

# Solid State Relays

## Industrial, 1-Phase ZS (IO) w. LED and Built-in Varistor

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

CARLO GAVAZZI



- Zero switching (RM1A) or instant-on switching (RM1B) AC Solid State Relay
- Direct copper bonding (DCB) technology
- LED indication
- Built-in varistor 230, 400, 480, 600V
- Clip-on IP 20 protection cover
- Self-lifting terminals
- Housing free of moulding mass
- 2 input ranges: 3-32\* VDC and 20-280VAC/22-48VDC
- Operational ratings: Up to 100AACrms and 600VACrms
- Blocking voltage: Up to 1400V<sub>p</sub>
- Opto-isolation: > 4000VACrms

## 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 crosses zero. The instant-on relay

with DC control input can be used for phase control. 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 protection to IP 20. Protected output terminals can handle cables up to 16mm<sup>2</sup>.

## Ordering Key

**RM 1 A 23 D 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 B: Instant-on switching (DC Control only)	23: 230VACrms 40: 400VACrms 48: 480VACrms 60: 600VACrms	A: 20-280VAC/22-48VDC D: 3-32VDC* *4 to 32VDC for 400, 480 and 600VAC types *4 to 32VDC for RM1B types	25: 25AACrms 50: 50AACrms 75: 75AACrms 100: 100AACrms

## Selection Guide

Rated operational voltage	Blocking voltage	Control voltage	Rated operational current			
			25A	50A	75A	100A
230VACrms	650V <sub>p</sub>	3 - 32VDC	RM1A23D25	RM1A23D50	RM1A23D75	RM1A23D100
		20 to 280VAC 22 to 48VDC	RM1A23A25	RM1A23A50	RM1A23A75	RM1A23A100
400VACrms	850V <sub>p</sub>	4 - 32VDC	RM1A40D25	RM1A40D50	RM1A40D75	RM1A40D100
		20 to 280VAC 22 to 48VDC	RM1A40A25	RM1A40A50	RM1A40A75	RM1A40A100
480VACrms	1200V <sub>p</sub>	4 - 32VDC	RM1A48D25	RM1A48D50	RM1A48D75	RM1A48D100
		20 to 280 VAC 22 to 48VDC	RM1A48A25	RM1A48A50	RM1A48A75	RM1A48A100
600VACrms	1400V <sub>p</sub>	4 - 32VDC	RM1A60D25	RM1A60D50	RM1A60D75	RM1A60D100
		20 to 280VAC 22 to 48VDC	RM1A60A25	RM1A60A50	RM1A60A75	RM1A60A100

## General Specifications

	RM1.23...	RM1.40...	RM1.48...	RM1.60...
<b>Operational voltage range</b>				
RM1A...	24 to 265VACrms	42 to 440VACrms	42 to 530VACrms	42 to 660VACrms
RM1B...	42 to 265VACrms	42 to 440VACrms	42 to 530VACrms	42 to 660VACrms
<b>Blocking voltage</b>	$\geq 650V_p$	$\geq 850V_p$	$\geq 1200V_p$	$\geq 1400V_p$
<b>Zero voltage turn-on</b>	$\leq 10V$	$\leq 10V$	$\leq 10V$	$\leq 10V$
<b>Operational frequency range</b>	45 to 65Hz	45 to 65Hz	45 to 65Hz	45 to 65Hz
<b>Power factor</b>	$> 0.5 @ 230VACrms$	$> 0.5 @ 400VACrms$	$> 0.5 @ 480VACrms$	$> 0.5 @ 600VACrms$
<b>Approvals</b>	UL, cUL, CSA	UL, cUL, CSA	UL, cUL, CSA	UL, cUL, CSA
<b>CE-marking</b>	Yes	Yes	Yes	Yes *

\* Heatsink must be connected to ground

## Input Specifications

	RM1...D..	RM1...A..
<b>Control voltage range</b>		
RM1A23...	3 - 32VDC	20 - 280VAC, 22 - 48VDC
RM1A40... RM1A48... RM1A60...	4 - 32VDC	20 - 280VAC, 22 - 48VDC
RM1B...	4 - 32VDC	-
<b>Pick-up voltage @ Ta = 25°C</b>		
RM1A23...	2.5VDC	18VAC/DC
RM1A40... RM1A48... RM1A60...	3.5VDC	18VAC/DC
RM1B ...	3.5VDC	-
<b>Reverse voltage</b>	32VDC	-
<b>Drop out voltage</b>	1.2VDC	6VAC/DC
<b>Input current @ max input voltage</b>		
RM1A	$\leq 12 \text{ mA}$	$\leq 20\text{mA}$
RM1B	$\leq 15 \text{ mA}$	-
<b>Response time pick-up</b>		
RM1A	$\leq 1/2 \text{ cycle}$	$\leq 12\text{ms}$
RM1B	$\leq 0.1\text{ms}$	-
<b>Response time drop-out</b>	$\leq 1/2 \text{ cycle}$	$\leq 40\text{ms}$

