# RGC1P..AA.., RGC1P..V..

## 1-pole proportional switching controllers with integrated heatsink




## Description

The RGC1P is a series of solid state contactors (with integrated heatsink) that give the possibility to control output power of 1-phase loads with an analog control input.

Input types cover a wide range of current and voltage ranges. Local setting by an external potentiometer is possible. Switching modes, selectable through a front knob, allow phase angle control, full cycle control, advanced full cycle control specific for short wave infrared heaters and soft starting for limiting inrush current of loads having a high temperature coefficient.

The output of the RGC1P is protected against overvoltages by means of an integrated varistor across the output. Two front LEDs indicate the status of the load and control.

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

## Benefits

- **Eliminates the need for analog to digital convertors.** The output of the RGC1P can be controlled directly via an analog current or analog voltage signal.
- **Inventory reduction.** Multifunction controller with the possibility to select amongst a number of switching modes.
- **Less maintenance costs.** Wire bonding technology reduces thermal and mechanical stresses of the output chips resulting in a larger number of operational cycles compared to other assembly technologies.
- **Low machine downtime.** Integrated overvoltage protection prevents the solid state relay from breaking down due to uncontrolled transients that may occur on the lines.
- **Ease of use.** The RGC1P ready to use solution is provided with integrated heatsink thus eliminating the need for the user to calculate the size of heatsink needed for adequate thermal dissipation.
- **Fast wiring**. Power connections for models rated >30 A are equipped with terminals that can handle cables up to 25 $mm^2$ / AWG3 cables.
- **Accommodates UL508A requirements for Industrial Control Panels.** The RGC1P is certified as a listed product. All models carry a 100 kArms Short Circuit Current Rating.

## Applications

Injection moulding, PET stretch blow moulding, thermoforming, electrical ovens, furnaces, climatic chambers, duct heating, air handling units.

## Main features

- 1-pole analog switching AC solid state relays
- Selectable switching mode: phase angle, distributed full cycle(s), advanced full cycle, soft starting
- Ratings up to 660 VAC and 63 AAC
- Control inputs: 4-20 mA or 0-5 V, 1-5 V, 0-10 V, external potentiometer



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## Order code

**RGC1P □□□E□□**

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

| Code | Option | Description | Comments |
|---|---|---|---|
| R | - | Solid State Relay (RG) | |
| G | - | | |
| C | - | With integrated heatsink | |
| 1 | - | 1-pole switching | |
| P | - | Proportional switching | |
| □ | 23 | Rated voltage: 85 - 265 VAC, 800 Vp | |
| | 48 | Rated voltage: 190 - 550 VAC, 1200 Vp | |
| | 60 | Rated voltage: 410 - 660 VAC, 1200 Vp | |
| □ | AA | Control input: 4-20 mADC | |
| | V | Control input: 0-5 VDC, 1- 5 VDC, 0-10 VDC, external potentiometer | Requires external supply (Us) |
| □ | 12 | Rated current: 15 AAC (1800 A²s) | |
| | 30 | Rated current: 30 AAC (1800 A²s) | |
| | 42 | Rated current: 43 AAC (18000 A²s) | |
| | 50 | Rated current: 50 AAC (3200 A²s) | |
| | 62 | Rated current: 63 AAC (18000 A²s) | |
| E | - | Contactor configuration | |
| □ | D | External power supply (Us): 24 VDC/AC | |
| | A | External power supply (Us): 90 - 250 VAC | |
| □ | - | | |
| | T | Tamper proof cover & secureness tie included in packaging | |



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## Selection guide

| Rated voltage, Ue | Control input | External Supply, Us | Power connection | Rated operational current @ 40°C | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 15 AAC (1800 A²s) | 30 AAC (1800 A²s) | 43 AAC (18000A²s) | 50 AAC (3200 A²s) | 63 AAC (18000 A²s) |
| | | | | Product width | | | | |
| | | | | 35 mm | 35 mm | 35 mm | 70 mm | 70 mm |
| 85 - 265 VAC | AA: 4-20 mADC | - | Screw | RGC1P23AA12E | RGC1P23AA30E | - | - | - |
| | | | Box | - | - | RGC1P23AA42E RGC1P23AA42ET | RGC1P23AA50E | RGC1P23AA62E |
| | V: 0-10V, 0-5V, 1-5VDC, pot | 24 VDC/AC | Screw | RGC1P23V12ED | RGC1P23V30ED | - | - | - |
| | | | Box | - | - | RGC1P23V42ED RGC1P23V42EDT | RGC1P23V50ED | RGC1P23V62ED |
| | | 90-250 VAC | Screw | RGC1P23V12EA | RGC1P23V30EA | - | - | - |
| | | | Box | - | - | RGC1P23V42EA | - | RGC1P23V62EA |
| 190 - 550 VAC | AA: 4-20 mADC | - | Screw | RGC1P48AA12E | RGC1P48AA30E | - | - | - |
| | | | Box | - | - | RGC1P48AA42E RGC1P48AA42ET | RGC1P48AA50E | RGC1P48AA62E |
| | V: 0-10V, 0-5V, 1-5VDC, pot | 24 VDC/AC | Screw | RGC1P48V12ED | RGC1P48V30ED | - | - | - |
| | | | Box | - | - | RGC1P48V42ED | RGC1P48V50ED | RGC1P48V62ED |
| | | 90-250 VAC | Screw | RGC1P48V12EA | RGC1P48V30EA | - | - | - |
| | | | Box | - | - | RGC1P48V42EA | - | RGC1P48V62EA |
| 410 - 660 VAC | AA: 4-20 mADC | - | Screw | - | RGC1P60AA30E | - | - | - |
| | | | Box | - | - | RGC1P60AA42E | - | RGC1P60AA62E |
| | V: 0-10V, 0-5V, 1-5VDC, pot | 24 VDC/AC | Screw | - | RGC1P60V30ED | - | - | - |
| | | | Box | - | - | RGC1P60V42ED | - | RGC1P60V62ED |
| | | 90-250 VAC | Screw | - | RGC1P60V30EA | - | - | - |
| | | | Box | - | - | RGC1P60V42EA | - | RGC1P60V62EA |

## Carlo Gavazzi compatible components

| Description | Component code | Notes |
|---|---|---|
| **Protection cover** | RGTMP | Tamper proof accessory kit containing:<br>- 5 x transparent covers<br>- 5 x secureness ties |

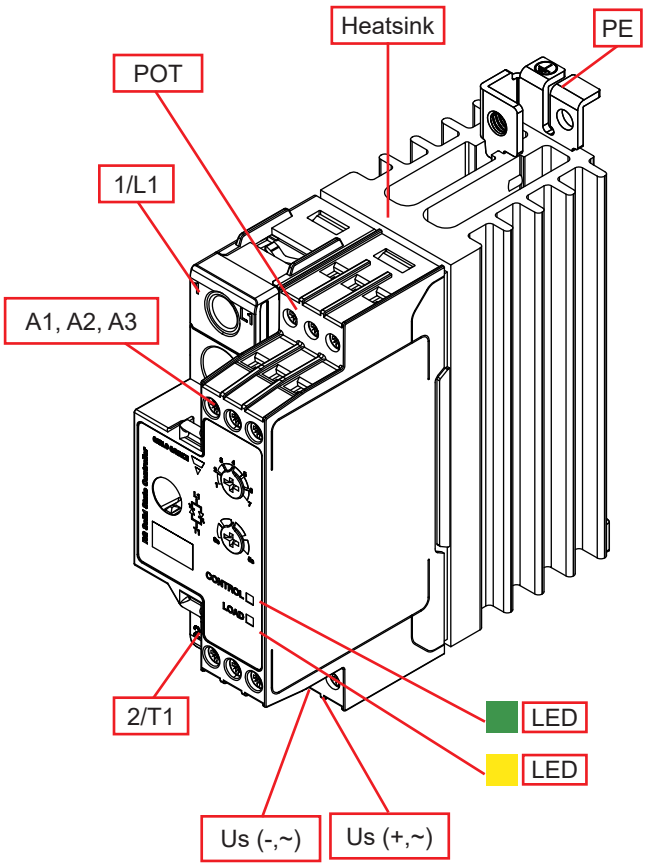
## Carlo Gavazzi further reading

| Information | Where to find it | Notes |
|---|---|---|
| **Datasheet** | http://cga.pub/?39eb59 | Heatsink and accessories range overview |



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# Structure




| Element | Component | Function |
|---|---|---|
| **1/L1** | Power connection | Mains connection |
| **2/T1** | Power connection | Load connection |
| **A1, A2, A3** | Control connection | Control input |
| **POT** | Potentiometer connection | External potentiometer input |
| **Us (+,~)** | External supply connection | Positive signal (RGC1P..V..D) or AC signal (RGC1P..V..A) |
| **Us (-,~)** | External supply connection | Ground (RGC1P..V..D) or AC signal (RGC1P..V..A) |
| **Green LED** | Control indicator | Indicates presence of control voltage |
| **Yellow LED** | Load indicator | Indicates presence of load voltage |
| **Heatsink** | Integrated heatsink | DIN rail mounting (panel mounting also possible) |
| **PE** | Protective Earth | Connection for Protective Earth, PE screw not provided with RGC1P |



