

3-phase solid state relays



Main features

- Zero cross switching 3-phase solid state relay
- Ratings up to 690 VAC, 75 AAC
- High blocking voltage
- DC or AC control voltage
- Integrated over voltage protection
- Over-temperature protection option with alarm output
- LED indication of control input and over-temperature alarm status
- UL certified motor ratings

Description

The **RZ3A** is a 3-phase, 3-pole switching solid state relay suitable for various industrial loads such as heating elements, motors and transformers.

The series covers a range of load currents, up to 75 AAC. The maximum current rating depends on the size of the heatsink to which the solid state relay is mounted. The output is protected against over voltages by means of an integrated varistor. Control ON indication is provided through a green LED.

The **RZ3A..P** optionally provides integrated over temperature protection that will protect the solid state relay output against damage from overheating. In case of overheating, an LED indication and alarm output is activated for remote signaling.

Specifications are at a surrounding temperature of 25°C unless otherwise specified.

Applications

Plastic extrusion machines, thermoforming machines, blow moulding machines, coffee machines, electrical ovens, vending machines, reflow ovens, dryers, climatic chambers, air handling units, plastic sealing machines, shrink tunnels, etc.

Main functions

- 3-pole switching AC solid state relay
- Rated operational current: 3x 25 AAC, 55 AAC or 75 AAC
- Voltage ratings: 400 VAC, 480 VAC, 600 VAC or 690 VAC
- 4-32 VDC or 24-275 VAC control voltage

References

Order code



Enter the code option instead of ☐. Refer to the selection guide section for valid part numbers.

Code	Option	Description	Notes
RZ	-	Solid State Relay	
3	-	Number of poles	
A	-	Switching mode: zero cross switching	
☐	40	Rated operational voltage: 400 VACrms	
	48	Rated operational voltage: 480 VACrms	
	60	Rated operational voltage: 600 VACrms	
	69	Rated operational voltage: 690 VACrms	Available only with 75 A version
☐	D	Control voltage: 4 - 32 VDC	
	A	Control voltage: 24 - 275 VAC / 24 - 50 VDC	Not available with 480 VAC version
☐	25	Rated operational current: 3 x 25 AACrms	
	55	Rated operational current: 3 x 55 AACrms	
	75	Rated operational current: 3 x 75 AACrms	
☐	P	Over-temperature protection and alarm output	Not available with 480 and 690 VAC versions

Selection guide RZ3

Rated operational voltage	Control voltage	Maximum rated operational current		
		3 x 25 AAC	3 x 55 AAC	3 x 75 AAC
400 VACrms	4-32 VDC	RZ3A40D25	RZ3A40D55	RZ3A40D75
	24-275 VAC / 24-50 VDC	RZ3A40A25	RZ3A40A55	RZ3A40A75
480 VACrms	4-32 VDC	RZ3A48D25	RZ3A48D55	RZ3A48D75
	24-275 VAC / 24-50 VDC	RZ3A60D25	RZ3A60D55	RZ3A60D75
600 VACrms	4-32 VDC	RZ3A60D25	RZ3A60D55	RZ3A60D75
	24-275 VAC / 24-50 VDC	RZ3A60A25	RZ3A60A55	RZ3A60A75
690 VACrms	4-32 VDC	-	-	RZ3A69D75
	24-275 VAC / 24-50 VDC	-	-	RZ3A69A75

Selection guide RZ3..P (with over-temperature protection and alarm output)

Rated operational voltage	Control voltage	Maximum rated operational current		
		3 x 25 AAC	3 x 55 AAC	3 x 75 AAC
400 VACrms	4-32 VDC	RZ3A40D25P	RZ3A40D55P	RZ3A40D75P
	24-275 VAC / 24-50 VDC	-	RZ3A40A55P	RZ3A40A75P
600 VACrms	4-32 VDC	RZ3A60D25P	RZ3A60D55P	RZ3A60D75P
	24-275 VAC / 24-50 VDC	-	RZ3A60A55P	RZ3A60A75P

