

Solid State Relays Industrial, 1-Phase ZS (IO) w. LED Types RAM1A, RAM1B



- Zero switching (RAM1A) or instant-on switching (RAM1B) AC Solid State Relay
- Direct copper bonding (DCB) technology
- LED indication
- Clip-on IP 20 protection cover
- Self-lifting terminals
- Housing free of moulding mass
- 2 input ranges: 3-32 * and 20-280 VAC/22-48VDC
- Operational ratings: Up to 125AACrms and 600VACrms
- Non-repetitive voltage: Up to 1600V_p
- Opto-insulation: > 4000VACrms
- Integrated overvoltage protection by self switching (suffix "Z" option)

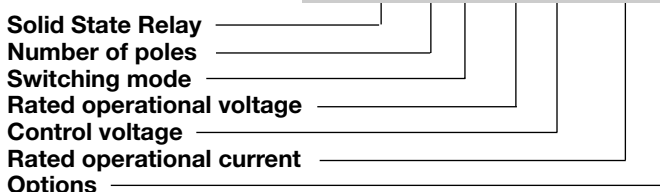
Product Description

The industrial, 1-phase relay with antiparallel thyristor output is the most widely used industrial SSR due to its multiple application possibilities. The relay can be used for resistive, inductive and capacitive loads. The zero switching relay switches ON when the sinusoidal curve crosses zero and switches OFF when the current cross-

es zero. The instant-on relay with DC control input can be used for phase angle control. The built-in snubber secures transient protection. The LED indicates the status of the control input. The clip-on cover secures touch protection (IP 20). Protected output terminals can handle cables up to 16 mm².

Ordering Key

RAM 1 A 60 D 125 Z



Type Selection

| Switching mode | Rated operational voltage | Control voltage | Rated operational current | Options |
|--|---|---|---|--|
| A: Zero Switching B: Instant-on switching (DC Control only) | 23: 230VACrms 60: 600VACrms 69: 690VACrms | A: 20-280 VAC/22-48VDC D: 3 - 32VDC* | 25 : 25AACrms 50 : 50AACrms 75 : 75AACrms 100:100AACrms 125:125AACrms | Z: Overvoltage protection (self-switching) |
| | | * 4 to 32VDC for RAM1A60..., RAM1A69... * 4 to 32VDC for RAM1B types | | |

Selection Guide

| Rated operational voltage | Non-rep. voltage | Control voltage | Rated operational current | | | | |
|---------------------------|--------------------|---------------------|---------------------------|------------|------------|-------------|-------------|
| | | | 25A | 50A | 75A | 100A | 125A |
| 230VACrms | 650V _p | 3 - 32VDC | RAM1A23D25 | RAM1A23D50 | RAM1A23D75 | RAM1A23D100 | RAM1A23D125 |
| | | 20-280VAC/22-48VDC | RAM1A23A25 | RAM1A23A50 | RAM1A23A75 | RAM1A23A100 | RAM1A23A125 |
| 600VACrms | 1200V _p | 4 - 32VDC | RAM1A60D25 | RAM1A60D50 | RAM1A60D75 | RAM1A60D100 | RAM1A60D125 |
| | | 20-280VAC/22-48VDC | RAM1A60A25 | RAM1A60A50 | RAM1A60A75 | RAM1A60A100 | RAM1A60A125 |
| 690VACrms | 1600V _p | 4-32VDC | - | - | RAM1A69D75 | RAM1A69D100 | RAM1A69D125 |
| | | 20-280VAC/ 22-48VDC | - | - | RAM1A69A75 | RAM1A69A100 | RAM1A69A125 |

Options

1 Overvoltage protection by self-switching; add suffix Z to include. Example: RAM1A60D25Z. Not applicable for 690V version.

