# Solid State Relays
# Industrial, 1-Phase Analog Switching
# Type RM1E


- **AC Solid State Relay**
- **Analog switching (phase-angle control) for resistive and slightly inductive load applications**
- **4 - 20mA or 0 -10V control input**
- **Rated operational current: 25, 50, 75 and 100 AACrms**
- **Rated operational voltage: Up to 600 VACrms**
- **Variable intensity LED-indication according to input current**
- **Integral snubber network**
- **Polarized lockable control connector for safe connection for voltage controlled version**

## Product Description

The analog switching relay works in accordance with the phase angle control principle, i.e., the output switching point in the AC sine wave depends on the control input which can be either 4-20mA or 0-10VDC. 4 mA or 0VDC correspond to zero output power whilst 20 mA or 10VDC correspond to full output power (near linear power response). The relay switches off every time the output current crosses zero, and switches ON in accordance with the applied control input.

## Ordering Key

**RM 1E 60 AA 50**

- **Solid State Relay**
- **Number of Poles**
- **Switching mode**
- **Rated operational voltage**
- **Control input**
- **Rated operational current**

## Type Selection

| Switching mode | Rated operational voltage | Rated operational current | Control input |
|---|---|---|---|
| E: Analog switching | 23: 230 VACrms* | 25: 25 AACrms | AA: 4 - 20 mADC |
| | 40: 400 VACrms | 50: 50 AACrms | V: 0-10VDC** |
| | 48: 480 VACrms | 75: 75 AACrms | |
| | 60: 600 VACrms | 100: 100 AACrms | |

* For nominal operational voltage of 110VACrms, use RM1E23...
** RM1E..V.. require an external supply voltage

## Selection Guide

| Rated operational voltage | Blocking voltage | Control input | Rated operational current 25 A | 50 A | 75A | 100 A |
|---|---|---|---|---|---|---|
| 230 VAC | 650 $V_p$ | 4 - 20 mA | **RM1E23AA25** | **RM1E23AA50** | | **RM1E23AA100** |
| | | 0-10 VDC | **RM1E23V25** | **RM1E23V50** | | **RM1E23V100** |
| 400 VAC | 850 $V_p$ | 4 - 20 mA | **RM1E40AA25** | **RM1E40AA50** | | **RM1E40AA100** |
| 480 VAC | 1200 $V_p$ | 4 - 20 mA | **RM1E48AA25** | **RM1E48AA50** | **RM1E48AA75** | **RM1E48AA100** |
| | | 0-10 VDC | **RM1E48V25** | **RM1E48V50** | | **RM1E48V100** |
| 600 VAC | 1400 $V_p$ | 4 - 20 mA | **RM1E60AA25** | **RM1E60AA50** | | **RM1E60AA100** |
| | | 0-10 VDC | **RM1E60V25** | **RM1E60V50** | | **RM1E60V100** |

## General Specifications

| | RM 1E 23 ... | RM 1E 40 ... | RM 1E 48 ... | RM 1E 60 ... |
|---|---|---|---|---|
| Operational voltage range | | | | |
| RM1E..AA.. | 90 to 280 VAC | 340 to 460 VAC | 90 to 550 VAC | 410 to 660 VAC |
| RM1E..V.. | 90 to 265 VAC | - | 200 to 550 VAC | 410 to 660 VAC |
| Blocking voltage | 650 $V_p$ | 850 $V_p$ | 1200 $V_p$ | 1400 $V_p$ |
| Operational frequency range | 45 to 65 Hz | 45 to 65 Hz | 45 to 65 Hz | 45 to 65 Hz |
| Power factor | > 0.75 | > 0.75 | > 0.75 | > 0.75 |
| Approvals | UL, cUL, CSA* | UL, cUL, CSA* | UL, cUL, CSA* | UL, cUL, CSA* |
| CE-marking | Yes | Yes | Yes | Yes** |

* Approvals pending for RM1E..V...
** Heatsink must be connected to ground for 600V types