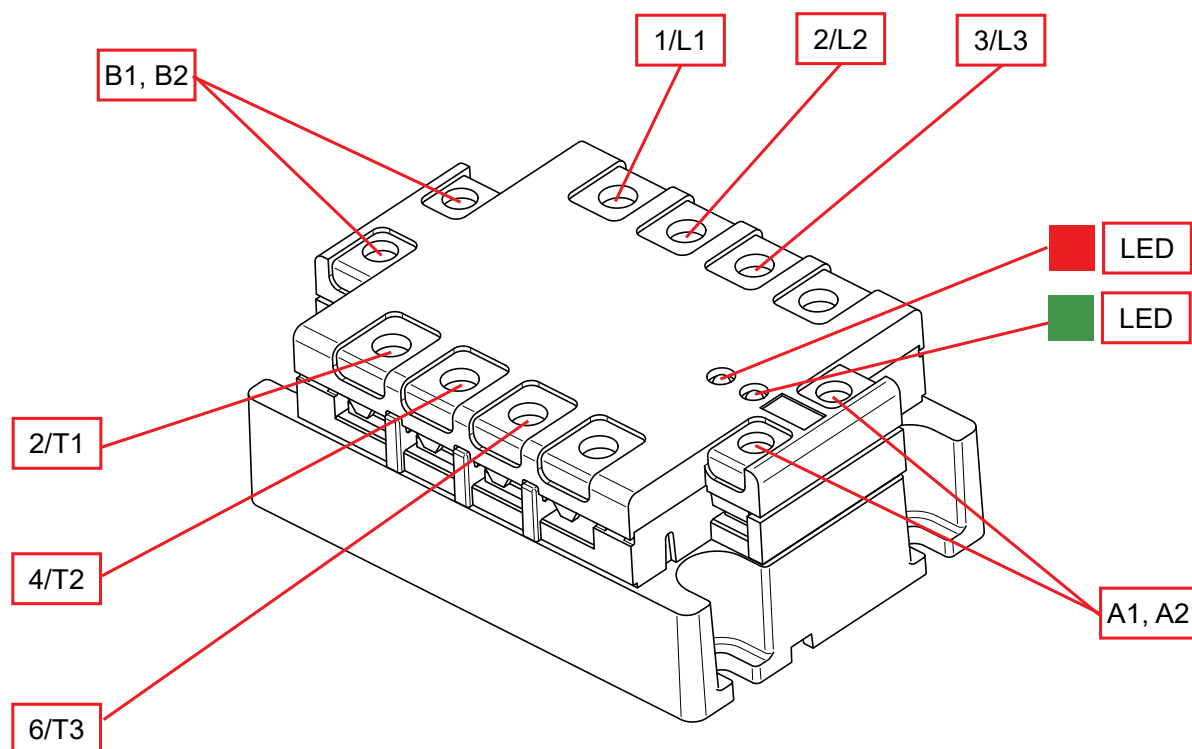
 Carlo Gavazzi compatible components

Purpose	Component name/code	Notes
Heatsinks	RHS	Heatsinks and fans
Thermal pad	RZHT	Packing qty. 10 pcs.

 Further reading

Information	Where to find it
Online heatsink selector tool	https://www.gavazziautomation.com/en-global/products/solid-state-relays/heat-sink-selector-tool