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# Features

## General data

| | | | |
|---|---|---|---|
| **Material** | | PA66 or PA6 (UL94 V0), RAL7035<br>Glow wire ignition temperature and Glow wire flammability index conform to EN 60335-1 requirements | |
| **Mounting** | | DIN rail (panel mount also possible) | |
| **Touch protection** | | IP20 | |
| **Overvoltage category** | | III, 6 kV (1.2/50 µs) rated impulse withstand voltage | |
| **Isolation** | | 4000 Vrms (L1, T1, A1, A2, A3, POT, GND, Us to case) | |
| | | 2500 Vrms (L1, T1 to A1, A2, A3, POT, GND, Us) | |
| | | 1500 Vrms (Us to A1, A2, A3, POT, GND) applicable only for RGC1P..V..EA | |
| **LED status indication**[1] | **Green** | **RGC1P..AA..**<br>**Control input:**<br><4 mA, flashing 0.5 s ON, 0.5 s OFF<br>>4 mA, intensity varies with input<br>**Supply ON (Us):**<br>n/a | **RGC1P..V..**<br>**Control input:**<br><0 V, flashing 0.5 s ON, 0.5 s OFF<br>>0 V, fully ON<br>**Supply ON (Us):**<br>Flashing 0.5 s ON, 0.5 s OFF |
| | **Yellow** | Load ON | |
| **Weight** | | RGC1P..12: approx. 225 g<br>RGC1P..30, 42: approx. 460 g<br>RGC1P..50, 62: approx. 815 g | |

1. Refer to LED indicators section



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# Performance

## Output specifications

| | RGC1P..12 | RGC1P..30 | RGC1P..42 | RGC1P..50 | RGC1P..62 |
|---|---|---|---|---|---|
| **Max. operational current[2]: AC-51 @ Ta=25 °C** | 18 AAC | 30 AAC | 50 AAC | 58 AAC | 73 AAC |
| **Max. operational current[2]: AC-51 @ Ta=40 °C** | 15 AAC | 30 AAC | 43 AAC | 50 AAC | 63 AAC |
| **Max. operational current[3]: AC-55b @ Ta=40 °C** | 15 AAC | 30 AAC | 43 AAC | 50 AAC | 63 AAC |
| **Operational frequency range** | 45 to 65 Hz | | | | |
| **Output protection** | Integrated varistor | | | | |
| **Leakage current @ rated voltage** | <5 mAAC | | | | |
| **Minimum operational current** | 250 mAAC | 250 mAAC | 500 mAAC | 500 mAAC | 500 mAAC |
| **Repetitive overload current UL508: Ta=40°C, $t_{ON}$=1 s, $t_{OFF}$=9 s, 50 cycles, PF = 0.7** | 51 AAC | 84 AAC | 126 AAC | 126 AAC | 168 AAC |
| **Non-repetitive surge current ($I_{TSM}$), t=10 ms** | 600 Ap | 600 Ap | 1900 Ap | 800 Ap | 1900 Ap |
| **$I^2t$ for fusing (t=10 ms), minimum** | 1800 $A^2s$ | 1800 $A^2s$ | 18000 $A^2s$ | 3200 $A^2s$ | 18000 $A^2s$ |
| **No. of starts[3]** | 500 | 15 | 200 | 6 | 350 |
| **Power factor** | >0.7 at rated voltage | | | | |
| **Critical dV/dt (@Tj init = 40°C)** | 1000 V/µs | | | | |

2. Refer to Current derating
3. Overload profile for AC-55b, Ie: AC-55b: 6x Ie - 0.2: 50 - x; where Ie = nominal current (AAC), 0.2 is the duration of the overload (6xIe) in seconds, 50 is the duty cycle in %, and x = no. of starts. The overload profile for RGC1P..62 is AC-55b:4.7xIe - 0.2 : 50-x

## Output voltage specifications

| | RGC1P23.. | RGC1P48.. | RGC1P60.. |
|---|---|---|---|
| **Operational voltage range (Ue)** | 85-265 VAC | 190-550 VAC | 410-660 VAC |
| **Blocking voltage** | 800 Vp | 1200 Vp | 1200 Vp |

## Supply specifications

| | RGC1P..V..D | RGC1P..V..A |
|---|---|---|
| **Supply voltage range (Us)[4]** | 24 VDC, -15% / +20%<br>24 VAC, -15% / +15% | 90-250 VAC<br>- |
| **Overvoltage protection** | Up to 32 VDC/AC for 30 sec. | n/a |
| **Reverse protection** | Yes | n/a |
| **Surge protection[5]** | Yes, integrated | Yes, integrated |
| **Max. supply current** | 30 mA | 14 mA |

4. 24 VDC/AC to be supplied from a Class 2 power source
5. Refer to Electromagnetic Compatibility section



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## Input specifications

| | RGC1P..AA.. | RGC1P..V.. |
|---|---|---|
| **Control input** | 4-20 mADC (A1-A2) | 0-10 VDC (A1-GND)<br>0-5 VDC (A2-GND)<br>1-5 VDC (A3-GND) |
| **Pickup current** | 4.3 mADC | - |
| **Drop out current** | 3.9 mADC | - |
| **Pick-up voltage**<br>**0-5 VDC, 0-10 VDC range**<br>**1-5 VDC range** | <br>-<br>- | <br>0.5 VDC<br>1.5 VDC |
| **Drop out voltage**<br>**0-5 VDC, 0-10 VDC range**<br>**1-5 VDC range** | <br>-<br>- | <br>0.05 VDC<br>1.02 VDC |
| **Potentiometer input** | - | 10 kΩ (GND - A2 - POT) |
| **Maximum initialisation time** | 280 ms | 250 ms |
| **Response time (input to output)**<br>**Modes 1, 5, 7**<br>**Modes 2, 3, 4, 6** | <br>2 half cycles<br>3 half cycles | |
| **Voltage drop** | <10 VDC @ 20 mA | n/a |
| **Input impedance** | n/a | 100 kΩ |
| **Linearity (output resolution)** | Refer to Transfer characteristics section[6] | |
| **Reverse protection** | Yes | |
| **Maximum allowable input current** | 50 mA for max. 30 sec | - |
| **Input protection vs. surges[7]** | Yes | |
| **Overvoltage protection** | - | up to 30 VDC |

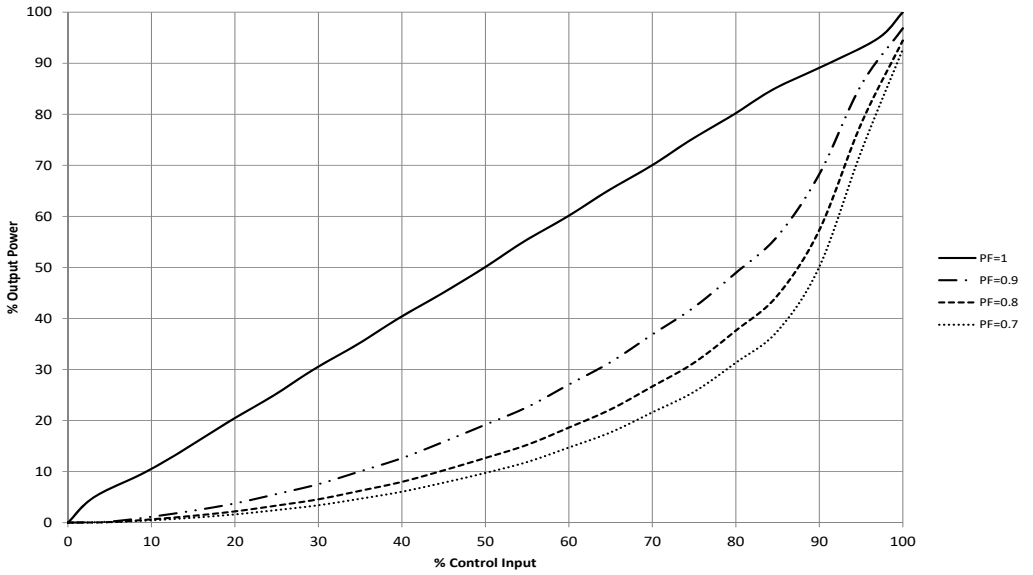
6. The RGx1P is intended for use in closed loop systems were the output power automatically adjusts to the control input available from the system.
7. Refer to Electromagnetic Compatibility section.



