

# 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
- Blocking voltage: Up to 1600V<sub>p</sub>
- Opto-isolation: > 4000VACrms
- Integrated overvoltage protection by self switching (suffix "Z" option)

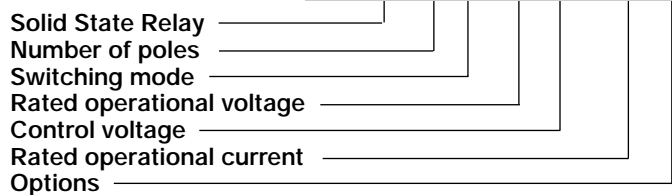
## Product Description

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 mm<sup>2</sup>.

## 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	Blocking voltage	Control voltage	Rated operational current				
			25A	50A	75A	100A	125A
230VACrms	650V <sub>p</sub>	3 - 32VDC	RAM1A23D25	RAM1A23D50	RAM1A23D75	RAM1A23D100	RAM1A23D125
		20-280VAC/22-48VDC	RAM1A23A25	RAM1A23A50	RAM1A23A75	RAM1A23A100	RAM1A23A125
600VACrms	1200V <sub>p</sub>	4 - 32VDC	RAM1A60D25	RAM1A60D50	RAM1A60D75	RAM1A60D100	RAM1A60D125
		20-280VAC/22-48VDC	RAM1A60A25	RAM1A60A50	RAM1A60A75	RAM1A60A100	RAM1A60A125
690VACrms	1600V <sub>p</sub>	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
Blocking 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		
RAM1A	$\leq 12mA$	$\leq 20mA$
RAM1B	$\leq 15mA$	-
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

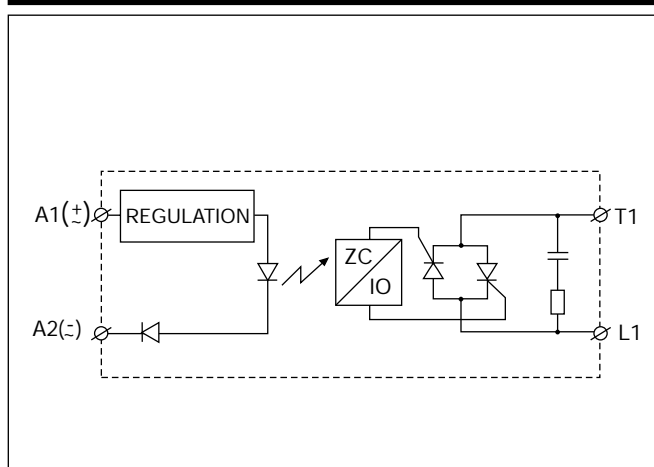
	RAM1...25	RAM...50	RAM1...75	RAM1...100	RAM...125
Rated operational current					
AC51 @ Ta=25°C	25Arms	50Arms	75Arms	100Arms	125Arms
AC53a @ Ta=25°C	5Arms	15Arms	17Arms	20Arms	30Arms
Min. operational current	150mA	250mA	400mA	400mA	500mA
Rep. overload current t=1 s	$< 55AACrms$	$< 125AACrms$	$< 130 AACrms$	$< 150 AACrms$	$< 200AACrms$
Non-rep. surge current t=10 ms	325A <sub>p</sub>	600A <sub>p</sub>	800A <sub>p</sub>	1150A <sub>p</sub>	1900A <sub>p</sub>
Off-state leakage current @ rated voltage and frequency	$< 3mArms$	$< 3mArms$	$< 3mArms$	$< 3mArms$	$< 3mArms$
I <sup>2</sup> t for fusing t= 10 ms	$< 520A^2s$	$< 1800A^2s$	$< 3200A^2s$	$< 6600A^2s$	$< 18000A^2s$
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

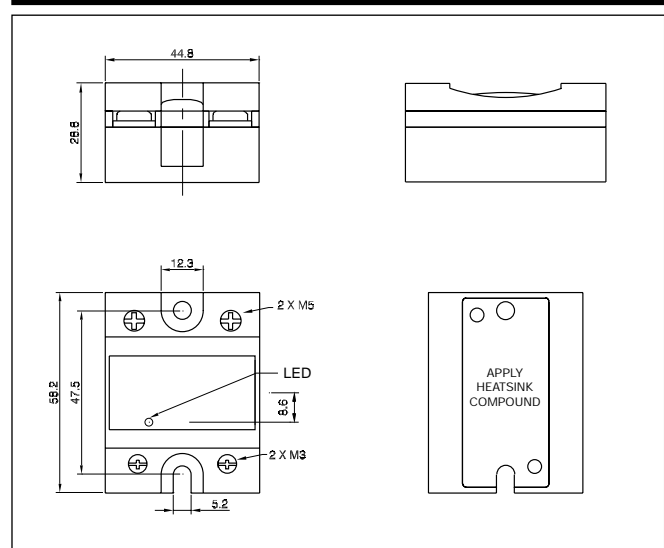
Weight 25A, 50A 75A, 100A, 125A	Approx. 60g Approx. 100g	Relay Mounting screws Mounting torque	M5 1.5-2.0Nm
Housing material	Noryl, black	Control terminal Mounting screws Mounting torque	M3 x 9 0.5Nm
Baseplate 25A, 50A 75A, 100A, 125A	Aluminium Copper, nickel-plated	Power terminal Mounting screws Mounting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

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## 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]

### 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]



## 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 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	> 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)

## Isolation

Rated isolation 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

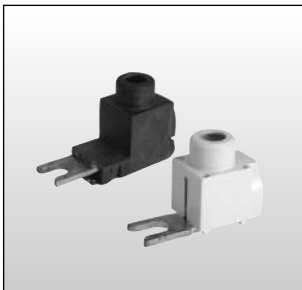
**RM48\*\*** | **F4\***

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



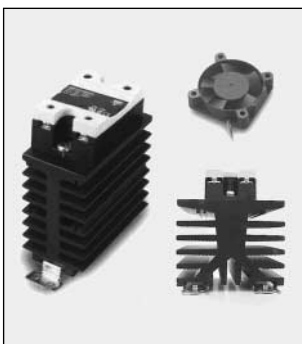
- Terminal adaptors for 35mm<sup>2</sup> cable
- Type RM635FK
- Pack size: 20 pieces

### Ordering Key

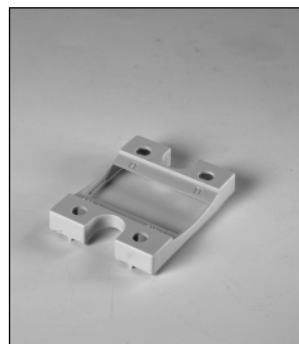
**RM635FK** | **P**

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.