Structure



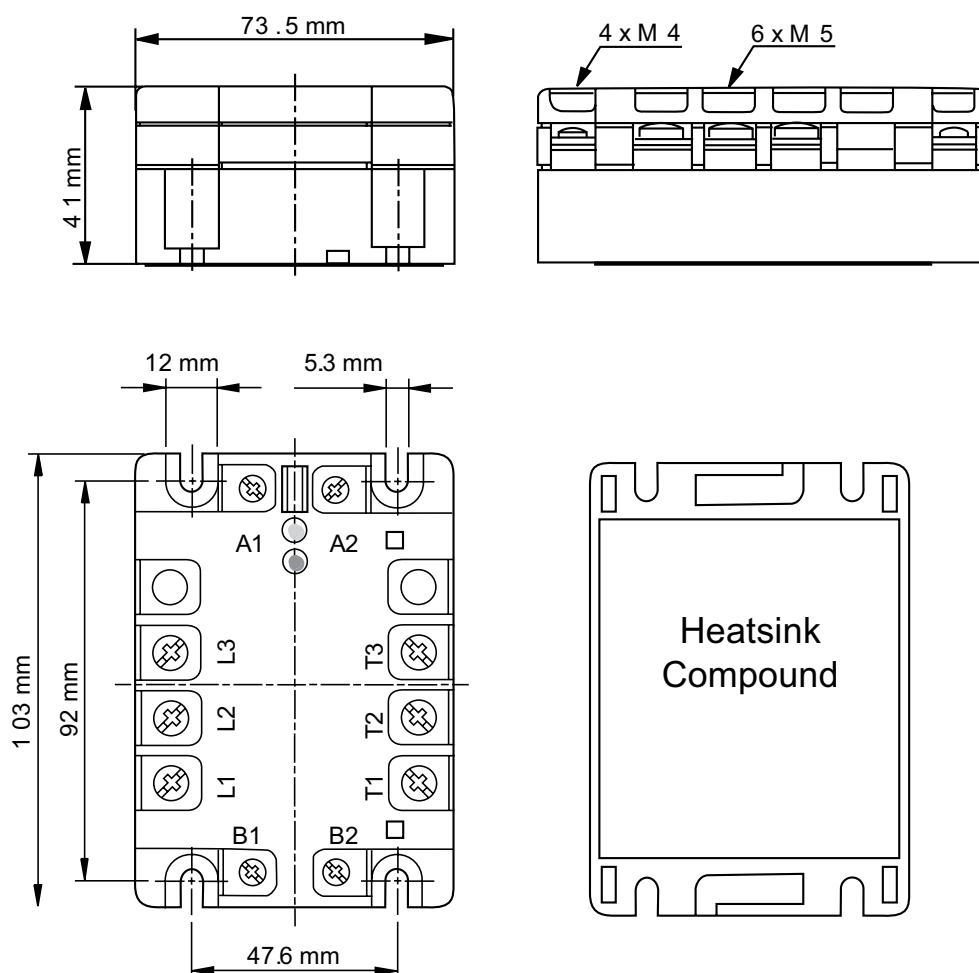
Element	Component	Function
1/L1, 3/L2, 5/L3	Power connection	Mains connection
2/T1, 4/T2, 6/T3	Power connection	Load connection
A1, A2	Control connection	Terminals for control voltage
B1, B2	Alarm connections	Terminals for over-temperature alarm connection (applicable only to "P" suffix option)
Green LED	Control indicator	Indicates presence of control voltage
Red LED	Over-temperature alarm indicator	Indicates presence of an over-temperature condition (applicable only to "P" suffix option)

Features

General

Material	Noryl, black
Potting compound	Polyurethane
Weight	Approx. 380 g
Touch protection	IP10
Overvoltage category	III, 6 kV (1.2/50 μ s) rated impulse withstand voltage
Rated isolation voltage	Input to output: 4000 VACrms Output to case: 4000 VACrms
Base plate	25, 55 A: aluminum, nickel-plated 75 A: copper, nickel-plated

Dimensions



- Control On LED
 - Over-temperature Alarm Trip LED (suffix "P" option)
- Tolerances +/- 0.5 mm.

Performance

Output specifications

	RZ3A..25..	RZ3A..55..	RZ3A..75..
Max. operational current ¹ : AC-51	25 AAC	55 AAC	75 AAC
Max. operational current ¹ : AC-53a	6 AAC	12 AAC	19 AAC
Minimum operational current	150 mArms	250 mArms	400 mArms
Operational frequency range	45 to 65 Hz		
Rep. overload current t = 1 s	37 Arms	< 125 Arms	< 150 Arms
Leakage current @ rated voltage	< 3 mArms		
Non-repetitive surge current (I _{TSM}), t = 10 ms	325 Ap	600 Ap	1150 Ap
I ² t for fusing (t = 10 ms), minimum	525 A ² s	1800 A ² s	6600 A ² s
Power factor	>0.5 at rated voltage		
Critical dV/dt off state min.	≥ 500 V/μs		

Output voltage specifications

	RZ3A40..	RZ3A48..	RZ3A60..	RZ3A69..
Operational voltage range	24 - 440 VAC	42 - 530 VAC	42 - 660 VAC	42 - 750 VAC
Blocking voltage	800 Vp	1200 Vp	1600 Vp	1600 Vp
Output protection ²	Integrated varistor			

Motor ratings: HP (UL508) / kW (EN/IEC 60947-4-2) @ 40°C

	120 VAC	240 VAC	400 VAC	480 VAC	600 VAC
RZ3A..25	0.75 HP / 0.56 kW	1.5 HP / 1.1 kW	3 HP / 2.2 kW	3 HP / 2.2 kW	5 HP / 3.7 kW
RZ3A..55	1.5 HP / 1.1 kW	3 HP / 2.2 kW	5 HP / 3.7 kW	7.5 HP / 5.5 kW	10 HP / 7.5 kW
RZ3A..75	3 HP / 2.2 kW	5 HP / 3.7 kW	10 HP / 7.5 kW	10 HP / 7.5 kW	15 HP / 11 kW