## Output Specifications

	RM1....25	RM....50	RM1....75	RM1....100
<b>Rated operational current</b>				
AC51 @ Ta=25°C	25Arms	50Arms	75Arms	100Arms
AC53a @ Ta=25°C	5Arms	15Arms	20Arms	30Arms
<b>Min. operational current</b>	150mA	250mA	400mA	500mA
<b>Rep. overload current t=1 s</b>	$< 55AACrms$	$< 125AACrms$	$< 150AACrms$	$< 200AACrms$
<b>Non-rep. surge current t=10 ms</b>	325A <sub>p</sub>	600A <sub>p</sub>	1150A <sub>p</sub>	1900A <sub>p</sub>
<b>Off-state leakage current @ rated voltage and frequency</b>	$< 3\text{mArms}$	$< 3\text{mArms}$	$< 3\text{mArms}$	$< 3\text{mArms}$
<b>I<sup>2</sup>t for fusing t=10 ms</b>	$< 525A^2s$	$< 1800A^2s$	$< 6600A^2s$	$< 18000A^2s$
<b>On-state voltage drop @ rated current</b>	1.6Vrms	1.6Vrms	1.6Vrms	1.6Vrms
<b>Critical dV/dt off-state min.</b>	1000V/μs	1000V/μs	1000V/μs	1000V/μs

## Thermal Specifications

	RM1....25	RM1....50	RM1.60.50	RM1....75	RM1....100
Operating temperature range	-20° to 70°C	-20° to 70°C	-20° to 70°C	-20° to 70°C	-20° to 70°C
Storage temperature range	-40° to 100°C	-40° to 100°C	-40° to 100°C	-40° to 100°C	-40° to 100°C
Junction temperature	≤ 125°C	≤ 125°C	≤ 125°C	≤ 125°C	≤ 125°C
R <sub>th</sub> junction to case	≤ 0.80K/W	≤ 0.50K/W	≤ 0.72K/W	≤ 0.35K/W	≤ 0.30K/W
R <sub>th</sub> junction to ambient	≤ 20.0K/W	≤ 20.0K/W	≤ 20.0K/W	≤ 20.0K/W	≤ 20.0K/W

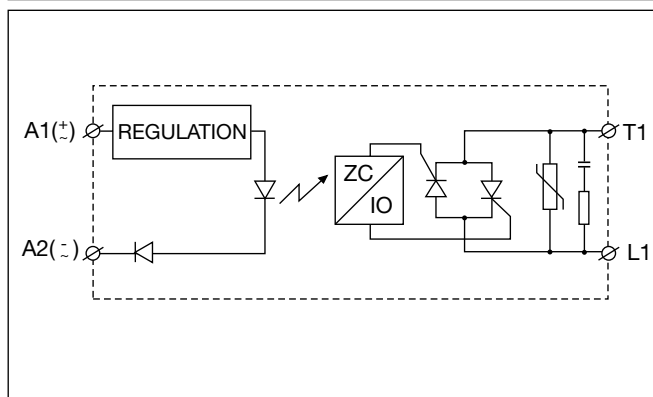
## Housing Specifications

<b>Weight</b> 25A, 50A 75A, 100A	Approx. 60g Approx. 100g
<b>Housing material</b>	Noryl GFN 1, black
<b>Baseplate</b> 25A, 50A 75A, 100A	Aluminium Copper, nickel-plated
<b>Potting compound</b>	None

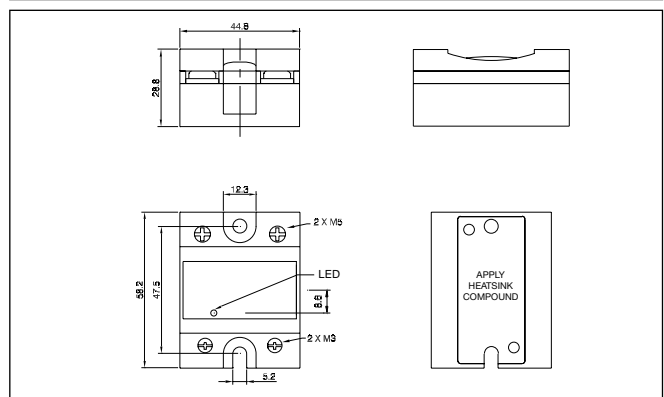
## Housing Specifications (Cont.)