General Specifications

| | RAM1.23.. | RAM1.60.. | RAM1.69.. |
|-----------------------------|---------------------|---------------------|---------------------|
| Operational voltage range | | | |
| RAM1A... | 24 to 265VACrms | 42 to 660VACrms | 42 to 760VACrms |
| RAM1B... | 42 to 265VACrms | 42 to 660VACrms | 42 to 760VACrms |
| Non-rep. peak voltage | $\geq 650V_p$ | $\geq 1200V_p$ | $\geq 1600V_p$ |
| Zero voltage turn-on | $\leq 10V$ | $\leq 10V$ | $\leq 10V$ |
| Operational frequency range | 45 to 65Hz | 45 to 65Hz | 45 to 65Hz |
| Power factor | $> 0.5 @ 230VACrms$ | $> 0.5 @ 600VACrms$ | $> 0.5 @ 690VACrms$ |
| Approvals | UL, cUL, CSA, VDE* | UL, cUL, CSA, VDE* | - |
| CE-marking | Yes | Yes** | Yes** |

* VDE0805

** Heatsink must be connected to ground

Input Specifications

| | RAM1...D.. | RAM1...A.. |
|-----------------------------------|------------------|---------------------|
| Control voltage range | | |
| RAM1A23... | 3-32VDC | 20-280VAC, 22-48VDC |
| RAM1A60..., RAM1A69... | 4-32VDC | 20-280VAC, 22-48VDC |
| RAM1B... | 4-32VDC | - |
| Pick-up voltage @ Ta = 25°C | | |
| RAM1A23... | 2.5VDC | 18VAC/DC |
| RAM1A60..., RAM1A69... | 3.5VDC | 18VAC/DC |
| RAM1B... | 3.5VDC | - |
| Reverse voltage | 32VDC | - |
| Drop out voltage | 1.2VDC | 6VAC/DC |
| Input current @ max input voltage | | |
| RM1A | $\leq 12mA$ | $\leq 20mA$ |
| RM1B | $\leq 15mA$ | - |
| Response time pick-up | | |
| RAM1A | $\leq 1/2$ cycle | $\leq 12ms$ |
| RAM1B | $\leq 0.1ms$ | - |
| Response time drop-out | $\leq 1/2$ cycle | $\leq 40ms$ |

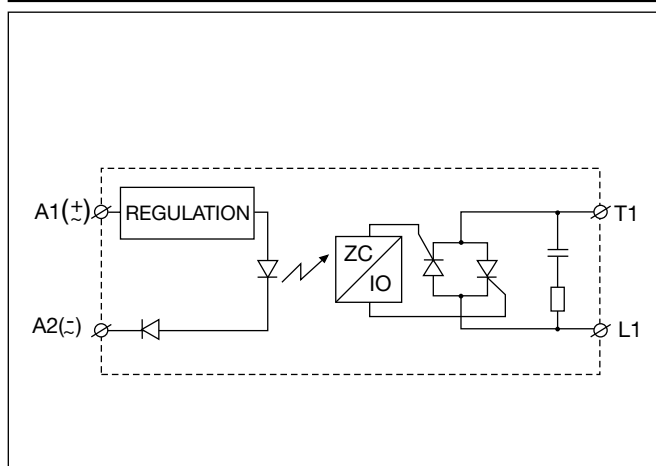
Output Specifications

| | RAM1...25 | RAM...50 | RAM1...75 | RAM1...100 | RAM...125 |
|---|-------------------|-------------------|-------------------|--------------------|--------------------|
| Rated operational current | | | | | |
| AC51 @ Ta=25°C | 25Arms | 50Arms | 75Arms | 100Arms | 125Arms |
| AC53a @ Ta=25°C | 5Arms | 15Arms | 17Arms | 20Arms | 30Arms |
| Min. operational current | 150mA | 150mA | 150mA | 150mA | 150mA |
| Rep. overload current t=1 s | $< 55AACrms$ | $< 125AACrms$ | $< 130 AACrms$ | $< 150 AACrms$ | $< 200AACrms$ |
| Non-rep. surge current t=10 ms | 300A _p | 580A _p | 800A _p | 1150A _p | 1900A _p |
| Off-state leakage current @ rated voltage and frequency | $< 3mArms$ | $< 3mArms$ | $< 3mArms$ | $< 3mArms$ | $< 3mArms$ |
| I ² t for fusing t= 1-10 ms | $< 450A^2s$ | $< 1680A^2s$ | $< 3200A^2s$ | $< 6600A^2s$ | $< 18000A^2s$ |
| Critical di/dt | $\geq 50A/\mu s$ | $\geq 50A/\mu s$ | $\geq 100A/\mu s$ | $\geq 100A/\mu s$ | $\geq 100A/\mu s$ |
| On-state voltage drop | $\leq 1.6Vrms$ | $\leq 1.6Vrms$ | $\leq 1.6Vrms$ | $\leq 1.6Vrms$ | $\leq 1.6Vrms$ |
| Critical dV/dt off-state min. | 1000V/ μs | 1000V/ μs | 1000V/ μs | 1000V/ μs | 1000V/ μs |