Inputs

	RZ3A..D..	RZ3A..A..
Control voltage range	4 - 32 VDC	24 - 275 VAC / 24 - 50 VDC
Pick-up voltage	3.8 VDC	18 VAC / 20 VDC
Drop-out voltage	1.2 VDC	9 VAC / DC
Input current	≤ 23 mA	≤ 15 mA
Response time pick-up (50 Hz)	10 ms	20 ms
Response time drop-out (50 Hz)	10 ms	30 ms

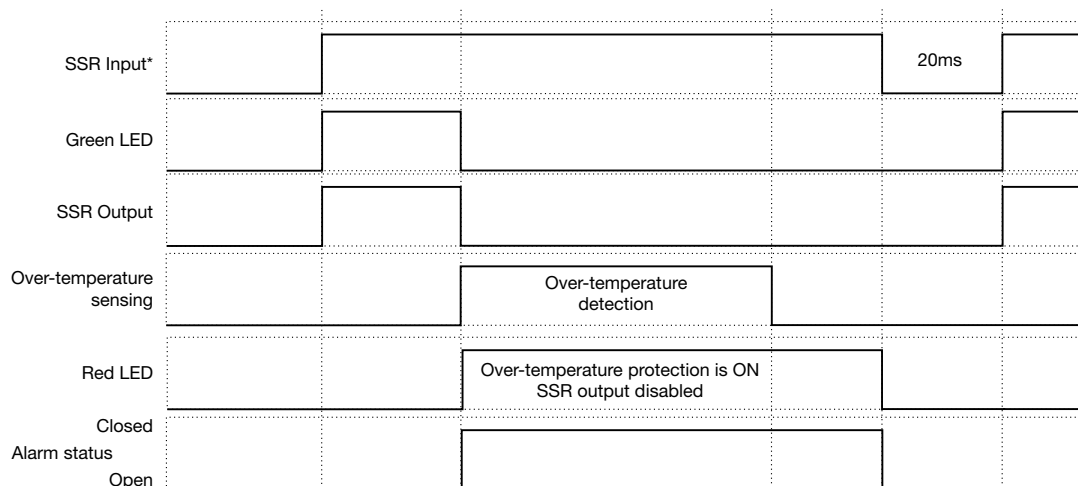
Alarm output specifications

Collector - emitter voltage	35 VDC
Emitter - collector voltage	6 VDC
Collector current	50 mA
Delay time on reset	20 ms

1. Refer to Heatsink selection section

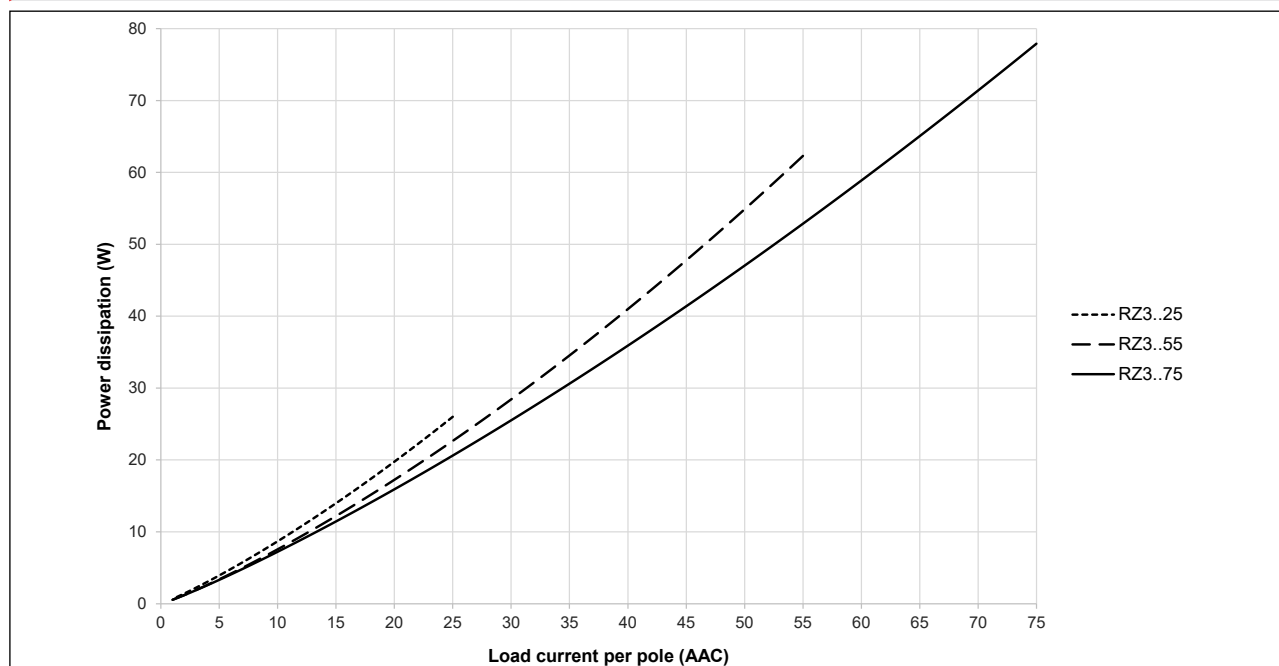
2. 690 VAC version is CE marked only and does not have an integrated varistor

