Solid State Relays
3-Phase with Integrated Heatsink
Phase Angle Switching
Types RGC3P..VS

- 3-pole phase angle switching solid state contactors
- Rated operational voltage: up to 660 VAC
- Rated operational current: up to 65 AAC
- Control input: 0-5V, 1-5V, 0-10V, external potentiometer
- Integrated varistor protection on output
- Monitoring for SSR overtemperature and mains loss
- EMR output for alarm indication
- 100kA short circuit current rating according to UL508
- DIN or panel mount

Product Description

The RGC3P...VS is a phase angle switching variant that is dedicated for speed control of ventilators with a power factor of around 0.7. This variant of the RGC3P provides a more linear speed regulation with phase angle control compared to the standard RGC3P series.

The RGC3P..VS can be regulated by an analog voltage input. A supply voltage, Us is requried to power the electronics. LEDs give a visual indication of the control, load and alarm status. In case of an alarm status, a signal output is available for remote signalling.

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

Ordering Key

RGC 3 P 60 V 65 E D F P VS

- **Solid state relay**
- **Number of switched poles**
- **Type of switching**
- **Rated operational voltage**
- **Control input**
- **Rated operational current**
- **Switching mode**
- **External supply**
- **Integrated fan**
- **Monitoring features**
- **Variant**

Ordering Key

SSR with heatsink	Type of switching	Rated voltage (Ue), Blocking voltage	Control input	Rated current/ pole @40°C[1]	Switching mode	External supply (Us)	Features	VS:
RGC3: 3-pole switching	**P:** Proportional	**60:** 180 - 660VAC, 1200Vp	**V:** 0-5VDC 1-5VDC 0-10VDC External potentio-meter	**20**: 20AAC **30**: 30AAC **65**: 65AAC	**E**: Phase Angle	**D:** 24VAC/DC	**P:** Integrated over temperature protection (OTP), mains loss with EMR alarm output **F:** Integrated fan	Ventilator Speed Control

OTP = Over Temperature Protection
EMR = Electromechanical Relay

1. Refer to Derating Curves

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Selection Guide

Output voltage, Ue	Control input	External supply, Us	Connection Control / Power	Rated operational current @ 40°C (I^2t) Product width		
				20 AAC (1800 A^2s) 54 mm	30 AAC (6600 A^2s) 70 mm	65 AAC (15000 A^2s) 70 mm with fan
180-600 VAC	0-10 V 5-10 V 1-5 V external potentiometer	24 VDC/AC	Box clamp / Screw	RGC3P60V20EDPVS	-	-
			Box clamp / Box clamp	-	RGC3P60V30EDPVS	RGC3P60V65EDFPVS

General Specifications

Latching voltage (across each pole L-T)	20V
Operational frequency range	45 to 65 Hz
Power factor	> 0.7 @ rated voltage
Output Power	0 to 100%
Touch Protection	IP20
CE marking	Yes
Pollution degree	2 (non-conductive pollution with possibilities of condensation)
Over-voltage category	III (fixed installations), 6kV (1.2 / 50µs) rated impulse withstand voltage Uimp
LED status indication	
Control ON	Green, Full intensity
Supply ON	Green, Flashing 0.5s ON, 0.5s OFF
Load ON	Yellow, ON according to load status
Alarm ON	Red, flashing[2]
Isolation	
Input & Output to Case	4000 Vrms
Input to Output	2500 Vrms
External supply to input Us to A1, A2, A3, A4, A5, Uf, 11, 12, 14	1500 Vrms
External supply & input to EMR Us, A1, A2, A3, A4, A5, Uf to 11, 12, 14	1500 Vrms

2: Refer to LED Indications

Input Specifications

Control input[3]	0 - 5 VDC 1 - 5 VDC 0 - 10 VDC
External potentiometer input	10K ohms (terminal A1, A3, A5)
Maximum initialisation time	250ms
Response time (Input to Output)	2 half cycles
Input impedance	100k ohms
Reverse protection	Yes
Input protection vs. surges	Yes
Overvoltage protection	up to 24 VDC

3: It is not suggested to operate the AC fan with a control signal lower than 25% of the input range (i.e. < 2.5 VDC for the 0-10 VDC range) to avoid stalling and/or overheating the coils of the fan.

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Output Specifications

	RGC3..20	RGC3..30	RGC3..65
Rated operational current per pole[4]			
AC-51 @ Ta=25°C	25 AAC	37 AAC	71 AAC
AC-51 @ Ta=40°C	20 AAC	30 AAC	66 AAC
AC-53a @ Ta=40°C[5, 6]	10 AAC	14 AAC	25 AAC
Minimum operational current	500 mACC	1AAC	1 AAC
Number of starts (x)[5]	30	30	30
Rep. Overload Current PF = 0.7 UL508: T=40°C, tON=1s, tOFF=9s, 50 cycles	61 AAC	107 AAC	154 AAC
Maximum transient surge current (I_{tsm}), t=10ms	600 Ap	1150 Ap	1750 Ap
I^2t for fusing (t=10ms), minimum	1800 A^2s	6600 A^2s	15000 A^2s
Critical dv/dt (@ Tj init = 40°C)	1000 V/us	1000 V/us	1000 V/us

4: Refer to Derating Curves

5: Overload profile for AC-53a, Ie: AC-53a: 6x Ie - 6: 50 - x, where Ie = nominal current (AAC), 6xIe = overload current (AAC), 6 = duration of overload current (s), 50 = ON duty cycle (%), x= number of starts.