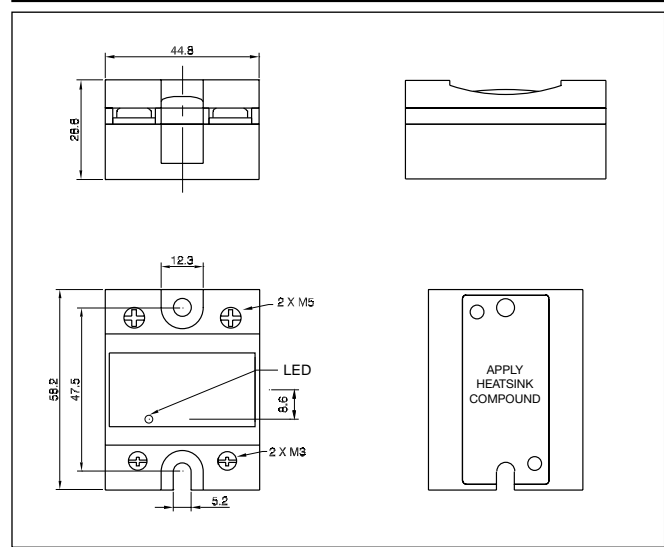
Housing Specifications

| | | | |
|--|------------------------------------|--|-----------------|
| Weight 25A, 50A 75A, 100A, 125A | Approx. 60g Approx. 100g | Relay Mounting screws Mounting torque | M5 1.5-2.0Nm |
| Housing material | Noryl, black | Control terminal Mounting screws Mounting torque | M3 x 9 0.5Nm |
| Baseplate 25A, 50A 75A, 100A, 125A | Aluminium Copper, nickel-plated | Power terminal Mounting screws Mounting torque | M5 x 9 2.4Nm |

Functional Diagram



Dimensions



All dimensions in mm.

Heatsink Dimensions (load current versus ambient temperature)

RAM..25

| Load current [A] | Thermal resistance [K/W] | | | | | | | Power dissipation [W] |
|------------------|--------------------------|-------|-------|-------|-------|------|------|-----------------------|
| | 20 | 30 | 40 | 50 | 60 | 70 | 80 | |
| 25.0 | 3.23 | 2.80 | 2.37 | 1.94 | 1.51 | 1.09 | 0.66 | 23 |
| 22.5 | 3.70 | 3.21 | 2.73 | 2.24 | 1.75 | 1.26 | 0.78 | 21 |
| 20.0 | 4.30 | 3.74 | 3.17 | 2.61 | 2.05 | 1.49 | 0.92 | 18 |
| 17.5 | 5.07 | 4.41 | 3.76 | 3.10 | 2.44 | 1.78 | 1.12 | 15 |
| 15.0 | 6.12 | 5.33 | 4.54 | 3.75 | 2.96 | 2.17 | 1.38 | 13 |
| 12.5 | 7.58 | 6.61 | 5.64 | 4.66 | 3.69 | 2.72 | 1.75 | 10 |
| 10.0 | 9.80 | 8.55 | 7.30 | 6.05 | 4.80 | 3.55 | 2.30 | 8 |
| 7.5 | 13.5 | 11.80 | 10.09 | 8.37 | 6.66 | 4.94 | 3.23 | 6 |
| 5.0 | - | 18.3 | 15.7 | 13.04 | 10.39 | 7.74 | 5.09 | 4 |
| 2.5 | - | - | - | - | - | 16.2 | 10.7 | 2 |