Over-temperature protection (option: ...P)



* After over-temperature condition is removed, SSR can be reset by switching OFF the control input for more than 20 ms and switching back ON: this will switch ON the SSR output.

Output power dissipation



Thermal data

	RZ3..25..	RZ3..55	RZ3..75
Max. junction temperature	125°C	125°C	125°C
Junction to case thermal resistance, R_{thjc}	0.250°C/W	0.167°C/W	0.117°C/W
Case to heatsink thermal resistance, R_{thcs} ³	0.067°C/W	0.067°C/W	0.033°C/W
Case to heatsink thermal resistance (RZ..HT), R_{thcs_HT} ⁴	0.133°C/W	0.133°C/W	0.067°C/W

3. Thermal resistance case to heatsink values are applicable upon application of a fine layer of silicon based thermal paste HTS02S from Electrolube between SSR and heatsink.

4. Thermal resistance case to heatsink values are applicable for the RZHT thermal pad

Heatsink selection

Thermal resistance [°C/W] of RZ3..25

Load current per pole [A]	Surrounding ambient temperature [°C]						
	20	30	40	50	60	70	80
25.0	1.02	0.81	0.61	0.43	0.26	0.10	-
22.5	1.29	1.03	0.79	0.57	0.37	0.18	-
20.0	1.66	1.32	1.02	0.75	0.50	0.28	0.07
17.5	2.10	1.69	1.33	1.00	0.69	0.41	0.16
15.0	2.73	2.16	1.68	1.26	0.89	0.56	0.26
12.5	3.84	2.96	2.24	1.64	1.14	0.70	0.33
10.0	6.30	4.55	3.28	2.32	1.56	0.94	0.43
7.5	16.05	9.35	5.92	3.83	2.42	1.40	0.62
5.0	nh	nh	nh	9.91	5.02	2.54	1.03
2.5	nh	nh	nh	nh	nh	10.66	2.73

Thermal resistance [°C/W] of RZ3..55

Load current per pole [A]	Surrounding ambient temperature [°C]						
	20	30	40	50	60	70	80
55.0	0.25	0.18	0.12	0.05	-	-	-
50.0	0.35	0.26	0.19	0.11	0.04	-	-
45.0	0.47	0.37	0.28	0.19	0.10	0.02	-
40.0	0.63	0.51	0.40	0.29	0.19	0.09	-
35.0	0.87	0.71	0.57	0.43	0.30	0.18	0.06
30.0	1.16	0.97	0.80	0.63	0.47	0.31	0.16
25.0	1.54	1.28	1.04	0.82	0.61	0.42	0.24
20.0	2.23	1.81	1.45	1.12	0.83	0.56	0.32
15.0	3.79	2.96	2.28	1.72	1.24	0.82	0.46
10.0	10.84	7.17	4.92	3.39	2.29	1.44	0.78
5.0	nh	nh	nh	nh	9.91	4.54	2.02
2.5	nh	nh	nh	nh	nh	nh	7.27

Thermal resistance [°C/W] of RZ3..75

Load current per pole [A]	Surrounding ambient temperature [°C]						
	20	30	40	50	60	70	80
75.0	0.28	0.23	0.17	0.12	0.07	0.03	-
70.0	0.33	0.27	0.21	0.16	0.10	0.05	-
65.0	0.39	0.33	0.26	0.20	0.14	0.08	0.02
60.0	0.47	0.39	0.32	0.25	0.18	0.11	0.05
55.0	0.56	0.47	0.39	0.31	0.23	0.15	0.08
50.0	0.68	0.57	0.48	0.38	0.29	0.20	0.12
45.0	0.79	0.67	0.56	0.46	0.36	0.26	0.17
40.0	0.93	0.79	0.66	0.54	0.42	0.30	0.20
35.0	1.13	0.95	0.79	0.64	0.50	0.36	0.23
30.0	1.42	1.19	0.98	0.78	0.61	0.44	0.28
25.0	1.88	1.56	1.27	1.01	0.77	0.55	0.35
20.0	2.74	2.22	1.77	1.38	1.04	0.74	0.46
15.0	4.88	3.74	2.85	2.14	1.56	1.08	0.67
10.0	18.94	10.67	6.76	4.49	2.99	1.93	1.13
5.0	nh	nh	nh	nh	nh	7.25	3.21