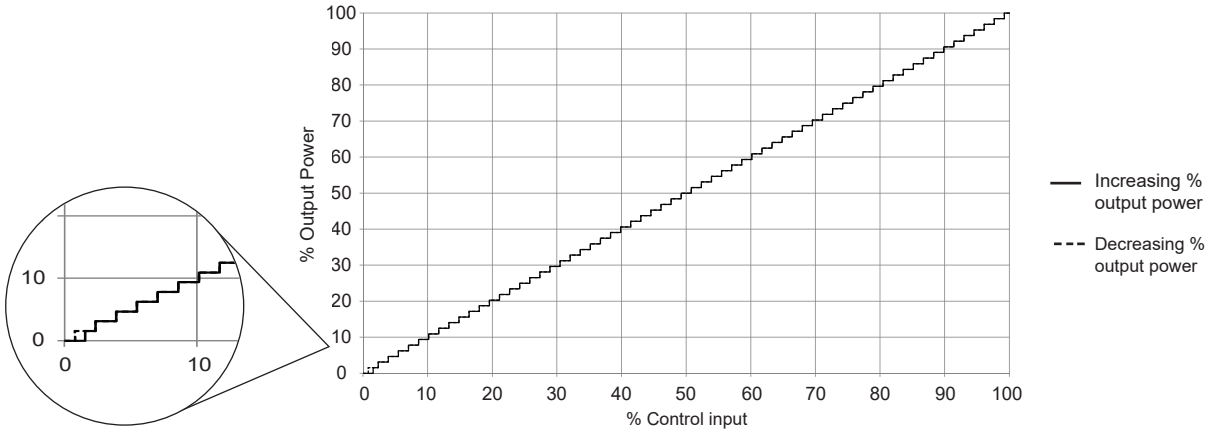
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## Transfer characteristics

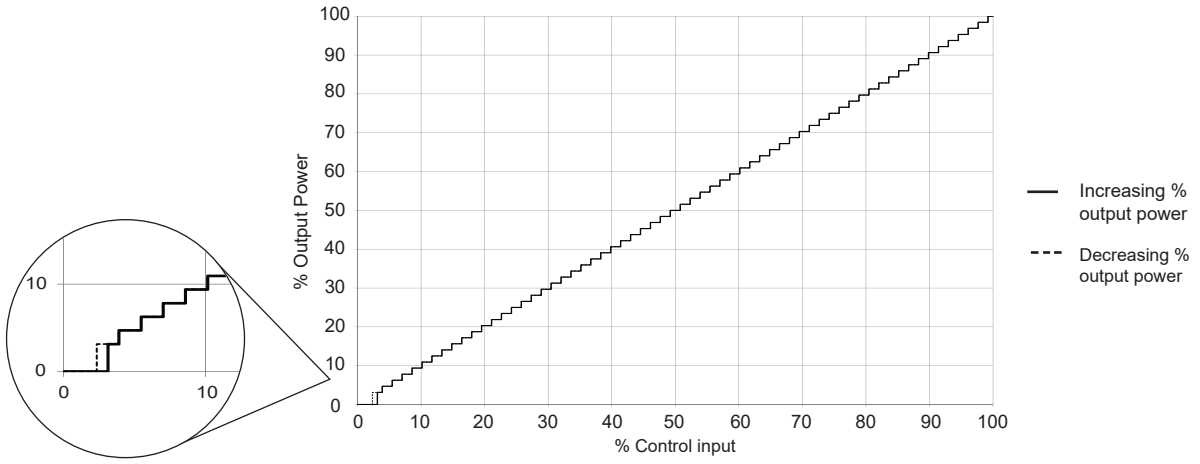
**Mode 1: Phase angle switching**




**Mode 2: 1 Full cycle switching**




**Mode 3: 4 Full cycles switching**

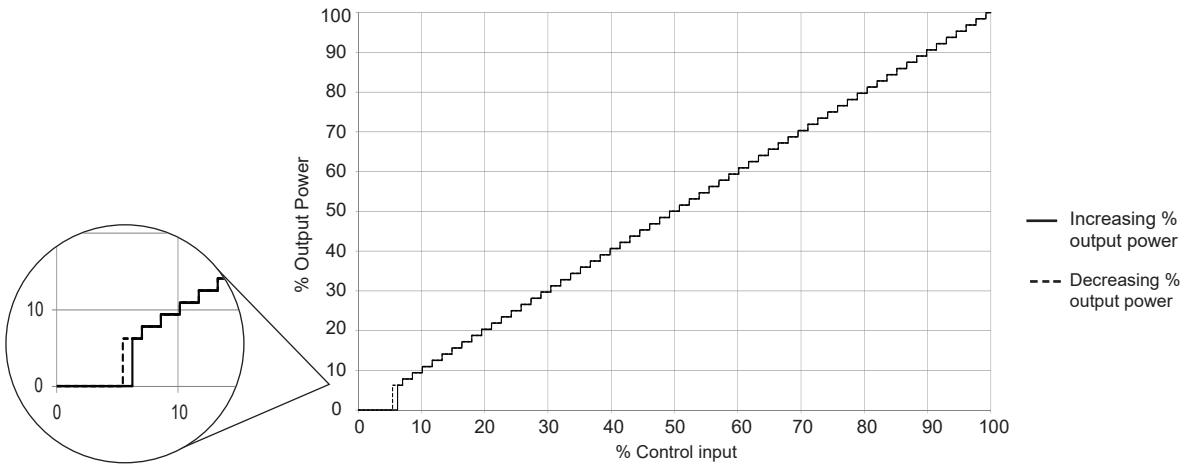




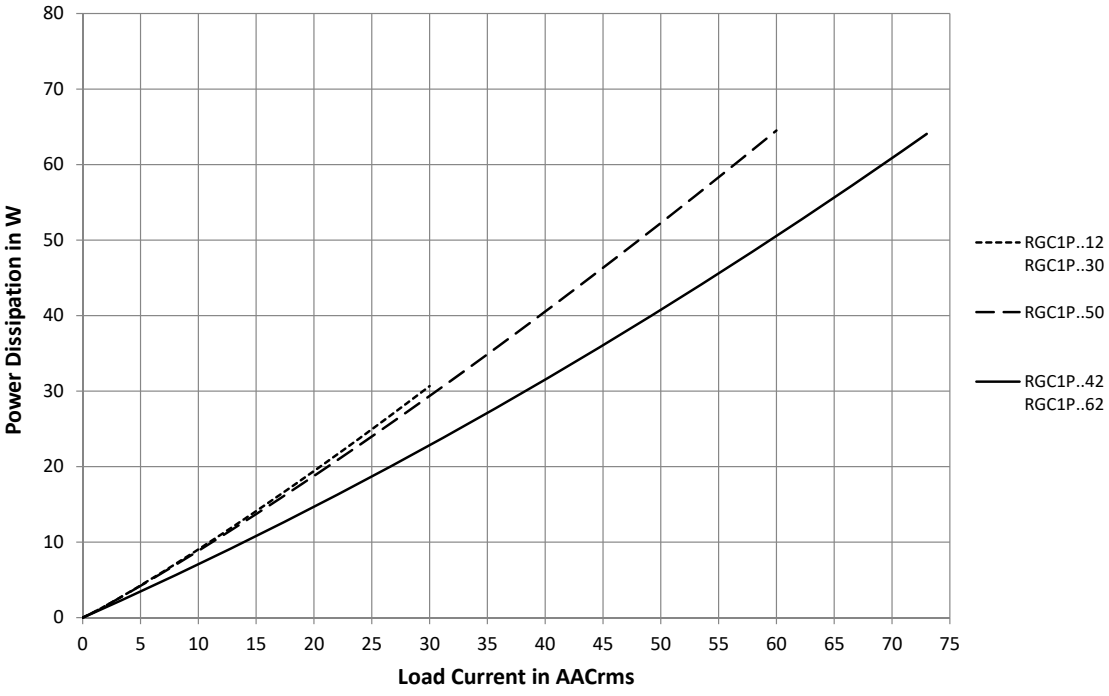

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## Transfer characteristics (continued)