Ambient temp. [°C] T_A

RAM..50

| Load current [A] | Thermal resistance [K/W] | | | | | | | Power dissipation [W] |
|------------------|--------------------------|------|------|------|------|------|------|-----------------------|
| | 20 | 30 | 40 | 50 | 60 | 70 | 80 | |
| 50.0 | 1.25 | 1.07 | 0.88 | 0.70 | 0.52 | 0.34 | 0.16 | 55 |
| 45.0 | 1.46 | 1.25 | 1.04 | 0.84 | 0.63 | 0.42 | 0.21 | 48 |
| 40.0 | 1.73 | 1.49 | 1.25 | 1.01 | 0.77 | 0.52 | 0.28 | 41 |
| 35.0 | 2.08 | 1.80 | 1.51 | 1.23 | 0.94 | 0.66 | 0.37 | 35 |
| 30.0 | 2.56 | 2.22 | 1.87 | 1.53 | 1.18 | 0.84 | 0.49 | 29 |
| 25.0 | 3.24 | 2.81 | 2.38 | 1.95 | 1.52 | 1.09 | 0.66 | 23 |
| 20.0 | 4.26 | 3.71 | 3.15 | 2.59 | 2.03 | 1.47 | 0.92 | 18 |
| 15.0 | 5.99 | 5.22 | 4.45 | 3.67 | 2.90 | 2.12 | 1.35 | 13 |
| 10.0 | 9.49 | 8.27 | 7.06 | 5.85 | 4.64 | 3.43 | 2.22 | 8 |
| 5.0 | - | 17.5 | 15.0 | 12.4 | 9.91 | 7.39 | 4.86 | 4 |

Ambient temp. [°C] T_A

Heatsink Dimensions (cont.)

RAM..75

| Load current [A] | Thermal resistance [K/W] | | | | | | | Power dissipation [W] |
|------------------|--------------------------|-------|-------|-------|------|------|------|-----------------------|
| | 20 | 30 | 40 | 50 | 60 | 70 | 80 | |
| 75.0 | 0.94 | 0.82 | 0.70 | 0.58 | 0.47 | 0.35 | 0.23 | 85 |
| 67.5 | 1.10 | 0.96 | 0.82 | 0.69 | 0.55 | 0.41 | 0.27 | 73 |
| 60.0 | 1.30 | 1.14 | 0.98 | 0.81 | 0.65 | 0.49 | 0.33 | 61 |
| 52.5 | 1.57 | 1.38 | 1.18 | 0.98 | 0.79 | 0.59 | 0.39 | 51 |
| 45.0 | 1.95 | 1.70 | 1.46 | 1.22 | 0.97 | 0.73 | 0.49 | 41 |
| 37.5 | 2.48 | 2.17 | 1.86 | 1.55 | 1.24 | 0.93 | 0.62 | 32 |
| 30.0 | 3.32 | 2.90 | 2.49 | 2.07 | 1.66 | 1.24 | 0.83 | 24 |
| 22.5 | 4.75 | 4.15 | 3.56 | 2.97 | 2.37 | 1.78 | 1.19 | 17 |
| 15.0 | 7.68 | 6.72 | 5.76 | 4.80 | 3.84 | 2.88 | 1.92 | 10 |
| 7.5 | - | 14.59 | 12.50 | 10.42 | 8.34 | 6.25 | 4.17 | 5 |

Ambient temp. [°C]

RAM..100

| Load current [A] | Thermal resistance [K/W] | | | | | | | Power dissipation [W] |
|------------------|--------------------------|------|------|------|------|------|------|-----------------------|
| | 20 | 30 | 40 | 50 | 60 | 70 | 80 | |
| 100.0 | 0.60 | 0.52 | 0.43 | 0.34 | 0.26 | 0.17 | 0.09 | 117 |
| 90.0 | 0.74 | 0.64 | 0.54 | 0.44 | 0.34 | 0.24 | 0.14 | 101 |
| 80.0 | 0.91 | 0.79 | 0.68 | 0.56 | 0.45 | 0.33 | 0.22 | 87 |
| 70.0 | 1.09 | 0.96 | 0.82 | 0.68 | 0.55 | 0.41 | 0.27 | 73 |
| 60.0 | 1.33 | 1.16 | 1.00 | 0.83 | 0.66 | 0.50 | 0.33 | 60 |
| 50.0 | 1.66 | 1.45 | 1.24 | 1.04 | 0.83 | 0.62 | 0.41 | 48 |
| 40.0 | 2.16 | 1.89 | 1.62 | 1.35 | 1.08 | 0.81 | 0.54 | 37 |
| 30.0 | 3.01 | 2.64 | 2.26 | 1.88 | 1.51 | 1.13 | 0.75 | 27 |
| 20.0 | 4.73 | 4.14 | 3.55 | 2.96 | 2.37 | 1.78 | 1.18 | 17 |
| 10.0 | 9.94 | 8.70 | 7.45 | 6.21 | 4.97 | 3.73 | 2.48 | 8 |