'nh' means no heatsink necessary. The SSR should still be tightened to a surface to ensure optimal thermal dissipation.

- : not possible or not recommended

Compatibility and conformance

Approvals ⁵	    
Standard compliance	LVD: EN 60947-4-2, EN 60947-4-3 EMCD: EN 60947-4-2, EN 60947-4-3 cURus: UL508, UL60947-4-2 (E172877), NMFT2, NMFT8 CSA: C22.2 No. 14, C22.2 No. 60947-4-2 (204075)
UL short circuit current rating	65k Arms (refer to short circuit current section, Type 1 – UL508)

5. UR, cUR and CSA not applicable for RZ3A69..

CSA approval for 75 A models (RZ3A..75.) is limited to 65 A @ 40°C.

Electromagnetic compatibility (EMC) - immunity	
Electrostatic discharge (ESD)	EN 61000-4-2 8 kV air discharge, 4 kV contact (PC2)
Radiated radio frequency	EN 61000-4-3 10 V/m, from 80 MHz to 1 GHz (PC1) 10 V/m, from 1.4 to 2 GHz (PC1) 3 V/m, from 2 to 2.7 GHz (PC1)
Electrical fast transient (burst)	EN 61000-4-4 Output: 2 kV, 5 kHz (PC1) Input: 1 kV, 5 kHz (PC1)
Conducted radio frequency	EN 61000-4-6 10V/m, from 0.15 to 80 MHz (PC1)
Electrical surge	EN 61000-4-5 Output, line to line: 1 kV (PC1) Output, line to earth: 2 kV (PC1) Input, line to earth: 1 kV (PC1)
Voltage dips	EN 61000-4-11 0% for 0.5, 1 cycle (PC2) 40% for 10 cycles (PC2) 70% for 25 cycles (PC2)
Voltage Interruptions	EN 61000-4-11 0% for 5000ms (PC2)

Electromagnetic compatibility (EMC) - emissions	
Radio interference field emission (radiated)	EN 55011 Class A: from 30 to 1000 MHz
Radio interference voltage emissions (conducted)	From 0.15 to 30 MHz EN 55011 Class A (industrial) with filters

Note:

- Performance Criteria 1 (PC1): no degradation of performance or loss of function is allowed when the product is operated as intended.
- Performance Criteria 2 (PC2): during the test, degradation of performance or partial loss of function is allowed. However when the test is complete the product should return operating as intended by itself.
- Performance Criteria 3 (PC3): temporary loss of function is allowed, provided the function can be restored by manual operation of the controls.
- Control input lines must be installed together to maintain products' susceptibility to Radio Frequency interference.

Use of AC solid state relays may, according to the application and the load current, cause conducted radio interferences. Use of mains filters may be necessary for cases where the user must meet E.M.C requirements. The capacitor values given inside the filtering specification tables should be taken only as indications, the filter attenuation will depend on the final application.

Environmental specifications

Operating temperature	-30° to +80°C (-22° to +176° F)
Storage temperature	-40° to +100°C (-40° to + 212° F)
Pollution degree	3
EU RoHS compliant	Yes
China RoHS	

The declaration in this section is prepared in compliance with People's Republic of China Electronic Industry Standard SJ/T11364-2014: Marking for the Restricted Use of Hazardous Substances in Electronic and Electrical Products.

Part Name	Toxic or Harardous Substances and Elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr(VI))	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
Power Unit Assembly	x	O	O	O	O	O
O: Indicates that said hazardous substance contained in homogeneous materials fot this part are below the limit requirement of GB/T 26572. X: Indicates that said hazardous substance contained in one of the homogeneous materials used for this part is above the limit requirement of GB/T 26572.						