**Mode 4: 16 Full cycles switching**



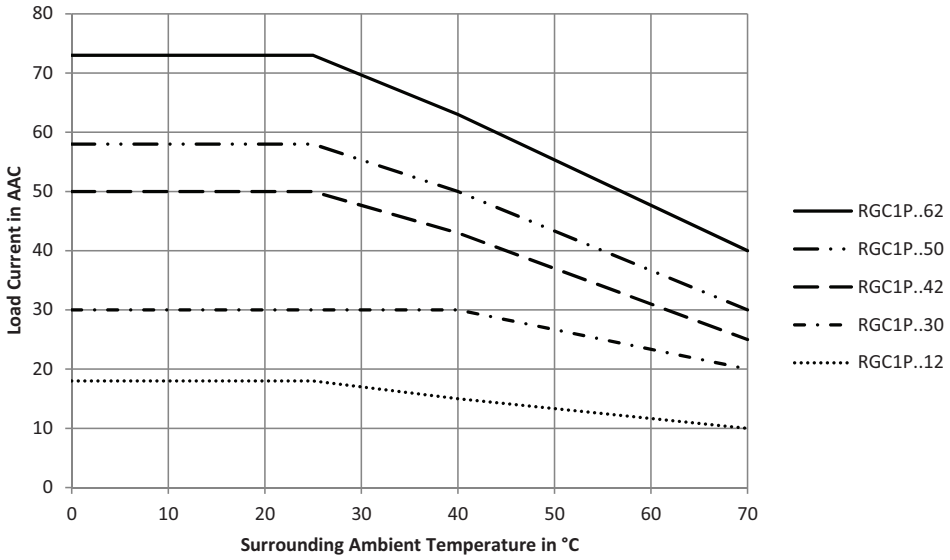

## Output power dissipation





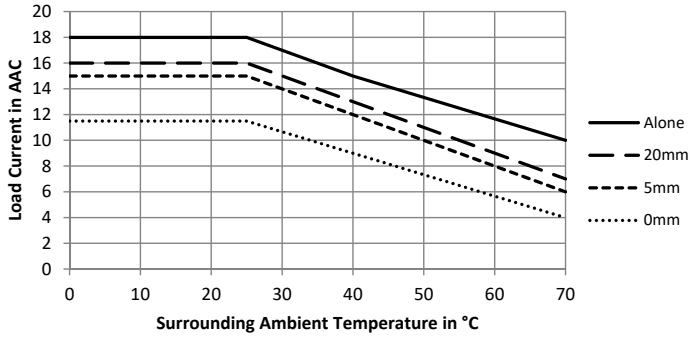

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## Current derating

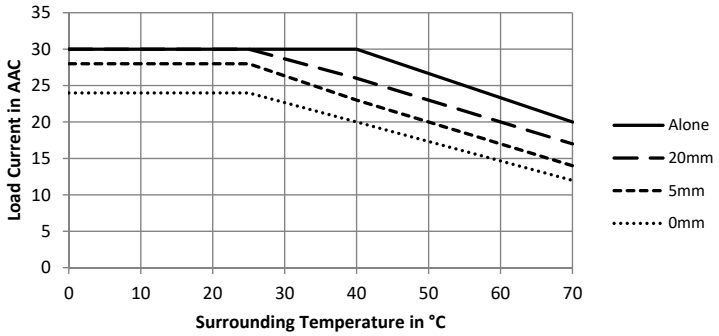



## Derating vs. spacing curves

**RGC1P..12**




**RGC1P..30**

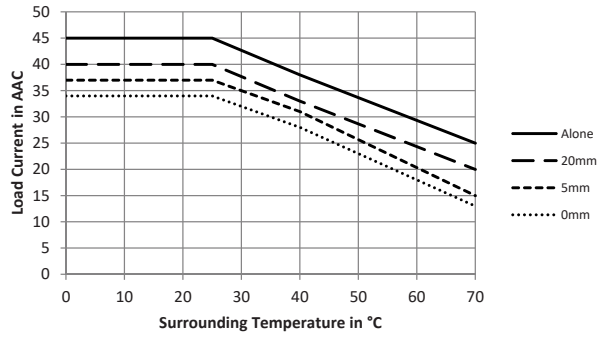




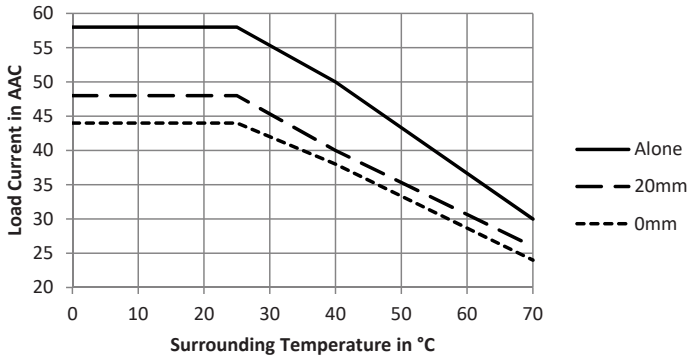

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## Derating vs. spacing curves (continued)

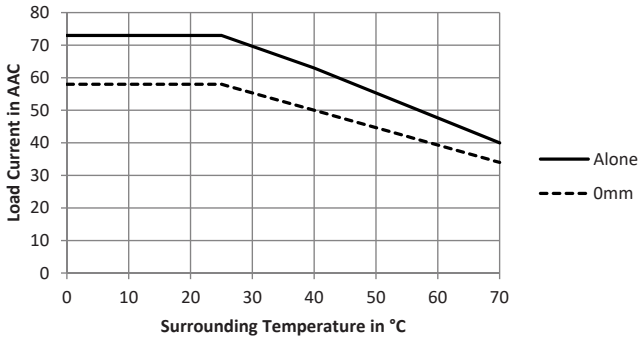
RGC1P..42




RGC1P..50




RGC1P..62




## Compatibility and conformance

| | |
|---|---|
| **Approvals** | |
| **Standards compliance** | LVD: EN 60947-4-3<br>EMCD: EN 60947-4-3<br>EE: EN 60947-4-3<br>EMC: EN 60947-4-3<br>UL: UL508 (E172877), NMFT<br>cUL: C22.2 No. 14 (E172877), NMFT7 |
| **UL short circuit current rating** | 100k Arms (refer to short circuit current section, Type 1 – UL508) |



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| Electromagnetic compatibility (EMC) - Immunity | |
|---|---|
| **Electrostatic discharge (ESD)** | EN/IEC 61000-4-2<br>8 kV air discharge, 4 kV contact (PC2) |
| **Radiated radio frequency** | EN/IEC 61000-4-3<br>10 V/m, from 80 MHz to 1 GHz (PC1)<br>10 V/m, from 1.4 to 2 GHz (PC1)<br>3 V/m, from 2 to 2.7 GHz (PC1) |
| **Electrical fast transient (burst)**<br><br>**RGC1P..AA..**<br>A1, A2<br>**RGC1P..V..**<br>A1, A2, A3, POT, GND<br>Us | EN/IEC 61000-4-4<br>Output: 2 kV, 5 kHz (PC1)<br><br>2 kV, 5 kHz (PC1)<br><br>1 kV, 5 kHz (PC1)<br>2 kV, 5 kHz (PC1) |
| **Conducted radio frequency** | EN/IEC 61000-4-6<br>10 V/m, from 0.15 to 80 MHz (PC1) |
| **Electrical surge**<br><br>**RGC1P..AA..**<br>A1, A2<br><br>**RGC1P..V..**<br>A1, A2, A3, POT, GND<br>**RGC1P..V..ED**<br>Us +, Us -<br><br>**RGC1P..V..EA**<br>Us ~ | EN/IEC 61000-4-5<br>Output, line to line: 1 kV (PC2)<br>Output, line to earth: 2 kV (PC2)<br><br>Line to line, 500 V (PC2)<br>Line to earth, 500 V (PC2)<br><br>Line to earth, 1 kV (PC2)<br><br>Line to line, 500 V (PC2)<br>Line to earth, 500 V (PC2)<br><br>Line to line, 1 kV (PC2)<br>Line to earth, 2 kV (PC2) |
| **Voltage dips** | EN/IEC 61000-4-11<br>0% for 0.5, 1 cycle (PC2)<br>40% for 10 cycles (PC2)<br>70% for 25 cycles (PC2)<br>80% for 250 cycles (PC2) |
| **Voltage interruptions** | EN/IEC 61000-4-11<br>0% for 5000 ms (PC2) |

| Electromagnetic compatibility (EMC) - Emissions | |
|---|---|
| **Radio interference field emission (radiated)** | EN/IEC 55011<br>Class A: from 30 to 1000 MHz |
| **Radio interference voltage emissions (conducted)** | EN/IEC 55011<br>Class A: from 0.15 to 30 MHz<br>(External filter may be required - refer to Filtering section) |

- Control input lines must be installed together to maintain products' susceptability 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.
- Surge tests on RG..A were carried out with the signal line impedence network. In case the line impedance is less than 40Ω, it is suggested that AC supply is provided through a secondary circuit where the short circuit limit between conductors and ground is 1500VA or less.
- A deviation of one step in the distributed full cycle models and up to 1.5% Full Scale Deviation in phase angle models is considered to be within PC1 criteria.
- 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.