Ambient temp. [°C]

RAM..125

| Load current [A] | Thermal resistance [K/W] | | | | | | | Power dissipation [W] |
|------------------|--------------------------|------|------|------|------|------|------|-----------------------|
| | 20 | 30 | 40 | 50 | 60 | 70 | 80 | |
| 125.0 | 0.63 | 0.55 | 0.47 | 0.40 | 0.32 | 0.24 | 0.16 | 126 |
| 112.5 | 0.73 | 0.64 | 0.54 | 0.45 | 0.36 | 0.27 | 0.18 | 110 |
| 100.0 | 0.84 | 0.74 | 0.63 | 0.53 | 0.42 | 0.32 | 0.21 | 95 |
| 87.5 | 0.99 | 0.87 | 0.74 | 0.62 | 0.50 | 0.37 | 0.25 | 81 |
| 75.0 | 1.20 | 1.05 | 0.90 | 0.75 | 0.60 | 0.45 | 0.30 | 67 |
| 62.5 | 1.48 | 1.30 | 1.11 | 0.93 | 0.74 | 0.56 | 0.37 | 54 |
| 50.0 | 1.92 | 1.68 | 1.44 | 1.20 | 0.96 | 0.72 | 0.48 | 42 |
| 37.5 | 2.65 | 2.32 | 1.98 | 1.65 | 1.32 | 0.99 | 0.66 | 30 |
| 25.0 | 4.12 | 3.60 | 3.09 | 2.57 | 2.06 | 1.54 | 1.03 | 19 |
| 12.5 | 8.55 | 7.48 | 6.41 | 5.34 | 4.27 | 3.21 | 2.14 | 9 |

Ambient temp. [°C]

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 45A 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 | > 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 fa | 0.25 K/W | > 0 W |
| Consult your distribution | > 0.25 K/W | N/A |
| Infinite heatsink - No solution | --- | N/A |

Thermal Specifications

| | |
|-----------------------|---------------------------------|
| Operating temperature | -40° to +80°C (-40° to +176°F) |
| Storage temperature | -40° to +100°C (-40° to +212°F) |
| Junction temperature | ≤ 125°C (257°F) |

Insulation

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

Faston terminals



- Faston tabs
- Tab dimensions according to DIN 46342 part 1
- Pure tin-plated brass

Ordering Key

**Screw mounted
Faston terminals**

RAM1A60D25 | **F 4***

RAM Solid State Relay
Faston terminals
Tab orientation

Input Tab width: 4.8mm
Output Tab width: 6.3mm

**Faston terminals
in packs of 20**

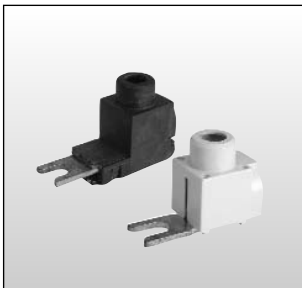
RM48** | **F4***

RS, RM Solid State Relay
Tab orientation

* 0: Flat (0°)
4: Angled (45°)

** 48: 4.8mm faston for input
63: 6.3mm faston for output

Fork Terminals



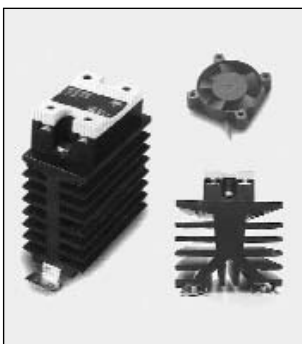
- Terminal adaptors for 35mm² cable
- Type RM635FK
- Pack size: 20 pieces

Ordering Key

RM635FK | **P**

RM terminal adaptor
Touch protected (optional)

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.