

# Solid State Relays

## Low Voltage AC/DC Control: 5 to 24 V

### Types RM 23M, RM 40M, RM 48M, RM 60M



- Zero switching AC Solid State Relay
- Low voltage AC/DC control: 5 to 24 V
- Direct copper bonding (DCB) technology
- LED indication
- Built-in varistor
- Clip-on IP 20 protection cover
- Self-lifting terminals
- Housing free of moulding mass
- Operational ratings up to 100 AACrms and 600 VAC
- Opto-insulation: > 4000 VACrms

## Product Description

The industrial, 1-phase relay with antiparallel thyristor output is the most widely used SSR due to its multiple application possibilities. This relay has been designed to interface low voltage AC or DC control systems with high voltage resistive, inductive and capacitive loads. The zero switching relay switches ON when the sinusoidal

curve crosses zero and switches OFF when the current crosses zero. The built-in varistor secures transient protection for the heavy industrial applications, and the LED indicates the status of the control input. The clip-on cover is securing touch safety to IP 20. Protected output terminals can take cables up to 16 mm<sup>2</sup>.

## Ordering Key

**RM 1 A 23 M 25**

Solid State Relay  
Number of poles  
Switching mode  
Rated operational voltage  
Control voltage  
Rated operational current

## Type Selection

| Switching mode                               | Rated operational voltage                                            | Control voltage   | Rated operational current                                          |
|----------------------------------------------|----------------------------------------------------------------------|-------------------|--------------------------------------------------------------------|
| A: Zero Switching<br>B: Instant-on switching | 23: 230 VACrms<br>40: 400 VACrms<br>48: 480 VACrms<br>60: 600 VACrms | M: 5 to 24 VDC/AC | 25: 25 AACrms<br>50: 50 AACrms<br>75: 75 AACrms<br>100: 100 AACrms |

## Selection Guide

| Rated operational voltage | Non-rep. voltage    | Control voltage | Rated operational current |           |           |            |
|---------------------------|---------------------|-----------------|---------------------------|-----------|-----------|------------|
|                           |                     |                 | 25 AACrms                 | 50 AACrms | 75 AACrms | 100 AACrms |
| 230 VACrms                | 650 V <sub>p</sub>  | 5 to 24 VDC/AC  | RM1A23M25                 | RM1A23M50 | RM1A23M75 | RM1A23M100 |
| 400 VACrms                | 850 V <sub>p</sub>  | 5 to 24 VDC/AC  | RM1A40M25                 | RM1A40M50 | RM1A40M75 | RM1A40M100 |
| 480 VACrms                | 1200 V <sub>p</sub> | 5 to 24 VDC/AC  | RM1A48M25                 | RM1A48M50 | RM1A48M75 | RM1A48M100 |
| 600 VACrms                | 1400 V <sub>p</sub> | 5 to 24 VDC/AC  | RM1A60M25                 | RM1A60M50 | RM1A60M75 | RM1A60M100 |

## General Specifications

|                                    | RM1A23M              | RM1A40M              | RM1A48M               | RM1A60M               |
|------------------------------------|----------------------|----------------------|-----------------------|-----------------------|
| <b>Operational voltage range</b>   | 24 to 265 VACrms     | 42 to 440 VACrms     | 42 to 530 VACrms      | 42 to 660 VACrms      |
| <b>Non-rep. peak voltage</b>       | ≥ 650 V <sub>p</sub> | ≥ 850 V <sub>p</sub> | ≥ 1200 V <sub>p</sub> | ≥ 1400 V <sub>p</sub> |
| <b>Zero voltage turn-on</b>        | ≤ 15 V               | ≤ 15 V               | ≤ 15 V                | ≤ 15 V                |
| <b>Operational frequency range</b> | 45 to 65 Hz          | 45 to 65 Hz          | 45 to 65 Hz           | 45 to 65 Hz           |
| <b>Power factor</b>                | > 0.5 @ 230 VACrms   | > 0.5 @ 400 VACrms   | > 0.5 @ 480 VACrms    | > 0.5 @ 600 VACrms    |
| <b>Approvals</b>                   | UL, CSA              | UL, CSA              | UL, CSA               | UL, CSA               |
| <b>CE-marking</b>                  | Yes                  | Yes                  | Yes                   | Yes **                |