这份申明根据中华人民共和国电子工业标准
SJ/T11364-2014：标注在电子电气产品中限定使用的有害物质

零件名称	有毒或有害物质与元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴化联苯 (PBB)	多溴联苯醚 (PBDE)
功率单元	x	O	O	O	O	O
O:此零件所有材料中含有的该有害物低于GB/T 26572的限定。 X: 此零件某种材料中含有的该有害物高于GB/T 26572的限定。						

Short circuit protection

Protection Co-ordination, Type 1 vs Type 2:

Type 1 protection implies that after a short circuit, the device under test will no longer be in a functioning state. In type 2 co-ordination the device under test will still be functional after the short circuit. In both cases, however the short circuit has to be interrupted. The fuse between enclosure and supply shall not open. The door or cover of the enclosure shall not be blown open. There shall be no damage to conductors or terminals and the conductors shall not separate from terminals. There shall be no breakage or cracking of insulating bases to the extent that the integrity of the mounting of live parts is impaired. Discharge of parts or any risk of fire shall not occur.

The product variants listed in the table hereunder are suitable for use on a circuit capable of delivering not more than 65,000 Arms Symmetrical Amperes 600 Volts maximum when protected by fuses. Tests at 65,000 A were performed with Class J fuses, fast acting; please refer to the table below for maximum allowed ampere rating of the fuse. Use fuses only.

Tests with Class J fuses are representative of Class CC fuses.

Protection co-ordination Type 1 according to UL 508				
Part No.	Prospective short circuit current [kArms]	Max fuse size [A]	Class	Voltage [VAC]
RZ3A..25	65	30	CC	600
RZ3A..55		50 30	J CC	
RZ3A..75		70	J	

Protection co-ordination Type 2 with fuses						
Part No.	Prospective short circuit current [kArms]	Ferraz Shawmut (Mersen)				
		Max fuse size [A]	Part number	Fuse size (mm)	Fuse holder type	Voltage [VAC]
RZ3A..25	65	25 20	F1014581 - FR10GR69V20 E1014580 - FR10GR69V20	10.3 x 38 10.3 x 38	G1062790 - CUSCC3	400 600
RZ3A..55		50 50	K1017207 - FR14GR69V50 C1018557 - FR22GR69V50	14 x 51 22 x 58	S331032 - CMS143 E331135 - CMS223	400 600
RZ3A..75		63	D1018558 - FR22GR69V63	22 x 58	E331135 - CMS223	600

Protection co-ordination Type 2 with Minature Circuit Breakers (M.C.B.s)				
Solid State Relay type	ABB Model no. for Z - type M. C. B. (rated current)	ABB Model no. for B - type M. C. B. (rated current)	Wire cross sectional area [mm ²]	Minimum length of Cu wire conductor [m] ⁶
RZ3A..25	S203 - Z4 (4 A) S203 - Z6 UC (6 A)	S203 - B2 (2 A) S203 - B2 (2 A)	1.0	21.0
			1.0	21.0
			1.5	31.5
RZ3A..55	S203 - Z10 (10 A)	S203 - B4 (4 A)	1.0	7.6
			1.5	11.4
			2.5	19.0
	S203 - Z16 (16 A)	S203 - B6 (6 A)	1.0	5.2
			1.5	7.8
			2.5	13.0
	S203 - Z20 (20 A)	S203 - B10 (10A)	4.0	20.8
			1.5	12.6
RZ3A..75	S203 - Z25 (25 A)	S203 - B13 (13 A)	2.5	21.0
			4.0	25.0
			2.5	40.0
	S203 - Z32 (32 A)	S203 - B16 (16 A)	4.0	4.2
			6.0	7.0
			2.5	11.2

6. Between MCB and Load (including return path which goes back to the mains)

Note: A prospective current of 6 kA and a 230 / 400 V power supply is assumed for the above suggested specifications. For cables with different cross section than those mentioned above please consult Carlo Gavazzi's Technical Support Group.