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## Filtering - EN/IEC 55011 compliance

### Compliance to Class A emission limits

| | RGC1P..12 | RGC1P..30 | RGC1P..42 | RGC1P..50 | RGC1P..62 |
|---|---|---|---|---|---|
| **Max. load current** | **15 AAC** | **30 AAC** | **43 AAC** | **50 AAC** | **60 AAC** |
| **Mode 1 - phase angle** | SCHURTER: 5500.2218 | SCHAFFNER: FN2410-45-33 | SCHAFFNER: FN2410-45-33 | SCHAFFNER: FN2410-60-34 | SCHAFFNER: FN2410-60-34 |
| | ROXBURGH: RES90F16, RES90F20 | EPCOS: SIFI -H-G136 | EPCOS: A50R000, A42R122, SIFI-H-G136 *(up to 36 A)* | EPCOS: A50R000 | |
| **Mode 2 -1x full cycle** | 1.0uF / 760 VAC / X1 | 2.2uF / 760 VAC / X1 | 3.3uF / 760 VAC / X1 | 3.3uF / 760 VAC / X1 | 3.3uF / 760 VAC / X1 |
| **Mode 3 - 4x full cycles** | 680nF / 760 VAC / X1 | 1uF / 760 VAC / X1 | 2.2uF / 760 VAC / X1 | 2.2uF / 760 VAC / X1 | 2.2uF / 760 VAC / X1 |
| **Mode 4 - 16x full cycles** | 330nF / 760 VAC / X1 | 680nF / 760 VAC / X1 | 1uF / 760 VAC / X1 | 1uF / 760 VAC / X1 | 2.2uF / 760 VAC / X1 |
| **Mode 5 - advanced full cycle** | 1.0uF / 760 VAC / X1 | 3.3uF / 760 VAC / X1 | 3.3uF / 760 VAC / X1 | 3.3uF / 760 VAC / X1 | SCHAFFNER: FN2410-60-34 |
| | | | | | EPCOS: A60R000 |
| **Mode 6 - Soft start + Mode 4** | 330nF / 760 VAC / X1 | 680nF / 760 VAC / X1 | 1uF / 760 VAC / X1 | 1uF / 760 VAC / X1 | 2.2uF / 760 VAC / X1 |
| **Mode 7 - Soft start + Mode 5** | 1.0uF / 760 VAC / X1 | 3.3uF / 760 VAC / X1 | 3.3uF / 760 VAC / X1 | 3.3uF / 760 VAC / X1 | SCHAFFNER: FN2410-60-34 |
| | | | | | EPCOS: A60R000 |

### Compliance to Class B emission limits

| | RGC1P..12 | RGC1P..30 | RGC1P..42 | RGC1P..50 | RGC1P..62 |
|---|---|---|---|---|---|
| **Max. load current** | **15 AAC** | **30 AAC** | **43 AAC** | **50 AAC** | **60 AAC** |
| **Mode 1 - phase angle** | SCHURTER: 5500.2069 *(up to 12A)* | EPCOS: A42R122 | EPCOS: A55R122 | EPCOS: A55R122 | EPCOS: A75R122 |
| | EPCOS: SIFI-H-G120 B12R000 *(up to 12 A)* | | | | |
| **Mode 2 -1x full cycle** | 3.3uF / 760 VAC / X1 | SCHAFFNER: FN2410-45-33 | SCHAFFNER: FN2410-45-33 | SCHAFFNER: FN2410-60-34 | SCHAFFNER: FN2410-60-34 |
| | | EPCOS: SIFI-H-G136 | EPCOS: A50R000, A42R122, SIFI-H-G136 *(up to 36 A)* | EPCOS: A55R122, A42R122, *(up to 42 A)* | EPCOS: A60R000 |
| | | | ROXBURGH: MDF50 | ROXBURGH: MDF50 | |
| **Mode 3 - 4x full cycles** | 2.2uF / 760 VAC / X1 | 3.3uF / 760 VAC / X1 | 3.3uF / 760 VAC / X1 | SCHAFFNER: FN2410-60-34 | SCHAFFNER: FN2410-60-34 |
| | | | | EPCOS: A55R122, A42R122, *(up to 42 A)* | EPCOS: A60R000 |
| **Mode 4 - 16x full cycles** | 1.0uF / 760 VAC / X1 | 2.2uF / 760 VAC / X1 | 2.2uF / 760 VAC / X1 | 3.3uF / 760 VAC / X1 | 3.3uF / 760 VAC / X1 |
| **Mode 5 - advanced full cycle** | SCHURTER: 5500.2218 | SCHAFFNER: FN2410-45-33 | SCHAFFNER: FN2410-45-33 | SCHAFFNER: FN2410-60-34 | SCHAFFNER: FN2410-60-34 |
| | ROXBURGH: RES90F16, RES90F20 | EPCOS: SIFI-H-G136 | EPCOS: A50R000, A42R122, SIFI-H-G136 *(up to 36 A)* | EPCOS: A55R122, A42R122, *(up to 42 A)* | EPCOS: A60R000 |
| | | | ROXBURGH: MDF50 | ROXBURGH: MDF50 | |
| **Mode 6 - Soft start + Mode 4** | 1.0uF / 760 VAC / X1 | 2.2uF / 760 VAC / X1 | 2.2uF / 760 VAC / X1 | 3.3uF / 760 VAC / X1 | 3.3uF / 760 VAC / X1 |
| **Mode 7 - Soft start + Mode 5** | SCHURTER: 5500.2218 | SCHAFFNER: FN2410-45-33 | SCHAFFNER: FN2410-45-33 | SCHAFFNER: FN2410-60-34 | SCHAFFNER: FN2410-60-34 |
| | ROXBURGH: RES90F16, RES90F20 | EPCOS: SIFI-H-G136 | EPCOS: A50R000, A42R122, SIFI-H-G136 *(up to 36 A)* | EPCOS: A55R122, A42R122, *(up to 42 A)* | EPCOS: A60R000 |
| | | | ROXBURGH: MDF50 | ROXBURGH: MDF50 | |

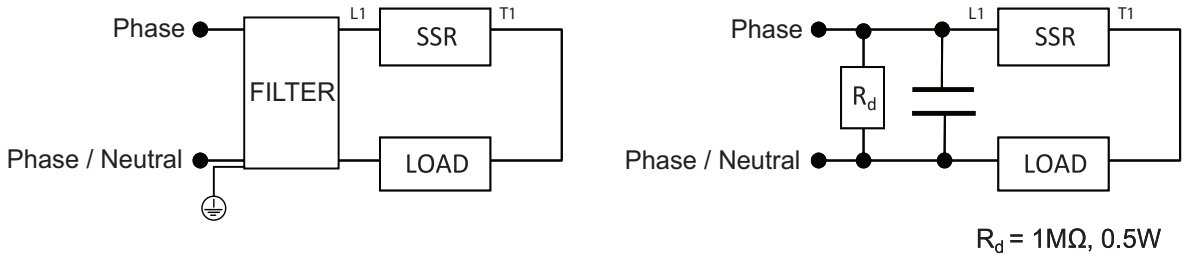
Note: The suggested filtering is determined by tests carried out on a representative setup and load. The RGC1P.. is intended to be integrated within a system where conditions may differentiate from conditions utilised for tests, such as load, cable lengths and other auxiliary components that may exist within the end system. It shall be the responsibility of the system integrator to ensure that the system containing the above component complies with the applicable rules and regulations.

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



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## Filter connection diagram




$R_d$ = 1MΩ, 0.5W

## Environmental specifications

| | |
|---|---|
| **Operating temperature** | -40°C to +70°C (-40°F to +158°F) |
| **Storage temperature** | -40°C to +100°C (-40°F to +212°F) |
| **Relative humidity** | 95% non-condensing @ 40°C |
| **Pollution degree** | 2 |
| **Installation altitude** | 0-1000m. Above 1000m derate linearly by 1% of FLC per 100 m up to a maximum of 2000m |
| **Vibration resistance** | 2g / axis (2-100Hz, IEC 60068-2-6, EN 50155, EN 61373) |
| **Impact resistance** | 15/11 g/ms (EN50155, EN61373) |
| **EU RoHS compliant** | Yes |
| **China RoHS** | 25 |

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 Hararous 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 |