\*\* Heatsink must be connected to ground

## Input Specifications

|                                    |                            |
|------------------------------------|----------------------------|
| <b>Control voltage range</b>       | 4.25-36 VDC<br>4.25-27 VAC |
| <b>Absolute max. input voltage</b> | 37 VDC<br>28 VAC           |
| <b>Pick-up voltage</b>             | 4.0 VDC<br>4.0 VAC         |
| <b>Drop out voltage</b>            | 2.0 VDC<br>2.0 VAC         |
| <b>Input current</b>               |                            |
| @ 5 VAC                            | 10 mA                      |
| @ 24 VAC                           | 18 mA                      |
| @ 5 VDC                            | 9 mA                       |
| @ 24 VDC                           | 12 mA                      |
| <b>Response time pick-up max.</b>  | ≤ 1 cycle                  |
| <b>Response time drop-out max.</b> | ≤ 2.5 cycle                |

## Insulation

|                                                    |               |
|----------------------------------------------------|---------------|
| <b>Rated insulation voltage</b><br>Input to output | ≥ 4000 VACrms |
| <b>Rated insulation voltage</b><br>Output to case  | ≥ 4000 VACrms |

## Housing Specifications

|                                                               |                                    |
|---------------------------------------------------------------|------------------------------------|
| <b>Weight</b><br>25 A, 50 A<br>75 A, 100 A                    | Approx. 60 g<br>Approx. 100 g      |
| <b>Housing material</b>                                       | Noryl GFN 1, black                 |
| <b>Baseplate</b><br>25 A, 50 A<br>75 A, 100 A                 | Aluminium<br>Copper, nickel-plated |
| <b>Potting compound</b>                                       | None                               |
| <b>Relay</b><br>Mounting screws<br>Mounting torque            | M5<br>1.5-2.0 Nm                   |
| <b>Control terminal</b><br>Mounting screws<br>Mounting torque | M3 x 9<br>0.5 Nm                   |
| <b>Power terminal</b><br>Mounting screws<br>Mounting torque   | M5 x 9<br>2.4 Nm                   |

## Thermal Specifications

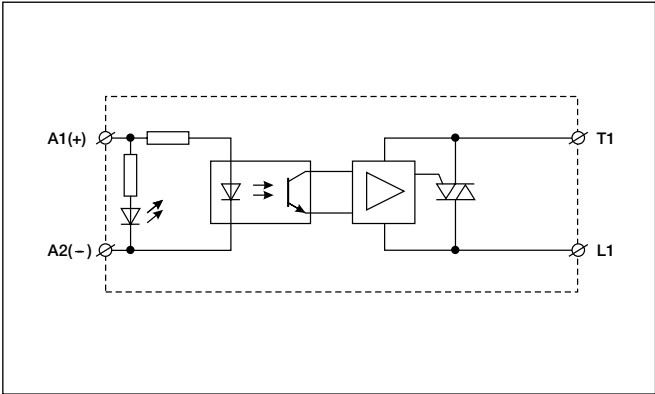
|                                           | RM1...M25     | RM1...M50     | RM1...M75     | RM1...M100    |
|-------------------------------------------|---------------|---------------|---------------|---------------|
| <b>Operating temperature range</b>        | -20° to 70°C  | -20° to 70°C  | -20° to 70°C  | -20° to 70°C  |
| <b>Storage temperature range</b>          | -40° to 100°C | -40° to 100°C | -40° to 100°C | -40° to 100°C |
| <b>Junction temperature</b>               | ≤ 125°C       | ≤ 125°C       | ≤ 125°C       | ≤ 125°C       |
| <b>R<sub>th</sub> junction to case</b>    | ≤ 0.80 K/W    | ≤ 0.50 K/W    | ≤ 0.35 K/W    | ≤ 0.30 K/W    |
| <b>R<sub>th</sub> junction to ambient</b> | ≤ 20.0 K/W    | ≤ 20.0 K/W    | ≤ 20.0 K/W    | ≤ 15.0 K/W    |