Connection Diagrams

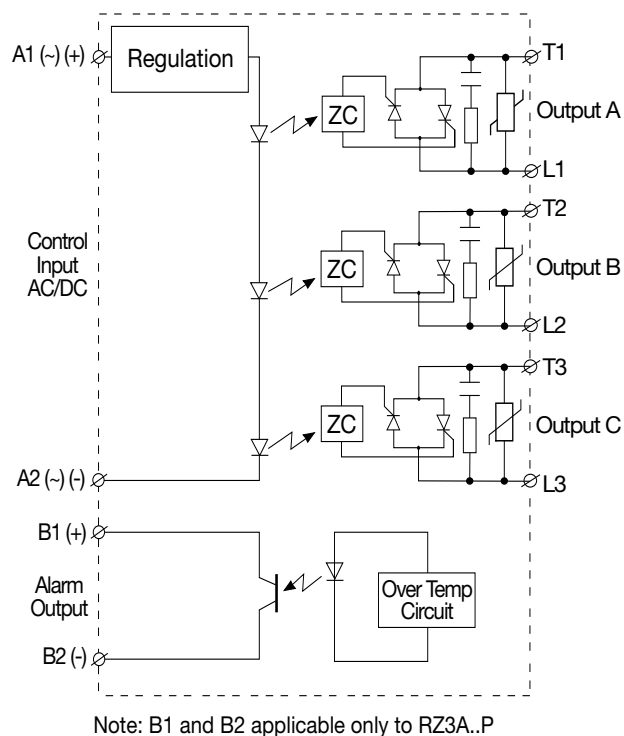


Fig. 1 Terminal wiring

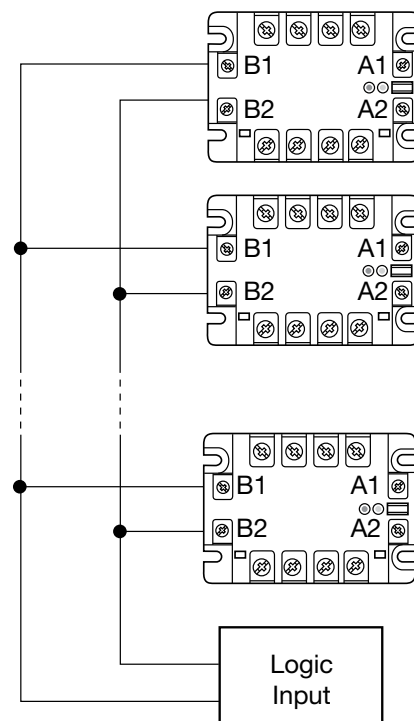
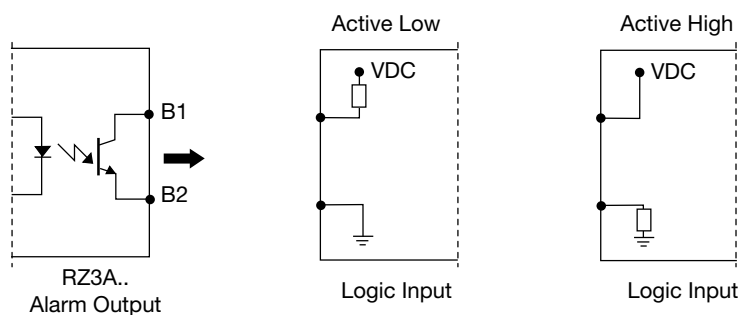


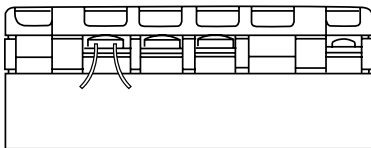
Fig. 2 Common alarm wiring

Alarm output connection

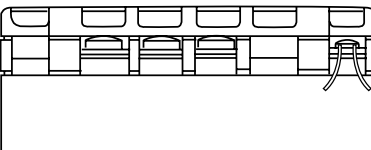


Connection specifications

Mounting specifications (SSR to heatsink)	
Mounting screws	M5, not provided with SSR
Mounting torque	1.5 Nm (13.3 lb-in)

Power connections	
Terminals	1/L1, 2/T1, 3/L2, 4/T2, 5/L3, 6/T3
Conductors	Use 75°C copper (Cu) conductors
	
Connection type	M5 screw with captivated washer
Stripping length	12 mm
Rigid (solid & stranded)	2x 1.0 - 6.0 mm ² 2x 18 - 8 AWG
Flexible (without end sleeve)	2x 1.5 - 6.0 mm ² 2x 18 - 8 AWG
Torque specifications	Pozidriv bit 2 2.5 Nm

Note: when wiring 2 cables in a single terminal, both cables must be of the same thickness to ensure cable secureness.

Control connections	
Terminals	A1+, A2- / A1, A2
Conductors	Use 60/75°C copper (Cu) conductors
	
Connection type	M4 screw with captivated washer
Stripping length	8 mm
Rigid (solid & stranded)	2x 1 - 2.5 mm ² 2x 18 - 14 AWG
Flexible (without end sleeve)	2x 1 - 2.5 mm ² 2x 18 - 14 AWG
Torque specification	Pozidriv bit 2 1.2 Nm



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