6: The only inductive loads suitable for use with the RGC3P..VS are AC fans.

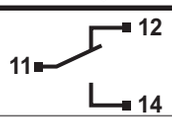
Output Voltage Specifications

Operational voltage range, Line to line voltage, L1/L2/L3	180-660 VAC
Permissible voltage unbalance	10% between L1/L2/L3
Blocking voltage	1200Vp
Leakage current @ rated voltage	5mAAC per pole
Internal Varistors (across each pole)	Yes

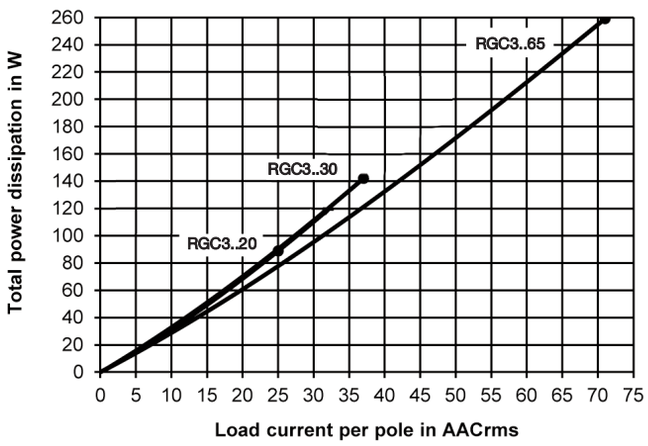
Supply Specifications (Us)

Supply voltage range	24VDC, -15% / +20% 24VAC, -15% / +15%
Overvoltage protection	up to 32 VDC/AC for 30 seconds
Reverse protection	Yes
Surge protection	Yes, integrated
Max. supply current no fan, RGC..P with fan, RGC..FP	 90mA 175mA

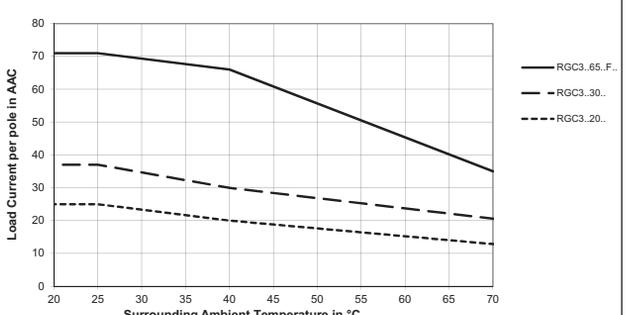
Alarm Specifications (12, 14, 11)

Output type		EMR, 1 Form C Normally closed (12-11) Normally open (14-11)
Contact rating		2A @ 250VAC / 30VDC
Isolation between open contacts		1000 VAC

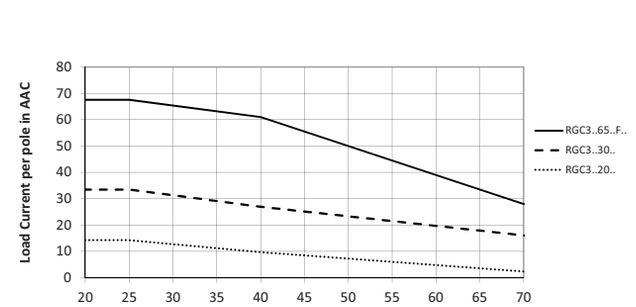
Output Power Dissipation



Current Derating



Current Derating with 0mm spacing



Note: Versions that utilise 24 VAC external supply (Us) are limited to a maximum operating temperature of 60°C (140°F)

Environmental Specifications

Operating temperature Us=24VAC	-40°C to +70°C (-40°F to +158°F) -40°C to +60°C (-40°F to +140°F)
Storage temperature	-40°C to +100°C (-40°F to +212°F)
RoHS (2011/65/EU)	Compliant
Impact resistance (EN50155, EN61373)	15/11 g/ms
Vibration resistance (2-100Hz, IEC60068-2-6, EN50155, EN61373)	2g per axis
Relative humidity	95% non condensing @ 40°C

UL flammability rating (for plastic)	UL 94 V0
Installation altitude	0 - 1000m. Above 1000m derate linearly by 1% of FLC per 100m up to maximum of 2000m
Weight RGC3..20 RGC3..30 RGC3..65	 approx. 670g approx. 920g approx. 990g

Agency Approvals and Conformance

Conformance	EN/IEC 60947-4-3	**Agency Approvals**	UL Listed (E172877), UL508 cUL Listed (E172877), C22.2 No.14-13
		Short Circuit Current rating	100kArms, UL508

