VDC | | |
| Drop-out voltage | Typ. 6.8 VDC | | |
| Input current (V _c = 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 51 | ≤ 25 Arms | ≤ 50 Arms | ≤ 90 Arms | ≤ 110 Arms |
| AC 53a | 5 Arms | 15 Arms | 20 Arms | 30 Arms |
| Min. operational load current | ≤ 200 mA | ≤ 250 mA | ≤ 400 mA | ≤ 500 mA |
| Non-rep. surge current t=10 ms | ≤ 325 A _p | ≤ 600 A _p | ≤ 1150 A _p | ≤ 1900 A _p |
| Off-state leakage current @ rated voltage and frequency | ≤ 6 mA | ≤ 6 mA | ≤ 6 mA | ≤ 6 mA |
| I ² t for fusing t=10 ms | ≤ 525 A ² s | ≤ 1800 A ² s | ≤ 6600 A ² s | ≤ 18000 A ² s |
| Critical dv/dt | ≥ 500 V/μs | ≥ 500 V/μs | ≥ 500 V/μs | ≥ 500 V/μs |

Sense Specifications

| | RA12..06..S | RA23..06..S | RA40..10..S | RA48..12..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 |

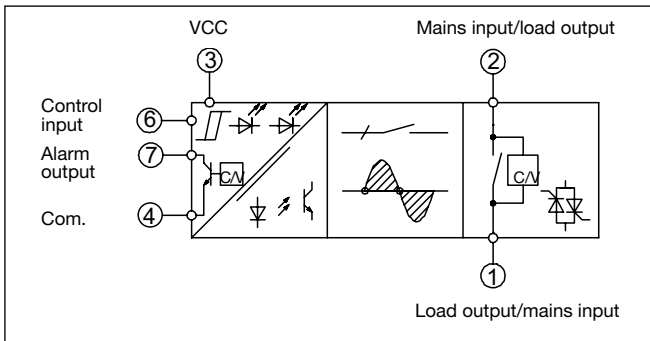
Thermal Specifications

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

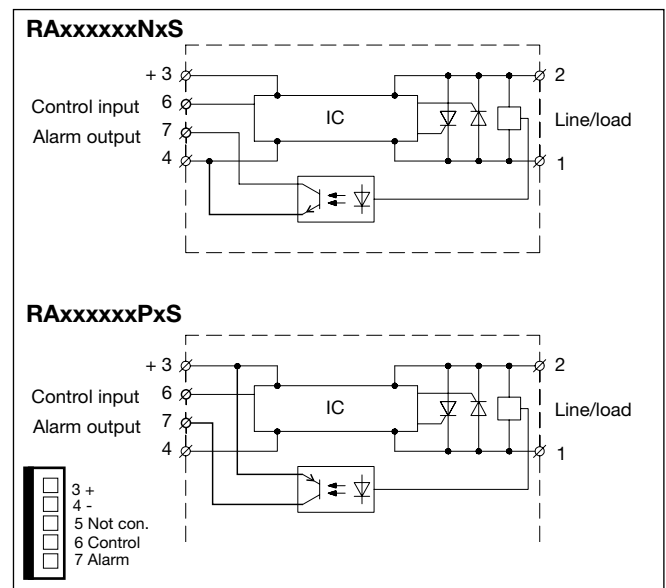
Isolation

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

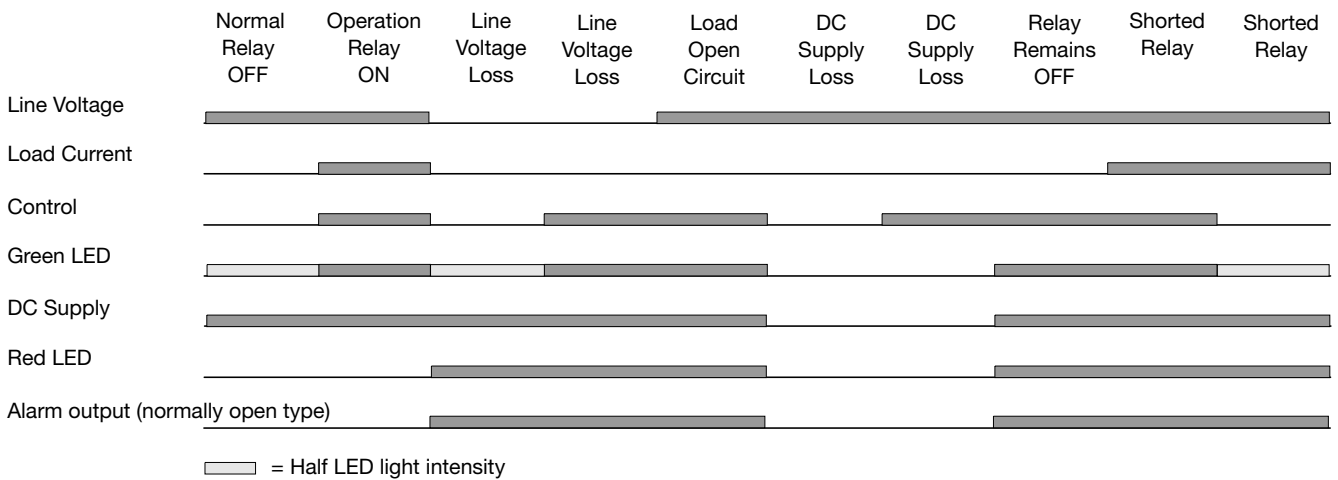
Functional Diagram



Wiring Diagrams



Operation Diagram





Heatsink Dimensions (load current versus ambient temperature)

RA ..25S

| 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 |

Ambient temp. [°C]

RA ..50S

| 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 |

Ambient temp. [°C]

RA ..90S