## Output Specifications

| | RM1E...25 | RM1E...50 | RM1E...75 | RM1E...100 |
|---|---|---|---|---|
| Rated operational current | | | | |
| AC51 Ta=25 ˚C | 25 AACrms | 50 AACrms | 75 AACrms | 100 AACrms |
| AC53a Ta=25 ˚C | 5 AACrms | 15 AACrms | 20 AACrms | 20 AACrms |
| Minimum operational current | 150 mA | 250 mA | 400 mA | 400 mA |
| Rep. overload current t=1s | 55 AACrms | 125 AACrms | 150 AACrms | 150 AACrms |
| Non-rep. surge current t=10ms | 325 $A_p$ | 600 $A_p$ | 1150 $A_p$ | 1150 $A_p$ |
| Off-state leakage current | < 3 mA | < 3 mA | < 3 mA | < 3 mA |
| $I^2t$ for fusing t= 10 ms | 525 $A^2s$ | 1800 $A^2s$ | 6600 $A^2s$ | 6600 $A^2s$ |
| Critical dV/dt off-state min. | 1000 V/µs | 1000 V/µs | 1000 V/µs | 1000 V/µs |

## Input Specifications

| Current controlled input | RM1E..AA.. |
|---|---|
| Control current range (A1-A2) | 4-20 mADC |
| Pick up current | 4.2 mADC |
| Drop out current | 4.1 mADC |
| Response time (input to output) | ≤ 20 ms |
| Voltage drop | < 10 VDC @ 20 mA |
| Dynamic impedance | ≥ 330 Ω |
| Max. allowable input current | 50 mA |
| Reverse polarity protected | Yes |

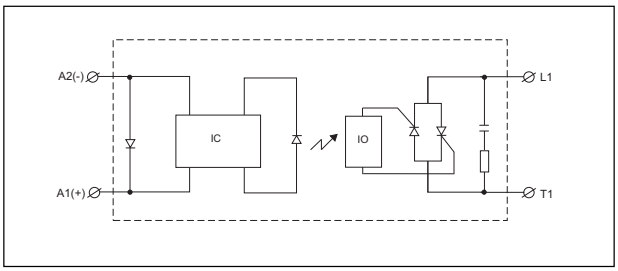
| Voltage controlled input | RM1E..V.. |
|---|---|
| Supply voltage, Vss (A3-A2) | 24 VDC ±20% |
| Max. supply current | 15 mA @ 19.2 VDC<br>20 mA @ 30 VDC |
| Control voltage, Vcc (A1-A2) | 0-10VDC |
| Pick up voltage | 0.2 VDC |
| Drop out voltage | 0.1VDC |
| Control input current | 0.15 mA @10 VDC |
| Response time (input to output) | ≤ 20 ms |
| Supply reverse protected | Yes |

Note: The use of twisted pair cable for the control input is recommended

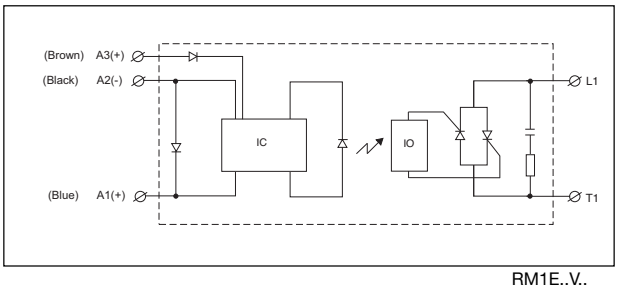
## Housing Specifications

| | |
|---|---|
| Weight | |
| 25 A, 50 A | Approx. 60 g |
| 75 A, 100 A | Approx. 100 g |
| Housing material | Noryl, black |
| Baseplate | |
| 25 A, 50 A | Aluminium |
| 75 A, 100 A | Copper, nickel-plated |
| Relay | |
| Mounting screws | M5 |
| Mounting torque | 1.5-2.0 Nm |
| Power terminal | |
| Mounting screws | M5 x 9mm |
| Mounting torque | 2.4 Nm |
| Control terminal (RM1E..AA..) | |
| Mounting screws | M3 x 9mm |
| Mounting torque | 0.5 Nm |
| Control terminal (RM1E..V..) | |
| 3 pin connector | 0.64mm square pin with 2.54mm centre distance, tin plated brass |
| Housing | Nylon, UL94V-0 |

## Functional Diagram




RM1E..AA..