Electromagnetic Compatibility

EMC immunity	EN 60947-4-3	**Radiated radio frequency immunity**	EN/IEC 61000-4-3
Electrostatic discharge (ESD) immunity	EN/IEC 61000-4-2	10V/m, 80 - 1000MHz	Performance Criteria 1
Air discharge, 8kV	Performance Criteria 2	10V/m, 1.4 - 2.0GHz	Performance Criteria 1
Contact, 4kV	Performance Criteria 2	3V/m, 2.0 - 2.7GHz	Performance Criteria 1
Electrical surge immunity	EN/IEC 61000-4-5	**Conducted radio frequency immunity**	EN/IEC 61000-4-6
Output, line to line, 1kV	Performance Criteria 2	10V/m, 0.15 - 80MHz	Performance Criteria 1
Output, line to earth, 2kV (A1, A2, A3, A4, A5)	Performance Criteria 2	**Voltage dips**	EN/IEC 61000-4-11
Line to earth, 1kV (Us+, Us-)	Performance Criteria 2	0% for 0.5, 1cycle	Performance Criteria 2
Line to line, 500V	Performance Criteria 2	40% for 10 cycles	Performance Criteria 2
Line to earth, 500V (Us ~, 11, 12, 14)	Performance Criteria 2	70% for 25 cycles	Performance Criteria 2
Line to line, 1kV	Performance Criteria 2	80% for 250 cycles	Performance Criteria 2
Line to earth, 2kV	Performance Criteria 2	**Voltage interruptions immunity**	EN/IEC 61000-4-11
Electrical fast transient (Burst) immunity	EN/IEC 61000-4-4	0% for 5000ms	Performance Criteria 2
Output: 2kV, 5kHz	Performance Criteria 1		
Input: 1kV, 5kHz (A1, A2, A3, A4, A5)	Performance Criteria 1		
Signal: 1kV, 5kHz (Us, 11, 12, 14)	Performance Criteria 1		

EMC emission	EN 60947-4-3	**Radio interference field emission (radiated)**	EN/IEC 55011
Radio interference voltage emission (conducted)	EN/IEC 55011	30-1000MHz	Class A (Industrial)
0.15-30MHz	Class A (with external filtering)		

Note:

- 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.
- This product has been designed for Class A equipment. (External filtering may be required, refer to filtering section). Use of this product in domestic environments may cause radio interference, in which case the user may be required to employ additional mitigation methods.
- A deviation of up to 1.5% Full Scale Deviation is considered to be within PC1 criteria.

- Performance Criteria 1 (Performance Criteria A): No degradation of performance or loss of function is allowed when the product is operated as intended.
- Performance Criteria 2 (Performance Criteria B): During the test, degredation 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 (Performance Criteria C): Temporary loss of function is allowed, provided the function can be restored by manual operation of the control.

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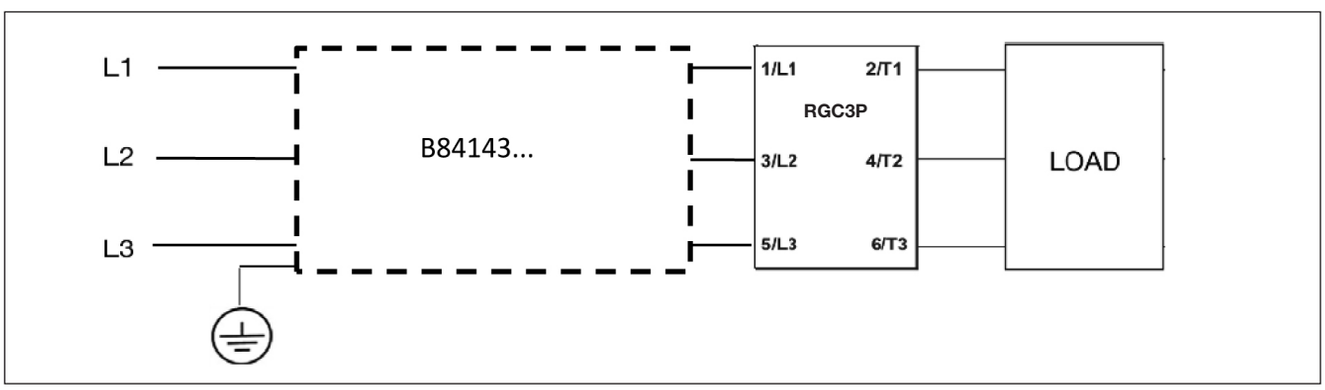
Filtering - EN/IEC 55011 Compliance

	Compliance to Class A emission limits		Compliance to Class B emission limits	
Part no.	Max. load current	Suggested filter	Max. load current	Suggested filter
RGC3P..E..	20AAC	Epcos, B84143A0025R105 / 530VAC	13AAC	Epcos, B84143A0025R105 / 530VAC
	30AAC	Epcos, B84143D0050R127 / 530VAC	-	-

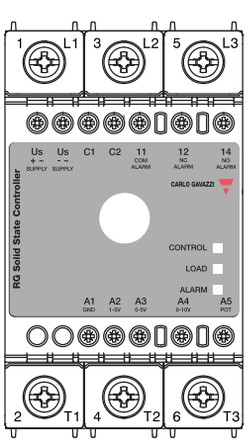
Filter Connection Diagrams



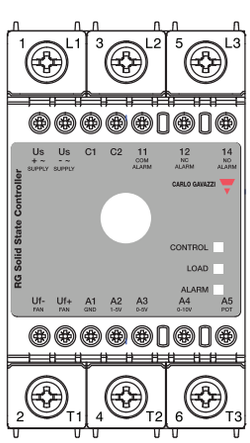
Note: The suggested filtering is determined by tests carried out on a representative setup and load. The RGC3P.. is intended to be integrated within a system where conditions may differentiate from conditions utilised for tests, such as load, cable lengths and other auxiliary components that may exist within the end system. It shall be the responsibility of the system integrator to ensure that the sytsem containing the above component complies with the applicable rules and regulations.