| 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 |

Ambient temp. [°C]

RA ..110S

| 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 |

Ambient temp. [°C]

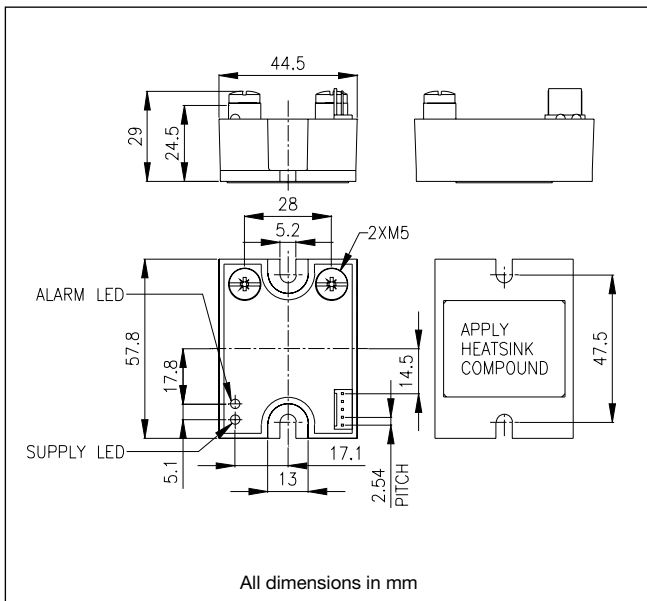
Heatsink Selection

| Carlo Gavazzi Heatsink (See "General Accessories") | Thermal resistance.. | ...for power dissipation |
|---|----------------------|--------------------------|
| No heatsink required | --- | N/A |
| RHS 300 | 5.00 K/W | > 0 W |
| RHS 100 | 3.00 K/W | > 25 W |
| RHS 45C | 2.70 K/W | > 60 W |
| RHS 45B | 2.00 K/W | > 60 W |
| RHS 90A | 1.35 K/W | > 60 W |
| RHS 45C plus fan | 1.25 K/W | > 0 W |
| RHS 45B plus fan | 1.20 K/W | > 0 W |
| RHS 112A | 1.10 K/W | > 100 W |
| RHS 301 | 0.80 K/W | > 70 W |
| RHS 90A plus fan | 0.45 K/W | > 0 W |
| RHS 112A 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 25, 50 A 90, 110 A | Aluminium, nickel-plated Coper, nickel-plated |
| Potting compound | Polyurethane |
| Relay Mounting screws Mounting torque | M5 ≤ 1.5 Nm |
| Power terminal Mounting screws Mounting torque | M5 x 6 ≤ 2.4 Nm |
| Control connector | 5 pole, centre distance 2.54 mm |

Dimensions



Accessories

- Heatsinks
- DIN rail adapter
- Varistors
- Fuses
- Connector for ribbon cable: Methode 1300-105-424
- Header for PCB mounting: Methode 1100-8-105-01
- Ribbon cable: 5 x 0.5 mm², 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