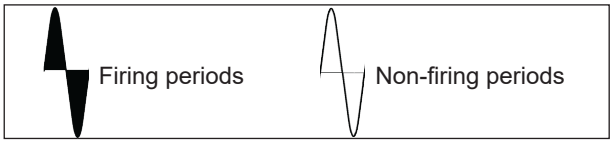
O:此零件所有材料中含有的该有害物低于GB/T 26572的限定。

X: 此零件某种材料中含有的该有害物高于GB/T 26572的限定。

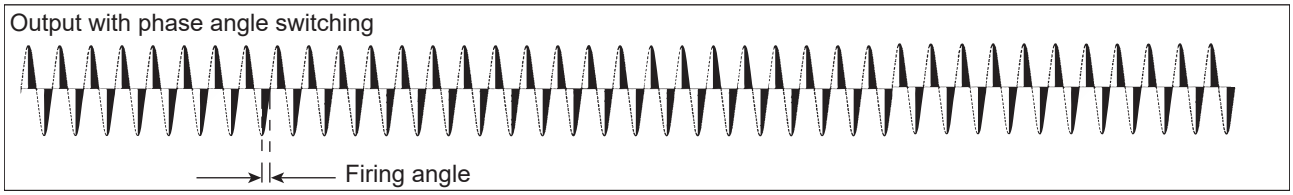


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## Switching modes



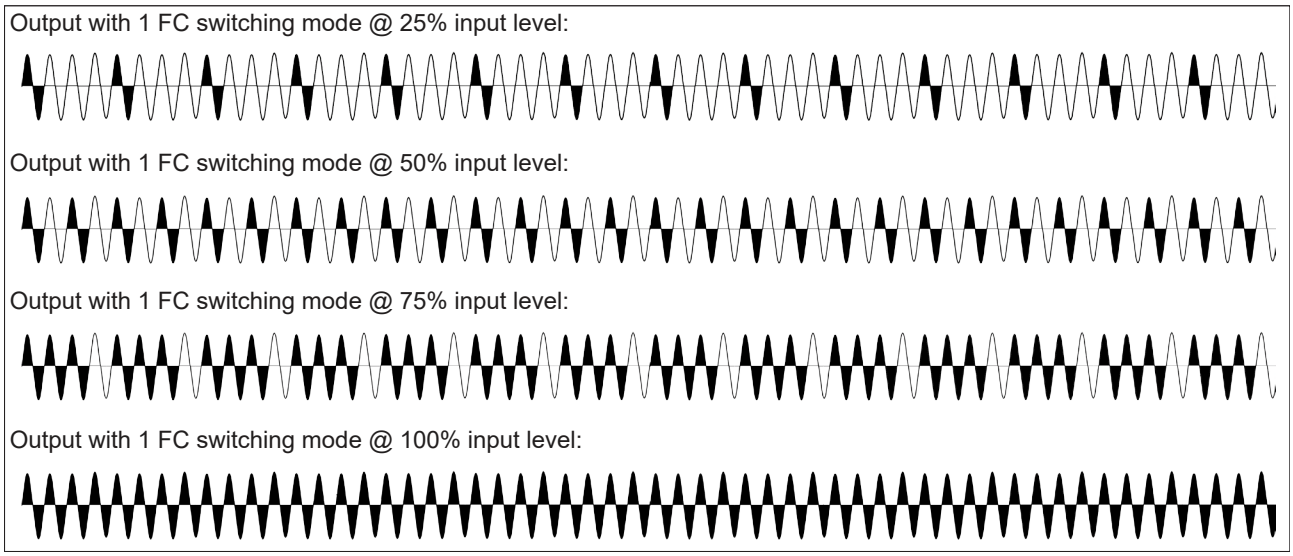

**MODE 1: Phase angle switching**
The Phase angle switching mode works in accordance with the phase angle control principle. The power delivered to the load is controlled by the firing of the thyristors over each half supply cycle. The firing angle varies in relation to the input signal level which determines the output power to be delivered to the load.




**Full cycle switching:**
In Full cycle switching modes only full cycles are being switched. Switching at zero voltage reduces EMC interference as compared to phase angle switching (mode 1). The ON full cycles are distributed over a specific time base. Compared to burst firing, this enables faster and more accurate control of the load in addition to extending the heater lifetime. This mode is suitable for use only with resistive loads.

**MODE 2: 1x Full cycle switching**
This mode offers the lowest resolution for full cycle switching, i.e., 1 full cycle. At 50% output power demand the SSR will switch ON the load for 1 full cycle and OFF for 1 full cycle in a repeated pattern. Below 50% output power demand, the non-firing period increases but the firing period remains fixed at 1 full cycle. Over 50% output power demand, the firing period increases but the non-firing period remains fixed at 1 full cycle.

Hence at 25% output power demand, the non-firing period gets longer and the SSR will switch ON the load for 1 full cycle and OFF for 3 full cycles in a repeated pattern. At 75% output power demand, the firing period is longer and the SSR will switch ON the load for 3 full cycles and OFF for 1 full cycle in a repeated pattern. At 100% output power demand, the SSR switches the load fully ON.






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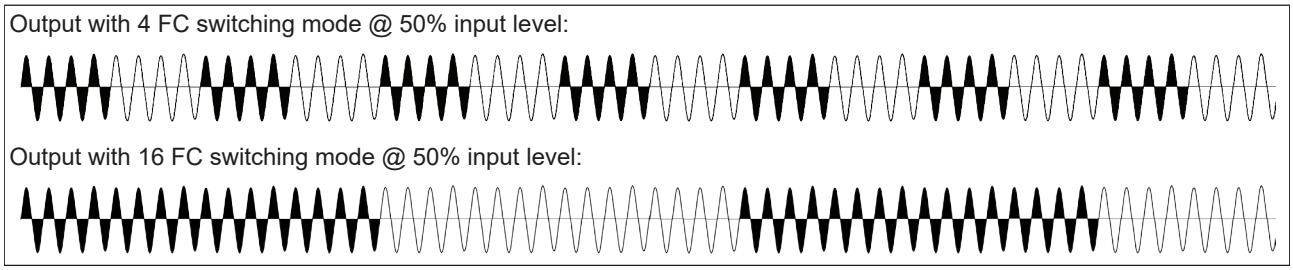
## Switching modes

**MODE 3: 4x Full cycle switching**

**MODE 4: 16x Full cycle switching**

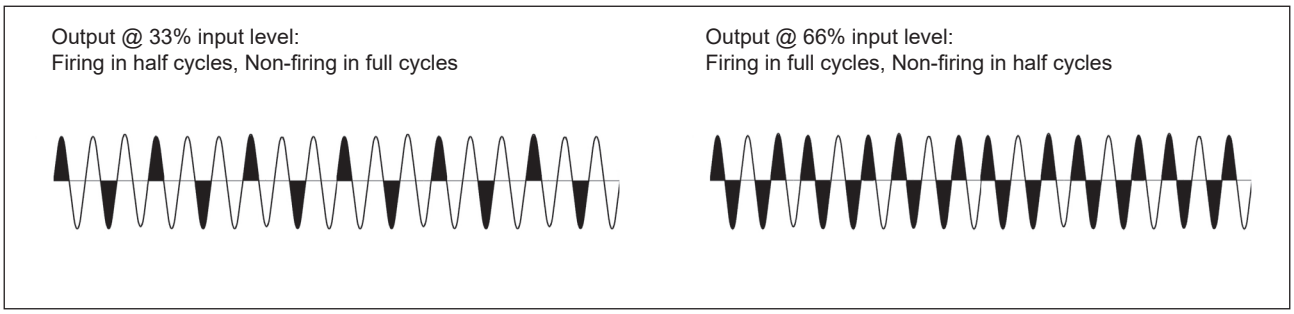
In mode 3 the minimum resolution is 4 full cycles. At 50% output power demand the SSR will switch ON the load for 4 full cycles and OFF for 4 full cycles in a repeated pattern. Below 50% output power demand, the non-firing period increases but the firing period remains fixed at 4 full cycles. Over 50% output power demand, the firing period increases but the non-firing period remains fixed at 4 full cycles.

In mode 4 the minimum resolution is 16 full cycles. At 50% output power demand the SSR will switch ON the load for 16 full cycles and OFF for 16 full cycles in a repeated pattern. Below 50% output power demand, the non-firing period increase but the firing period remains fixed at 16 full cycles. Over 50% output power demand the firing period increases but the non-firing period remains fixed at 16 full cycles.




**MODE 5: Advanced Full Cycle (AFC) switching**
This switching mode is based on the principle of distributed full cycle explained above with the difference that the resolution for firing and nonfiring periods is changed to a half mains cycle. This mode is intended for use with short / medium wave infrared heaters. The purpose of the half cycle non-firing time is to reduce the annoying visual flickering of such lamp loads.

Below 50% output power demand, the SSR switches ON the load in half cycle periods. The non-firing periods are full cycles.
Above 50% output power demand, the SSR switches ON the load in full cycle periods but the non-firing periods are half cycles.




**SOFT STARTING**
Soft starting is utilised to reduce the start-up current of loads having a high cold to hot resistance ratio such as short wave infrared heaters. The thyristor firing angle is gradually increased over a time period of maximum 5 seconds (settable through an accessible potentiometer) in order to apply the voltage (and current) to the load smoothly.

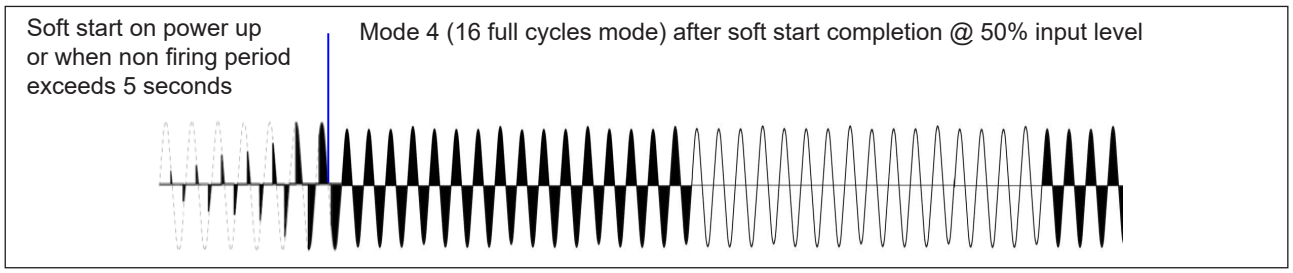
Soft starting is perfomed on the first power up and in cases of non firing periods exceeding 5 seconds. If soft start is stopped before soft start completion, it is assumed that a start was peformed and the non firing period count start as soon as the soft start is stopped.