<b>Relay</b> Mounting screws Mounting torque	M5 1.5-2.0Nm
<b>Control terminal</b> Mounting screws Mounting torque	M3 x 9 0.5Nm
<b>Power terminal</b> Mounting screws Mounting torque	M5 x 9 2.4Nm

## Functional Diagram



## Dimensions



All dimensions in mm

## Heatsink Selection

Carlo Gavazzi Heatsink (see Accessories)	Thermal resistance...	...for power dissipation
No heatsink required	---	N/A
RHS 300	5.00K/W	> 0W
RHS 100	3.00K/W	> 25W
RHS 45C	2.70K/W	> 60W
RHS 45B	2.00K/W	> 60W
RHS 90A	1.35K/W	> 60W
RHS 45C plus fan	1.25K/W	> 0W
RHS 45B plus fan	1.20K/W	> 0W
RHS 112A	1.10K/W	> 100W
RHS 301	0.80K/W	> 70W
RHS 90A plus fan	0.45K/W	> 0W
RHS 112A plus fan	0.40K/W	> 0W
RHS 301 plus fan	0.25K/W	> 0W
Consult your distribution	> 0.25K/W	N/A
Infinite heatsink - No solution	---	N/A

## Isolation

<b>Rated isolation voltage</b> Input to output	≥ 4000VACrms
<b>Rated isolation voltage</b> Output to case	≥ 4000VACrms



## Heatsink Dimensions (load current versus ambient temperature)

### RM....25

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]

### RM....50

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>	< 0.80	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

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

### RM1.60..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

T<sub>A</sub>  
Ambient temp. [°C]

### RM....75

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 baseplate case thermal resistance, R <sub>th j-c</sub>	< 0.72	K/W
Case to heatsink thermal resistance, R <sub>th c-s</sub>	< 0.20	K/W
Maximum allowable heatsink temperature	100	deg.C
Maximum allowable junction temperature	125	deg.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

## Heatsink Dimensions (load current versus ambient temperature) cont.

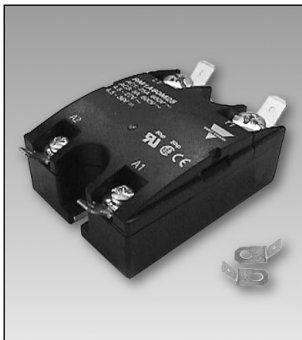
### RM....100

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

Ambient temp. [°C]

Junction to ambient thermal resistance, $R_{th\ j-a}$	< 20.0	K/W
Junction to case thermal resistance, $R_{th\ j-c}$	< 0.30	K/W
Case to heatsink thermal resistance, $R_{th\ c-s}$	< 0.10	K/W
Maximum allowable heatsink temperature	100	deg.C
Maximum allowable junction temperature	125	deg.C

## FASTON terminals



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

### Ordering Key

**Screw mounted Faston terminals**

**RM1A48D25 F 4\***

RS, RM 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\***

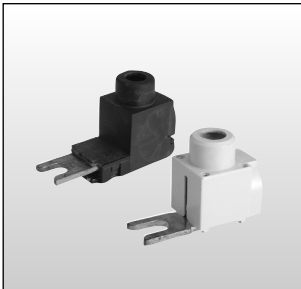
RS, RM Solid State Relay

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

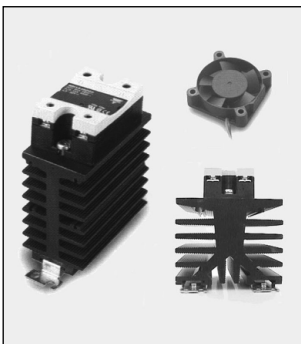
**RM635FK**

**P**

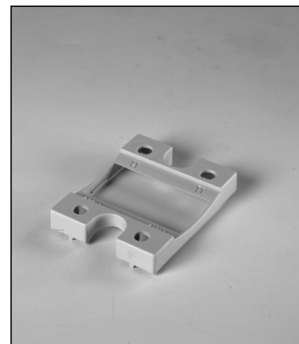
RM terminal adaptor

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.