Epcos installation recomendations shall be taken in consideration when utilising such filters.

Terminals Layout



RGC3P..V20, RGC3P..V30



RGC3P..V65

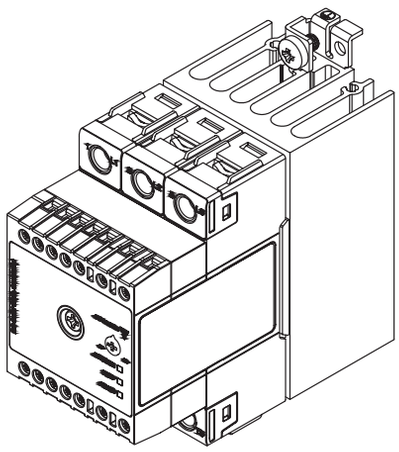
Terminals Labelling:

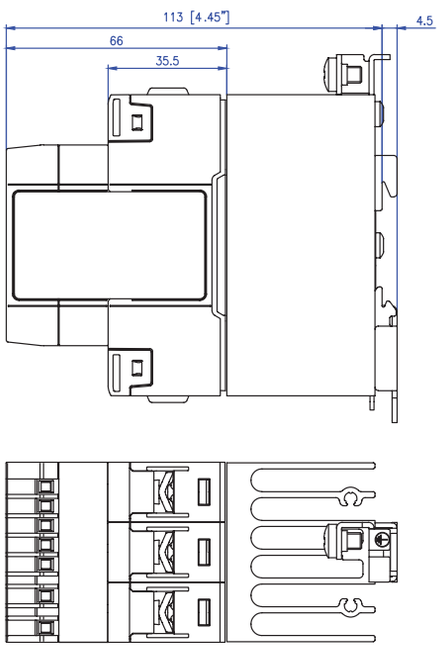
1/L1, 2/L2, 3/L3:	Line connections
2/T1, 4/T2, 6/T3:	Load connections
A1, A2:	Control input, 1-5V
A1, A3:	Control input, 0-5V
A1, A4:	Control input, 0-10V
A5:	External Potentiometer input
Us (+, ~):	External supply, positive signal
Us (-, ~):	External supply, ground
C1, C2:	NOT USED
Uf+:	Fan supply positive signal
Uf-:	Fan supply ground

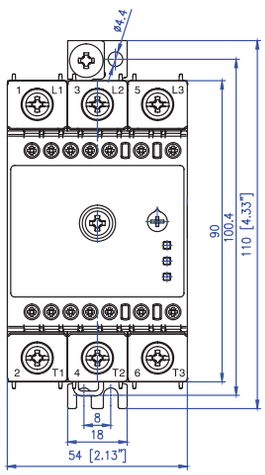
Connections to Uf-, Uf+ are readily terminated by manufacturer. No other connection is required by end user.

Dimensions

RGC3..V20

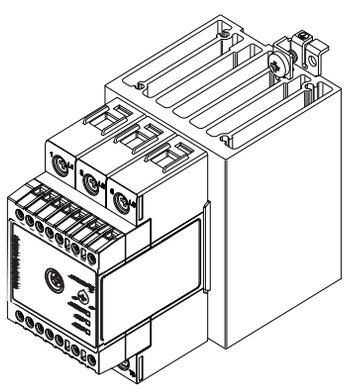


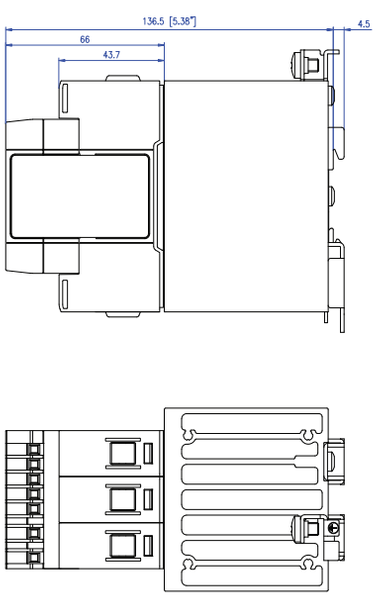


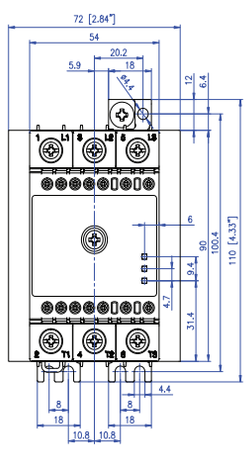


Potentiometer knob is not included in the RGC3P..VS.