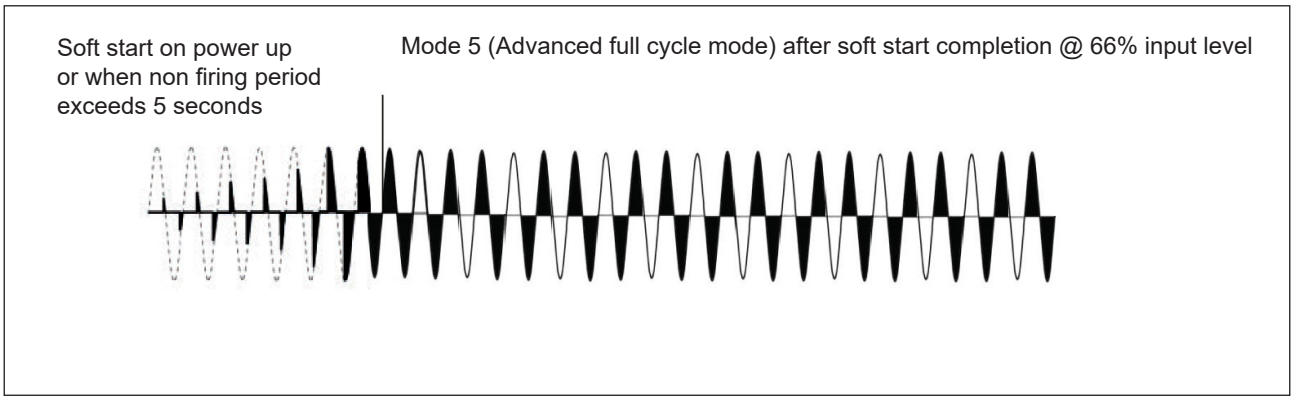
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## Switching modes

**MODE 6: Soft start + MODE 4 (16x full cycle switching)**
This switching mode works on the principle of switching mode 4 (16x full cycles) but soft starting is performed on power up or in case of the non firing periods exceeding 5 seconds. After the soft start is completed, full cycles (with a resolution of 16 full cycles) are delivered to the load according to the input signal, based on MODE 4 switching principle.




**MODE 7: Soft start + MODE 5 (Advanced full cycle switching)**
This switching mode works on the principle of the advanced full cycle (mode 5) but soft starting is performed on power up or in case of the non firing periods exceeding 5 seconds. After the soft start is completed, output power is delivered to the load according to the input signal, based on Mode 5 switching principle.




## LED indicators

**RGC1P..AA..**

| LED | Status | Timing Diagram |
|---|---|---|
| CONTROL (green) | Control input <4mA | |
| | Control input >4mA | |
| | Mains loss | 0.5s, 0.5s, 3s |
| | SSR internal error | |
| LOAD (yellow) | LOAD ON | |

**RGC1P..V..**

| LED | Status | Timing Diagram |
|---|---|---|
| CONTROL (green) | Supply voltage (Us) ON | |
| | Control input >0V | |
| | Mains loss | 0.5s, 0.5s, 3s |
| | SSR internal error | |
| LOAD (yellow) | LOAD ON | |



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## 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 100,000 A Symmetrical Amperes, 600 Volts maximum when protected by fuses. Tests at 100,000 Arms 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.

| Protection co-ordination Type 1 according to UL 508 | | | | |
|---|---|---|---|---|
| **Part No.** | **Prospective short circuit current [kArms]** | **Max fuse size [A]** | **Class** | **Voltage [VCA]** |
| RGC1P..12 | 100 | 30 | J or CC | Max. 600 |
| RGC1P..30 | | 30 | J or CC | |
| RGC1P..42 | | 80 | J | |
| RGC1P..50 | | 30 | J | |
| RGC1P..62 | | 80 | J | |

| Protection co-ordination Type 2 (IEC/EN 60947-4-3) | | | | | | |
|---|---|---|---|---|---|---|
| **Part No.** | **Prospective short circuit current [kArms]** | **Ferraz Shawmut (Mersen)** | | **Siba** | | **Max. voltage [VCA]** |
| | | **Max fuse size [A]** | **Part number** | **Max fuse size [A]** | **Part number** | |
| RGC1P..12<br>RGC1P..30 | 10 | 40 | 6.9xx CP GRC 22x58 /40 | 32 | 50 142 06.32 | 600 |
| | 100 | | | | | |
| RGC1P..42 | 10 | 63 | 6.9xx CP URC 14x51 /63 | 80 | 50 142 20.80 | |
| | | 70 | A70QS70-4 | | | |
| | 100 | 63 | 6.9xx CP URC 14x51 /63 | | | |
| | | 70 | A70QS70-4 | | | |
| RGC1P..50 | 10 | 80 | 6.621 CP URQ 27x60 /80 | 80 | 50 142 20.80 | |
| | 100 | n/a | n/a | | | |
| RGC1P..62 | 10 | 100 | 6.9xx CP GRC 22x58 /100 | 100 | 50 142 20.100 | |
| | | | A70QS100-4 | | | |
| | 100 | | 6.621 CP URGD 27x60 /100 | | | |
| | | | A70QS100-4 | | | |

xx = 00, without fuse trip indication,
xx = 21, with fuse trip indication



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| 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 [mm²]** | **Minimum length of Cu wire conductor [m][8]** |
| **RGC1P..12<br>RGC1P..30<br>(1800 A²s)** | S201 - Z10 (10A) | S201-B4 (4A) | 1.0<br>1.5<br>2.5 | 7.6<br>11.4<br>19.0 |
| | S201 - Z16 (16A) | S201-B6 (6A) | 1.0<br>1.5<br>2.5<br>4.0 | 5.2<br>7.8<br>13.0<br>20.8 |
| | S201 - Z20 (20A) | S201-B10 (10A) | 1.5<br>2.5 | 12.6<br>21.0 |
| | S201 - Z25 (25A) | S201-B13 (13A) | 2.5<br>4.0 | 25.0<br>40.0 |
| | S202 - Z25 (25A) | S202-B13 (13A) | 2.5<br>4.0 | 19.0<br>30.4 |
| **RGC1P..50<br>(3200 A²s)** | S201-Z25 (25A) | S201-B16 (13A) | 2.5<br>4.0<br>6.0 | 7.0<br>11.2<br>16.8 |
| **RGC1P..42<br>RGC1P..62<br>(18000 A²s)** | S201 - Z32 (32A) | S201-B16 (16A) | 2.5<br>4.0<br>6.0 | 3.0<br>4.8<br>7.2 |
| | S201 - Z50 (50A) | S201-B25 (25A) | 4.0<br>6.0<br>10.0<br>16.0 | 4.8<br>7.2<br>12.0<br>19.2 |
| | S201 - Z63 (63A) | S201-B32 (32A) | 6.0<br>10.0<br>16.0 | 7.2<br>12.0<br>19.2 |

8. Between M.C.B. 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-sectional area than those mentioned above, please consult Carlo Gavazzi's Technical Support Group.

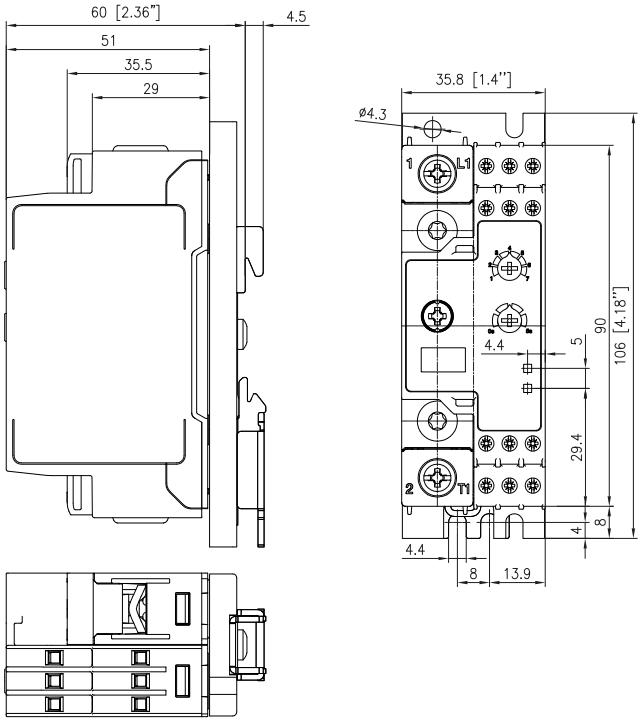
S201 models refer to 1-pole M.C.B., S202 models refer to 2-poles M.C.B.