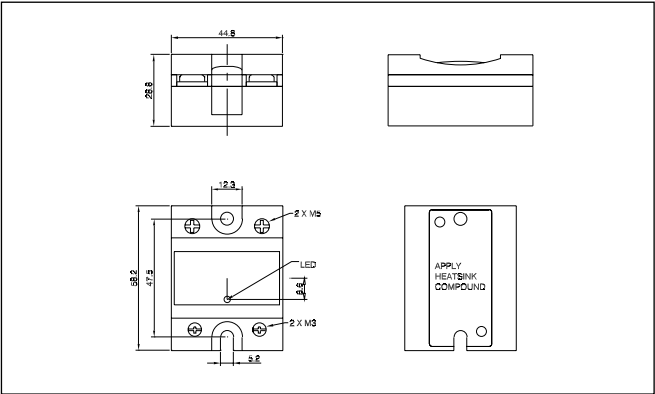
Output Specifications

|                                                                | RM1A..M25         | RM1A..M50          | RM1A..M75          | RM1A..M100          |
|----------------------------------------------------------------|-------------------|--------------------|--------------------|---------------------|
| Rated operational current<br>AC51 @ Ta=25°C<br>AC53a @ Ta=25°C | 25 Arms<br>5 Arms | 50 Arms<br>15 Arms | 75 Arms<br>20 Arms | 100 Arms<br>30 Arms |
| Min. operational current                                       | 150 mA            | 150 mA             | 150 mA             | 150 mA              |
| Rep. overload current t=1 s                                    | < 55 AACrms       | < 125 AACrms       | < 150 AACrms       | < 200 AACrms        |
| Non-rep. surge current t=10 ms                                 | 250 Ap            | 600 Ap             | 1000 Ap            | 1500 Ap             |
| Off-state leakage current @<br>rated voltage and frequency     | < 3 mArms         | < 3 mArms          | < 3 mArms          | < 3 mArms           |
| I²t for fusing t=1-10 ms                                       | < 310 A²s         | < 1800 A²s         | < 6600 A²s         | < 18000 A²s         |
| Critical di/dt                                                 | ≥ 100 A/µs        | ≥ 100 A/µs         | ≥ 100 A/µs         | ≥ 100 A/µs          |
| On-state voltage drop @ rated current                          | 1.6 Vrms          | 1.6 Vrms           | 1.6 Vrms           | 1.6 Vrms            |
| Critical dV/dt commutating                                     | 500 V/µs          | 500 V/µs           | 500 V/µs           | 500 V/µs            |
| Critical dV/dt off-state min.                                  | 500 V/µs          | 500 V/µs           | 500 V/µs           | 500 V/µs            |
| Zero crossing detection                                        | Yes               | Yes                | Yes                | Yes                 |

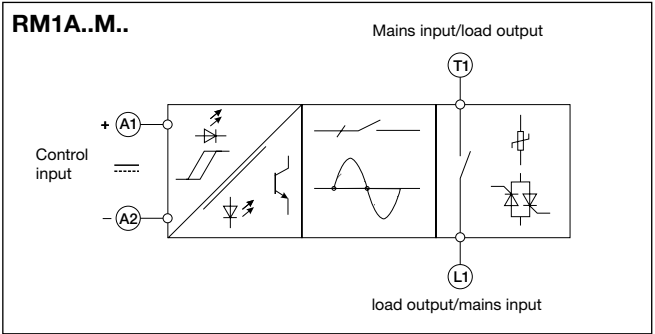
Wiring Diagram



Dimensions



Functional Diagram



## Heatsink Dimensions (load current versus ambient temperature)

### RM1...M25

| Load current [A] | Thermal resistance [K/W] |      |      |      |      |      | Power dissipation [W] |
|------------------|--------------------------|------|------|------|------|------|-----------------------|
|                  | 20                       | 30   | 40   | 50   | 60   | 70   |                       |
| 25.0             | 2.70                     | 2.34 | 1.98 | 1.61 | 1.25 | 0.89 | 28                    |
| 22.5             | 3.10                     | 2.69 | 2.28 | 1.86 | 1.45 | 1.04 | 24                    |
| 20.0             | 3.61                     | 3.13 | 2.65 | 2.18 | 1.70 | 1.23 | 21                    |
| 17.5             | 4.26                     | 3.70 | 3.14 | 2.59 | 2.03 | 1.47 | 18                    |
| 15.0             | 5.14                     | 4.47 | 3.80 | 3.14 | 2.47 | 1.80 | 15                    |
| 12.5             | 6.38                     | 5.56 | 4.73 | 3.91 | 3.09 | 2.27 | 12                    |
| 10.0             | 8.25                     | 7.19 | 6.14 | 5.08 | 4.02 | 2.97 | 9                     |
| 7.5              | 11.4                     | 9.94 | 8.49 | 7.04 | 5.59 | 4.14 | 7                     |
| 5.0              | 17.7                     | 15.4 | 13.2 | 11.0 | 8.74 | 6.51 | 4                     |
| 2.5              | -                        | -    | -    | -    | 18.2 | 13.6 | 2                     |