RGC3..V30





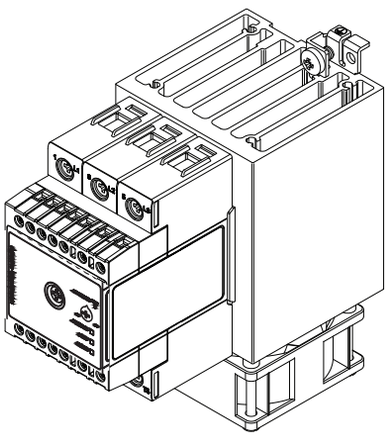


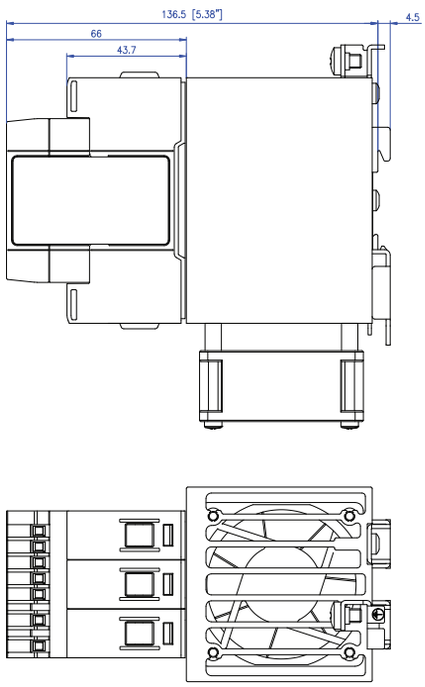
Potentiometer knob is not included in the RGC3P..VS

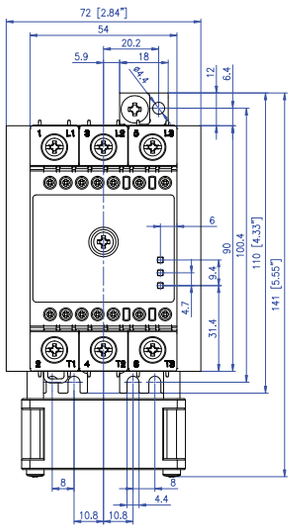
Dimensions in mm. Housing width tolerance +0.5mm, - 0mm as per DIN43880.
All other tolerances ±0.5mm

Dimensions

RGC3..V65







Potentiometer knob is not included in the RGC3P..VS

Dimensions in mm. Housing width tolerance +0.5mm, -0mm as per DIN43880.
All other tolerances ±0.5mm

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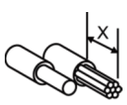
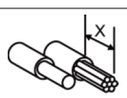
Connection Specifications

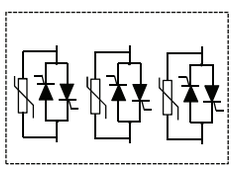
POWER CONNECTIONS	**1/L1, 3/L2, 5/L3, 2/T1, 4/T2, 6/T3**		
Use 75°C copper (Cu) conductors	**RGC3..20**		**RGC3..30, RGC3..65**
			
Stripping length (X)	12mm		11mm
Connection type	M4 screw with captivated washer		M5 screw with box clamp
Rigid (solid & stranded) UL/cUL rated data 	2x 2.5 - 6.0 mm^2 2x 14 - 10 AWG	1x 2.5 - 6.0 mm^2 1x 14 - 10 AWG	1x 2.5 - 25 mm^2 1x 14 - 3 AWG
Flexible with end sleeve 	2x 1.0 - 2.5 mm^2 2x 2.5 - 4.0 mm^2 2x 18 - 14 AWG 2x 14 - 12 AWG	1x 1.0 - 4.0 mm^2 1x 18 - 12 AWG	1x 2.5 - 16 mm^2 1x 14 - 6 AWG
Flexible without end sleeve 	2x 1.0 - 2.5 mm^2 2x 2.5 - 6.0 mm^2 2x 18 - 14 AWG 2x 14 - 10 AWG	1x 1.0 - 6.0 mm^2 1x 18 - 10 AWG	1x 4.0 - 25 mm^2 1x 12 - 3 AWG
Torque specification 	Pozidriv 2 UL: 2Nm (17.7 lb-in) IEC: 1.5-2.0Nm (13.3-17.7 lb-in)		Pozidriv 2 UL: 2.5Nm (22 lb-in) IEC: 2.5-3.0Nm (22-26.6 lb-in)
Aperture for termination lug	12.3mm		n/a
Protective Earth (PE) connection 	M5, 1.5Nm (13.3 lb-in) Not provided with SSR. PE connection required when product is intended to be used in Class 1 applications according to EN/IEC 61140		