RM1E..V..

## Thermal Specifications

| | | |
|---|---|---|
| Operating temperature | -20° to +70°C | (4° to +158 °F) |
| Storage temperature | -20° to +100°C | (-4° to +212 °F) |
| Junction temperature | ≤125°C | (257 °F) |

## Isolation

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

## Heatsink Dimensions (load current versus ambient temperature)

With the output fully ON (360° conduction angle)

### RM1E..25

| Load current [A] | Thermal resistance [K/W] | | | | | | Power dissipation [W] |
|---|---|---|---|---|---|---|---|
| | 20 | 30 | 40 | 50 | 60 | 70 | |
| 25.0 | 3.23 | 2.80 | 2.37 | 1.94 | 1.51 | 1.09 | 23 |
| 22.5 | 3.70 | 3.21 | 2.73 | 2.24 | 1.75 | 1.26 | 21 |
| 20.0 | 4.30 | 3.74 | 3.17 | 2.61 | 2.05 | 1.49 | 18 |
| 17.5 | 5.07 | 4.41 | 3.76 | 3.10 | 2.44 | 1.78 | 15 |
| 15.0 | 6.12 | 5.33 | 4.54 | 3.75 | 2.96 | 2.17 | 13 |
| 12.5 | 7.58 | 6.61 | 5.64 | 4.66 | 3.69 | 2.72 | 10 |
| 10.0 | 9.80 | 8.55 | 7.30 | 6.05 | 4.80 | 3.55 | 8 |
| 7.5 | 13.5 | 11.80 | 10.09 | 8.37 | 6.66 | 4.94 | 6 |
| 5.0 | - | 18.3 | 15.7 | 13.04 | 10.39 | 7.74 | 4 |
| 2.5 | - | - | - | - | - | 7 | 2 |
| | 20 | 30 | 40 | 50 | 60 | 70 | $T_A$ |

Ambient temp. [°C]

### RM1E..50

| Load current [A] | Thermal resistance [K/W] | | | | | | Power dissipation [W] |
|---|---|---|---|---|---|---|---|
| | 20 | 30 | 40 | 50 | 60 | 70 | |
| 50.0 | 1.25 | 1.07 | 0.88 | 0.70 | 0.52 | 0.34 | 55 |
| 45.0 | 1.46 | 1.25 | 1.04 | 0.84 | 0.63 | 0.42 | 48 |
| 40.0 | 1.73 | 1.49 | 1.25 | 1.01 | 0.77 | 0.52 | 41 |
| 35.0 | 2.08 | 1.80 | 1.51 | 1.23 | 0.94 | 0.66 | 35 |
| 30.0 | 2.56 | 2.22 | 1.87 | 1.53 | 1.18 | 0.84 | 29 |
| 25.0 | 3.24 | 2.81 | 2.38 | 1.95 | 1.52 | 1.09 | 23 |
| 20.0 | 4.26 | 3.71 | 3.15 | 2.59 | 2.03 | 1.47 | 18 |
| 15.0 | 5.99 | 5.22 | 4.45 | 3.67 | 2.90 | 2.12 | 13 |
| 10.0 | 9.49 | 8.27 | 7.06 | 5.85 | 4.64 | 3.43 | 8 |
| 5.0 | - | 17.5 | 15.0 | 12.4 | 9.91 | 7.39 | 4 |
| | 20 | 30 | 40 | 50 | 60 | 70 | $T_A$ |

Ambient temp. [°C]