T<sub>A</sub>  
Ambient temp. [°C]

|                                                             |        |       |
|-------------------------------------------------------------|--------|-------|
| Junction to ambient thermal resistance, R <sub>th j-a</sub> | < 20.0 | K/W   |
| Junction to case thermal resistance, R <sub>th j-c</sub>    | < 0.80 | K/W   |
| Case to heatsink thermal resistance, R <sub>th c-s</sub>    | < 0.20 | K/W   |
| Maximum allowable case temperature                          | 100    | deg.C |
| Maximum allowable junction temperature                      | 125    | deg.C |

### RM1...M50

| Load current [A] | Thermal resistance [K/W] |      |      |      |      |      | Power dissipation [W] |
|------------------|--------------------------|------|------|------|------|------|-----------------------|
|                  | 20                       | 30   | 40   | 50   | 60   | 70   |                       |
| 50.0             | 1.03                     | 0.86 | 0.70 | 0.53 | 0.37 | 0.20 | 61                    |
| 45.0             | 1.27                     | 1.09 | 0.90 | 0.71 | 0.52 | 0.33 | 53                    |
| 40.0             | 1.54                     | 1.32 | 1.10 | 0.89 | 0.67 | 0.45 | 46                    |
| 35.0             | 1.85                     | 1.59 | 1.34 | 1.08 | 0.82 | 0.57 | 39                    |
| 30.0             | 2.26                     | 1.95 | 1.65 | 1.34 | 1.03 | 0.72 | 33                    |
| 25.0             | 2.85                     | 2.47 | 2.08 | 1.70 | 1.32 | 0.94 | 26                    |
| 20.0             | 3.73                     | 3.24 | 2.75 | 2.26 | 1.77 | 1.27 | 20                    |
| 15.0             | 5.22                     | 4.54 | 3.86 | 3.19 | 2.51 | 1.83 | 15                    |
| 10.0             | 8.21                     | 7.16 | 6.11 | 5.05 | 4.00 | 2.95 | 10                    |
| 5.0              | 17.2                     | 15.0 | 12.9 | 10.7 | 8.51 | 6.33 | 5                     |

T<sub>A</sub>  
Ambient temp. [°C]

|                                                             |        |       |
|-------------------------------------------------------------|--------|-------|
| Junction to ambient thermal resistance, R <sub>th j-a</sub> | < 20.0 | K/W   |
| Junction to case thermal resistance, R <sub>th j-c</sub>    | < 0.50 | K/W   |
| Case to heatsink thermal resistance, R <sub>th c-s</sub>    | < 0.20 | K/W   |
| Maximum allowable case temperature                          | 100    | deg.C |
| Maximum allowable junction temperature                      | 125    | deg.C |

### RM1...M75

| Load current [A] | Thermal resistance [K/W] |       |       |      |      |      | Power dissipation [W] |
|------------------|--------------------------|-------|-------|------|------|------|-----------------------|
|                  | 20                       | 30    | 40    | 50   | 60   | 70   |                       |
| 75.0             | 0.91                     | 0.78  | 0.65  | 0.52 | 0.39 | 0.26 | 77                    |
| 67.5             | 1.10                     | 0.96  | 0.81  | 0.66 | 0.51 | 0.36 | 68                    |
| 60.0             | 1.34                     | 1.17  | 1.00  | 0.83 | 0.66 | 0.49 | 59                    |
| 52.5             | 1.60                     | 1.40  | 1.20  | 1.00 | 0.80 | 0.60 | 50                    |
| 45.0             | 1.93                     | 1.68  | 1.44  | 1.20 | 0.96 | 0.72 | 42                    |
| 37.5             | 2.38                     | 2.08  | 1.78  | 1.49 | 1.19 | 0.89 | 34                    |
| 30.0             | 3.06                     | 2.68  | 2.30  | 1.91 | 1.53 | 1.15 | 26                    |
| 22.5             | 4.21                     | 3.68  | 3.16  | 2.63 | 2.10 | 1.58 | 19                    |
| 15.0             | 6.51                     | 5.70  | 4.88  | 4.07 | 3.26 | 2.44 | 12                    |
| 7.5              | 13.5                     | 11.77 | 10.09 | 8.41 | 6.73 | 5.04 | 6                     |