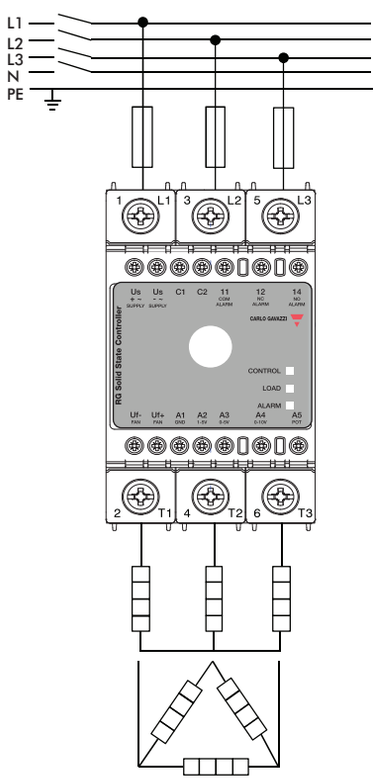
CONTROL CONNECTIONS	**A1, A2, A3, A4, A5 Us, Uf, 11, 12, 14**
Use 75°C copper (Cu) conductors	
Stripping length (X)	8mm
Connection type	M3 screw with box clamp
Rigid (solid & stranded) UL/cUL rated data 	1x 1.0 - 2.5 mm^2 1x 18 - 12 AWG
Flexible with end sleeve 	1x 0.5 - 2.5 mm^2 1x 20 - 12 AWG
Torque specification 	Pozidriv 1 UL: 0.5Nm (4.4 lb-in) IEC: 0.4-0.5Nm (3.5-4.4 lb-in)

Potentiometer knob is included only for switching modes 'S' and 'S16'

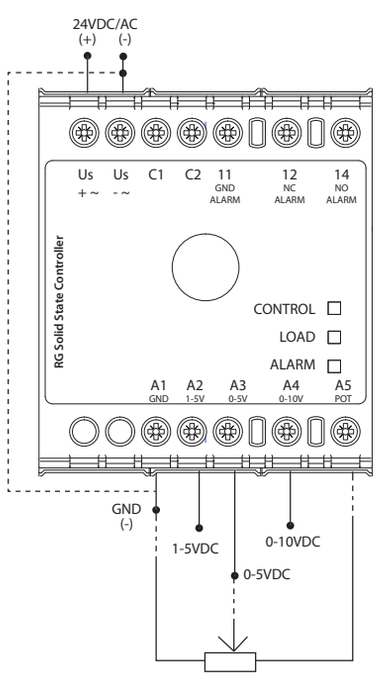
Dimensions in mm. Housing width tolerance +0.5mm, - 0mm as per DIN43880.
All other tolerances ±0.5mm

Connection Diagram





Connection Configuration

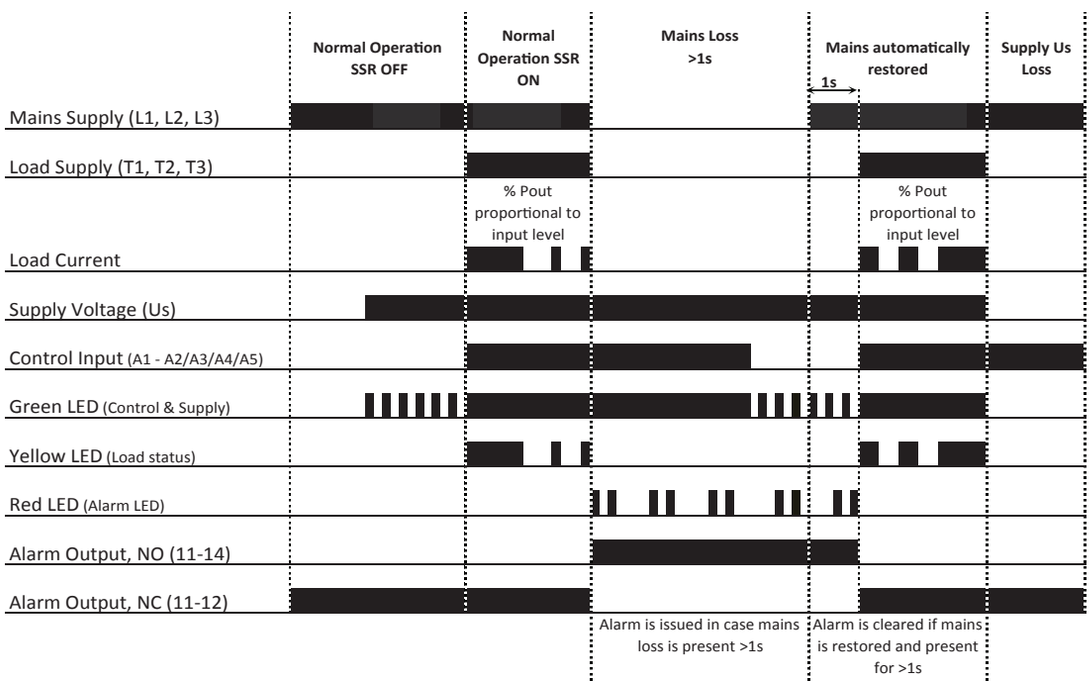


Note: Control input shall be connected either to A1-A2 or A1-A3 or A1-A4 or A1-A3-A5 in case an external potentiometer is used.