### RM1.60..50

| Load current [A] | Thermal resistance [K/W] | | | | | | Power dissipation [W] |
|---|---|---|---|---|---|---|---|
| | 20 | 30 | 40 | 50 | 60 | 70 | |
| 50.0 | 0.99 | 0.81 | 0.63 | 0.44 | 0.26 | 0.08 | 55 |
| 45.0 | 1.28 | 1.07 | 0.86 | 0.65 | 0.44 | 0.23 | 48 |
| 40.0 | 1.64 | 1.40 | 1.15 | 0.91 | 0.67 | 0.42 | 41 |
| 35.0 | 2.11 | 1.82 | 1.54 | 1.25 | 0.96 | 0.67 | 35 |
| 30.0 | 2.60 | 2.25 | 1.90 | 1.55 | 1.20 | 0.85 | 29 |
| 25.0 | 3.30 | 2.86 | 2.43 | 1.99 | 1.55 | 1.11 | 23 |
| 20.0 | 4.36 | 3.79 | 3.22 | 2.65 | 2.08 | 1.51 | 18 |
| 15.0 | 6.1 | 5.4 | 4.6 | 3.77 | 2.97 | 2.18 | 13 |
| 10.0 | 9.76 | 8.52 | 7.3 | 6.0 | 4.8 | 3.54 | 8 |
| 5.0 | -- | -- | 15.47 | 12.85 | 10.24 | 7.6 | 4 |
| | 20 | 30 | 40 | 50 | 60 | 70 | $T_A$ |

Ambient temp. [°C]

### RM1E...75

| Load current [A] | Thermal resistance [K/W] | | | | | | Power dissipation [W] |
|---|---|---|---|---|---|---|---|
| | 20 | 30 | 40 | 50 | 60 | 70 | |
| 75.0 | 1.00 | 0.88 | 0.75 | 0.63 | 0.50 | 0.38 | 80 |
| 67.5 | 1.15 | 1.00 | 0.86 | 0.72 | 0.57 | 0.43 | 70 |
| 60.0 | 1.33 | 1.16 | 1.00 | 0.83 | 0.66 | 0.50 | 60 |
| 52.5 | 1.56 | 1.37 | 1.17 | 0.98 | 0.78 | 0.59 | 51 |
| 45.0 | 1.88 | 1.65 | 1.41 | 1.18 | 0.94 | 0.71 | 43 |
| 37.5 | 2.33 | 2.04 | 1.75 | 1.46 | 1.17 | 0.87 | 34 |
| 30.0 | 3.01 | 2.64 | 2.26 | 1.88 | 1.51 | 1.13 | 27 |
| 22.5 | 4.16 | 3.64 | 3.12 | 2.60 | 2.08 | 1.56 | 19 |
| 15.0 | 6.46 | 5.66 | 4.85 | 4.04 | 3.23 | 2.42 | 12 |
| 7.5 | 13.42 | 11.74 | 10.06 | 8.39 | 6.71 | 5.03 | 6 |
| | 20 | 30 | 40 | 50 | 60 | 70 | $T_A$ |

Ambient temp. [°C]

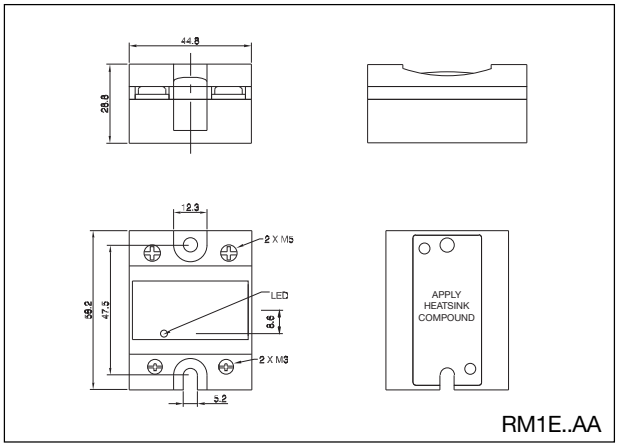
## Heatsink Dimensions (load current versus ambient temperature) - Cont ...