T<sub>A</sub>  
Ambient temp. [°C]

|                                                             |        |       |
|-------------------------------------------------------------|--------|-------|
| Junction to ambient thermal resistance, R <sub>th j-a</sub> | < 20.0 | K/W   |
| Junction to case thermal resistance, R <sub>th j-c</sub>    | < 0.35 | K/W   |
| Case to heatsink thermal resistance, R <sub>th c-s</sub>    | < 0.10 | K/W   |
| Maximum allowable heatsink temperature                      | 100    | deg.C |
| Maximum allowable junction temperature                      | 125    | deg.C |

### RM1...M100.

| Load current [A] | Thermal resistance [K/W] |      |      |      |      |      | Power dissipation [W] |
|------------------|--------------------------|------|------|------|------|------|-----------------------|
|                  | 20                       | 30   | 40   | 50   | 60   | 70   |                       |
| 100.0            | 0.54                     | 0.45 | 0.36 | 0.27 | 0.18 | 0.09 | 111                   |
| 90.0             | 0.68                     | 0.58 | 0.47 | 0.37 | 0.27 | 0.17 | 97                    |
| 80.0             | 0.86                     | 0.74 | 0.62 | 0.50 | 0.38 | 0.26 | 84                    |
| 70.0             | 1.08                     | 0.94 | 0.80 | 0.66 | 0.52 | 0.38 | 71                    |
| 60.0             | 1.37                     | 1.20 | 1.03 | 0.85 | 0.68 | 0.51 | 59                    |
| 50.0             | 1.70                     | 1.49 | 1.28 | 1.06 | 0.85 | 0.64 | 47                    |
| 40.0             | 2.21                     | 1.93 | 1.66 | 1.38 | 1.10 | 0.83 | 36                    |
| 30.0             | 3.06                     | 2.68 | 2.30 | 1.91 | 1.53 | 1.15 | 26                    |
| 20.0             | 4.78                     | 4.18 | 3.59 | 2.99 | 2.39 | 1.79 | 17                    |
| 10.0             | 9.98                     | 8.73 | 7.49 | 6.24 | 4.99 | 3.74 | 8                     |

T<sub>A</sub>  
Ambient temp. [°C]

|                                                             |        |       |
|-------------------------------------------------------------|--------|-------|
| Junction to ambient thermal resistance, R <sub>th j-a</sub> | < 20.0 | K/W   |
| Junction to case thermal resistance, R <sub>th j-c</sub>    | < 0.30 | K/W   |
| Case to heatsink thermal resistance, R <sub>th c-s</sub>    | < 0.10 | K/W   |
| Maximum allowable heatsink temperature                      | 100    | deg.C |
| Maximum allowable junction temperature                      | 125    | deg.C |



Heatsink Selection

| Carlo Gavazzi Heatsink<br>(see Accessories) | Thermal<br>resistance... | ...for power<br>dissipation |
|---------------------------------------------|--------------------------|-----------------------------|
| 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 distribution                   | > 0.25 K/W               | N/A                         |
| Infinite heatsink - No solution             | ---                      | N/A                         |

Fast-on terminals



- Fast-on tabs
- Type R..F.
- Screw mounted fast-on terminals
- Flat (0°) and angled (45°) orientation
- Input tab width: 4.8mm
- Output tab with: 6.3mm
- Tab dimensions according to DIN 46342 part 1
- Pure tin-plated brass

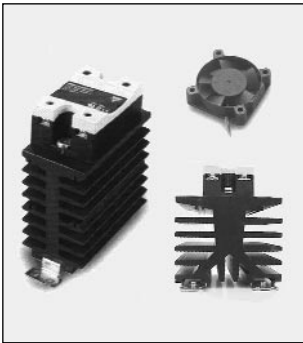
Ordering Key

RM1A48M25 F 4\*

RS, RM Solid State Relay  
Fast-on terminals  
Tab orientation

\* 0: Flat (0°)  
4: Angled (45°)

Other Accessories



- Heatsinks and fans
- Type RHS....
- 0.25 to 5.00 k/W
- Single and dual relay types



- Touch safety cover
- Type RMIP20
- IP20 protection degree
- Pack size: 20 pieces

All accessories can be ordered pre-assembled with Solid State Relays.  
Other accessories include DIN rail adaptors, fuses, varistors and spacers.  
For further information refer to Accessories datasheets.