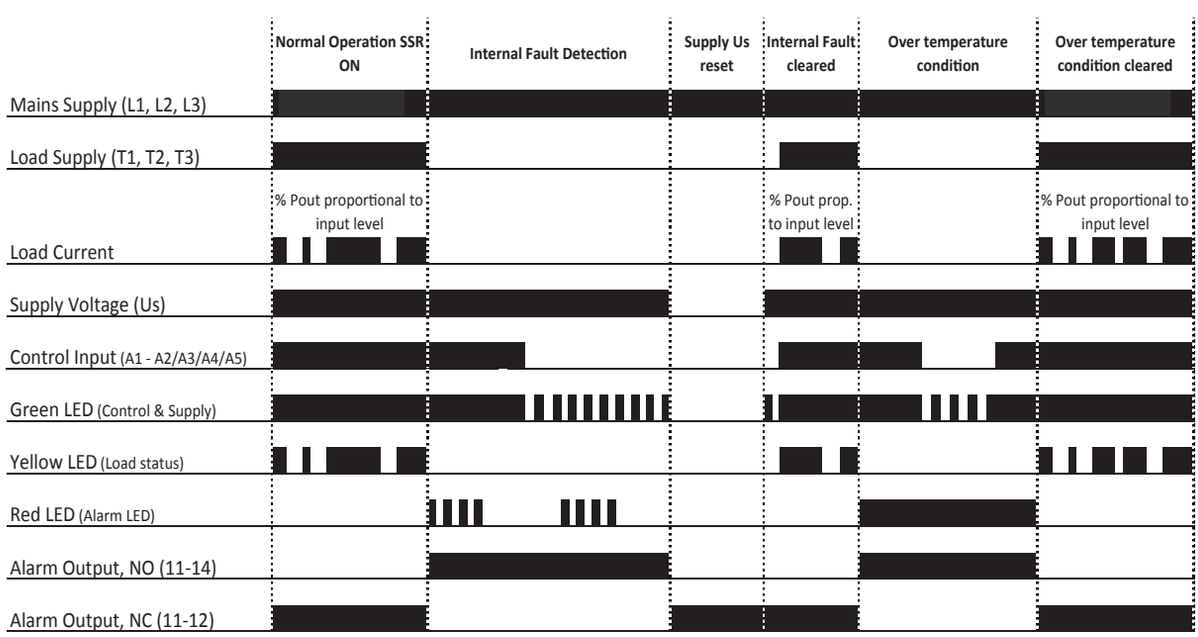
Mode of Operation

The following operation diagrams show the behaviour of the RGC3P..VS under different operating and abnormal conditions:
- Mains Loss (Operation Diagram 1)
- SSR Over Temperature (Operation Diagram 2)
- SSR Internal Fault (Operation Diagram 2)

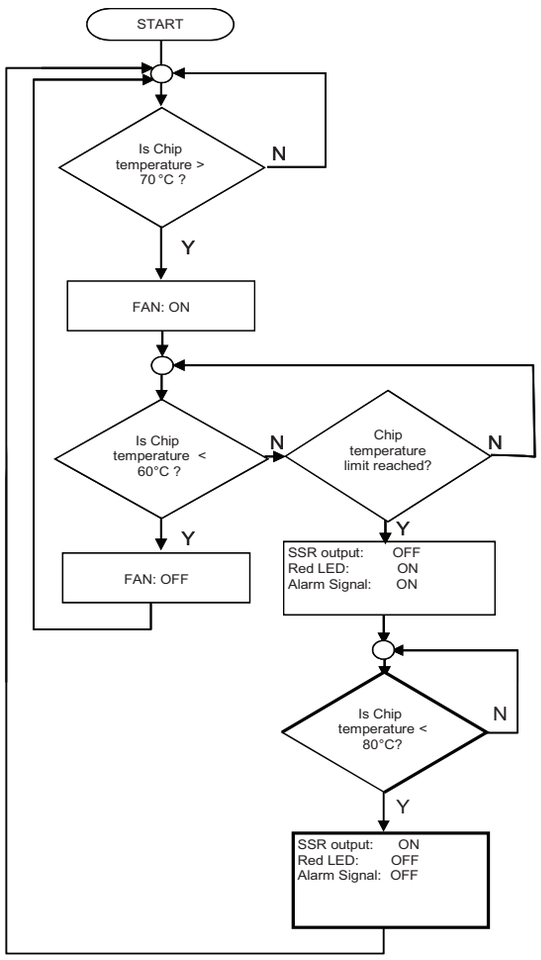
Operation Diagram 1:



Operation Diagram 2:



Fan operation for RGC..F..

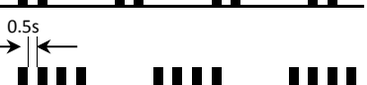


LED Indications

Green LED

Control ON ON in presence on control input	
Supply ON: (no control input) flash rate 0.5s ON, 0.5s OFF	

Red LED

Flashes	Red LED	Timing Diagram
2	Mains loss	
4	SSR internal fault	
100%	SSR over temperature	