**RM1E..100**

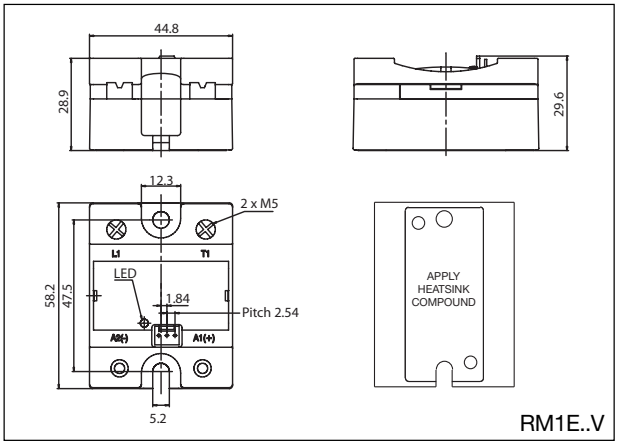
| Load current [A] | Thermal resistance [K/W] | | | | | | Power dissipation [W] |
|---|---|---|---|---|---|---|---|
| 100.0 | 0.60 | 0.52 | 0.43 | 0.34 | 0.26 | 0.17 | 117 |
| 90.0 | 0.74 | 0.64 | 0.54 | 0.44 | 0.34 | 0.24 | 101 |
| 80.0 | 0.91 | 0.79 | 0.68 | 0.56 | 0.45 | 0.33 | 87 |
| 70.0 | 1.09 | 0.96 | 0.82 | 0.68 | 0.55 | 0.41 | 73 |
| 60.0 | 1.33 | 1.16 | 1.00 | 0.83 | 0.66 | 0.50 | 60 |
| 50.0 | 1.66 | 1.45 | 1.24 | 1.04 | 0.83 | 0.62 | 48 |
| 40.0 | 2.16 | 1.89 | 1.62 | 1.35 | 1.08 | 0.81 | 37 |
| 30.0 | 3.01 | 2.64 | 2.26 | 1.88 | 1.51 | 1.13 | 27 |
| 20.0 | 4.73 | 4.14 | 3.55 | 2.96 | 2.37 | 1.78 | 17 |
| 10.0 | 9.94 | 8.70 | 7.45 | 6.21 | 4.97 | 3.73 | 8 |
| | 20 | 30 | 40 | 50 | 60 | 70 | $T_A$ |

Ambient temp. [°C]

## Dimensions



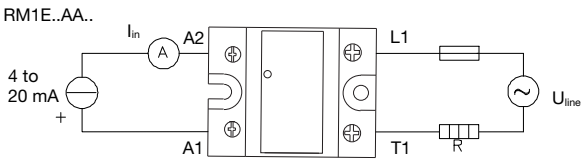

RM1E..AA

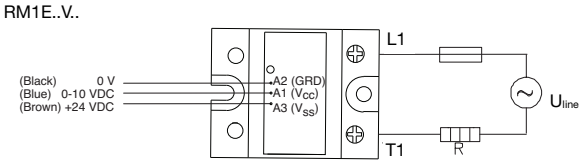



RM1E..V

All dimensions in mm

## Applications




**Transfer Characteristics**

Output power as a function of control input

| Control current (mA) | Control voltage (VDC) | Output power |
|---|---|---|
| 4 | 0 | 0 |
| 8 | 2.5 | 25 |
| 12 | 5 | 50 |
| 16 | 7.5 | 75 |
| 20 | 10 | 99 |

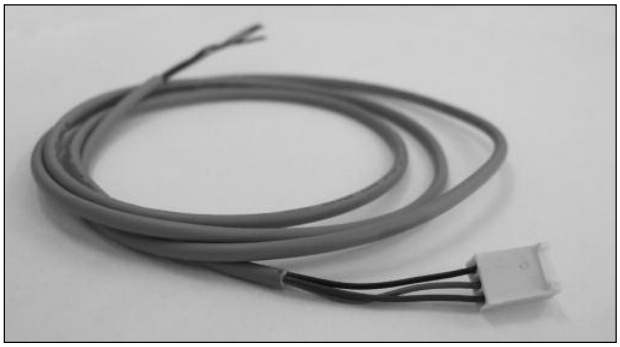
This relay is suitable for control of heaters, lighting and slightly inductive loads such as small fans. The relay can also be used for soft turn-on of high-power incandescent lamps.

## Heatsink Selection

| **Carlo Gavazzi Heatsink** (see 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 | > 55 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 45Bplus fan | 1.20 K/W | > 0 W |
| RHS 112A | 1.10 K/W | > 100 W |
| RHS 301 | 0.80 K/W | > 80 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 | ---- K/W | N/A |

Note: For power dissipation values smaller than those shown above, please refer to the corresponding heatsink curve in the SSR Accessories Section is referred to.

## Ribbon Cable Selection



**RCS 3-100-1**

**R-System**
**Cable sense**
**3-wire**
**Cable length in cm**
**1 connector mounted**