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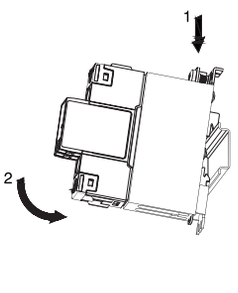
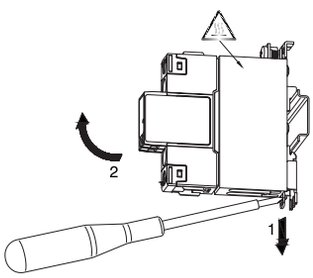
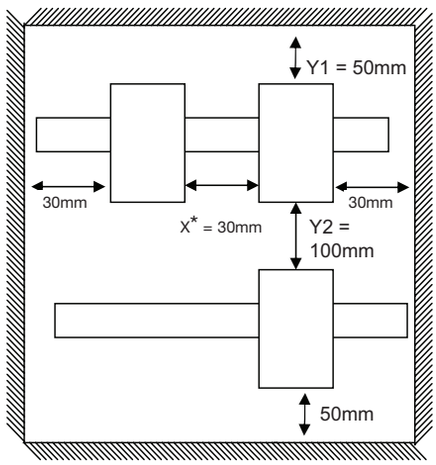
Installation Instructions



Mounting on DIN rail



Dismounting from DIN rail



* Refer to Current Derating curves at 0mm for 0mm spacing between units

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 100,000A Symmetrical Amperes, 600Volts maximum when protected by fuses. Tests at 100,000Arms were performed with Class J fuses, fast acting; please refer to the tables below for maximum ratings. Tests with Class J fuses are representative of Class CC fuses.

Co-ordination type 1 (UL508)

Part No.	Max. fuse size [A]	Class	Short circuit current [kArms]	Voltage [VAC]
RGC3..20	30	J or CC	100	Max. 600
RGC3..30	40	J	100	Max. 600
RGC3..65	60[7]	J	100	Max. 600

7: Consult a Carlo Gavazzi sales representative for use of 70A class J fuses

Co-ordination type 2 (EN/IEC 60947-4-3)

Part No.	Ferraz Shawmut (Mersen)		Siba		Short circuit current [kArms]	Voltage [VAC]
	Max. fuse size [A]	Part number	Max. fuse size [A]	Part Number		
RGC3..20	32	6.9xx gRC URC 14x51/32	32	50 142 06 32	10	600
	32	6.9xx gRC URC 14x51/32			100	
	40	A70QS40-4				
RGC3..30	40	6.9xx gRC URC 14x51/40	40	50 194 20 40	10	600
	40	6.9xx gRC URC 14x51/40			100	
	40	A70QS40-4				
RGC3..65	100	6.9xx gRC URC 22x58/100	125	50 196 20 125	10	600
	90	660 URD 22x58/90			100	
	100	A70QS100-4				

Type 2 Protection Coordination with Miniature Circuit Breakers (M.C.Bs)

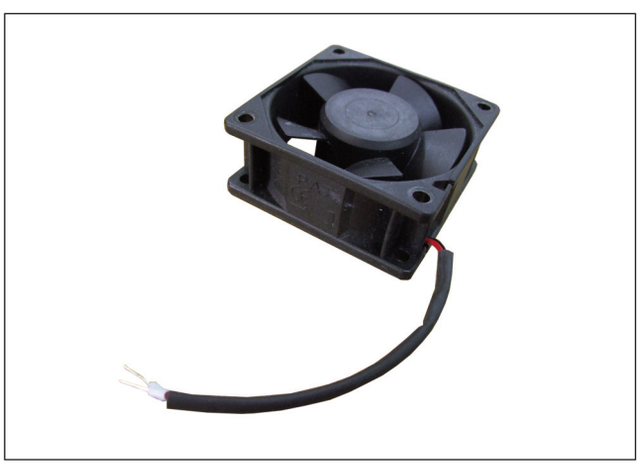
Solid State Relay type	ABB Model no. for Z - type M. C. B. (rated current)	ABB Model no. for B - type M. C. B. (rated current)	Wire cross sectional area [mm^2]	Minimum length of Cu wire conductor [m][8]
RGC3..20	S201 - Z10 (10A)	S201 - B4 (4A)	1.0 1.5 2.5	7.6 11.4 19.0
	S201 - Z16 (16A)	S201 - B6 (6A)	1.0 1.5 2.5 4.0	5.2 7.8 13.0 20.8
	S201 - Z20 (20A)	S201 - B10 (10A)	1.5 2.5	12.6 21.0
	S201 - Z25 (25A)	S201 - B13 (13A)	2.5 4.0	25.0 40.0
RGC3..30	S201 - Z20 (20A)	S201 - B10 (10A)	1.5 2.5 4.0	4.2 7.0 11.2
	S201 - Z32 (32A)	S201 - B16 (16A)	2.5 4.0 6.0	13 20.8 31.2
RGC3..65	S201 - Z25 (25A)	S201 - B16 (16A)	2.5 4.0 6.0	3.1 5.0 7.5
	S201 - Z50 (50A)	S201 - B25 (25A)	4.0 6.0 10.0 16.0	8.0 12.0 20.0 32.0
	S201 - Z63 (63A)	S201 - B32 (32A)	6.0 10.0 16.0	11.3 18.8 30.0

8: Between MCB and Load (including return path which goes back to the mains if applicable)

Note: A prospective current of 6kArms and a 230/400V power supply system 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.

Accessories

Fan



Ordering Key

RGC3FAN60

Fan accessory
for RGC3..65