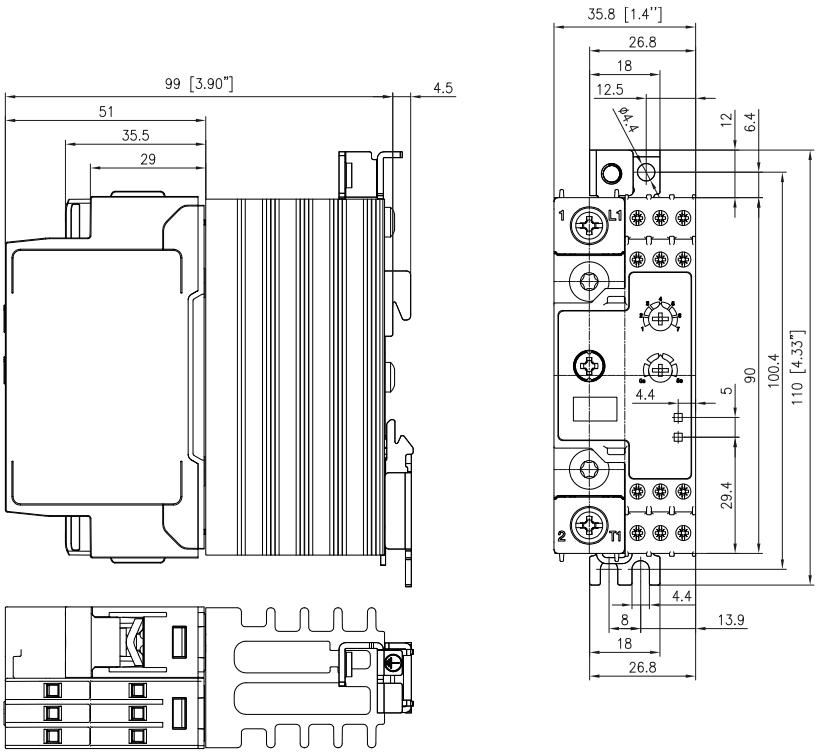
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## Dimensions

### RGC1P..12




### RGC1P..30




Housing width tolerance +0.5 mm, -0 mm as per DIN 43880. All other tolerances +/- 0.5 mm. Dimensions in mm.

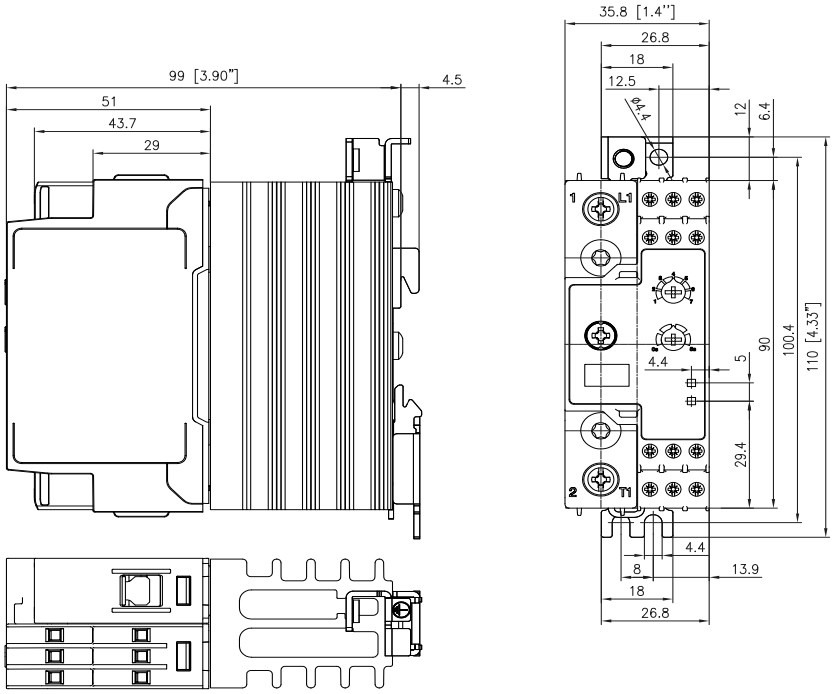
Note: The indicated depth dimension of the RGx1P has to be increased by 3 mm when the tamper proof cover accessory is mounted on the device.



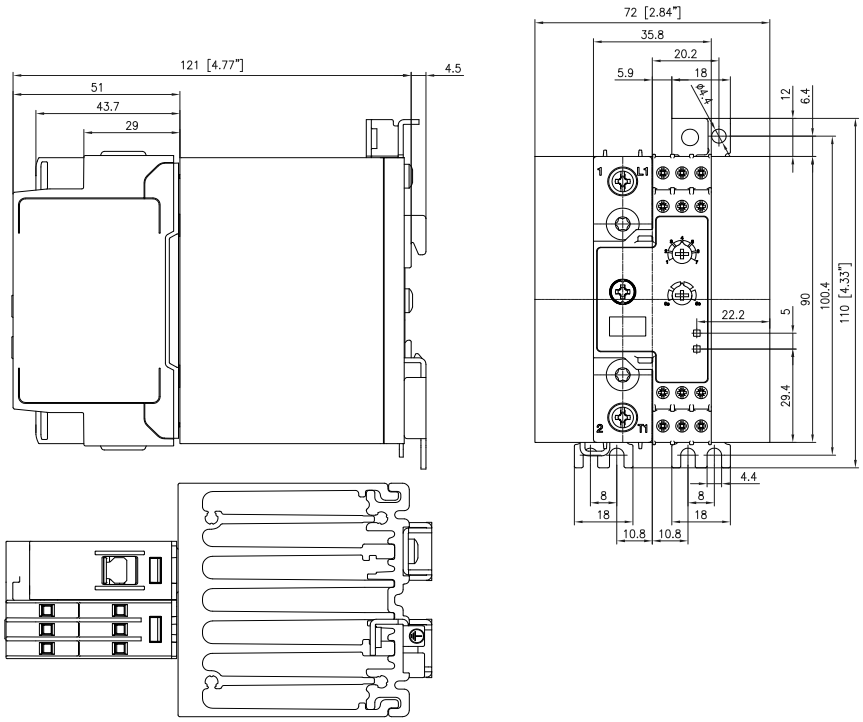
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## Dimensions (continued)

### RGC1P..42




### RGC1P..50, RGC1P..62




Housing width tolerance +0.5 mm, -0 mm as per DIN 43880. All other tolerances +/- 0.5 mm. Dimensions in mm.

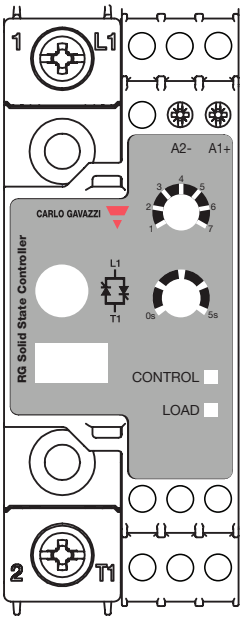
Note: The indicated depth dimension of the RGx1P has to be increased by 3 mm when the tamper proof cover accessory is mounted on the device.



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## Terminal interface

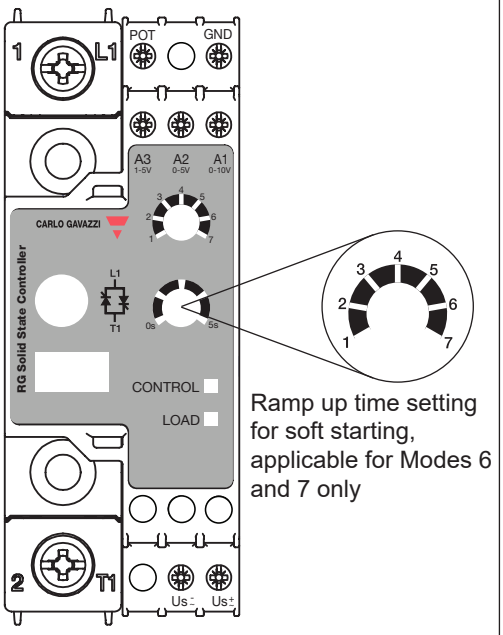
**RGC1P..AA..**




**Terminals labelling:**

| | |
|---|---|
| 1/L1: | Line connection |
| 2/T1: | Load connection |
| A1 - A2: | Control input: 4 - 20 mA |

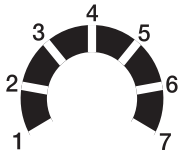
**RGC1P..V..**




Ramp up time setting for soft starting, applicable for Modes 6 and 7 only

**Terminals labelling:**

| | |
|---|---|
| 1/L1: | Line connection |
| 2/T1: | Load connection |
| A1-GND: | Control input: 0-10 V |
| A2-GND: | Control input: 0-5 V |
| A3-GND: | Control input: 1-5 V |
| POT: | External potentiometer input |
| Us (+, ~): | External supply, positive signal (RG..V..D) or AC signal (RG..V..A) |
| Us (-, ~): | External supply, ground (RG..V..D) or AC signal (RG..V..A) |

| Mode Selection | | Switching mode |
|---|---|---|
|  | **1** | Phase angle (default setting) |
| | **2** | 1x full cycle |
| | **3** | 4x full cycles |
| | **4** | 16x full cycles |
| | **5** | Advanced full cycle |
| | **6** | Soft start + 16x full cycles |
| | **7** | Soft start + advanced full cycle |

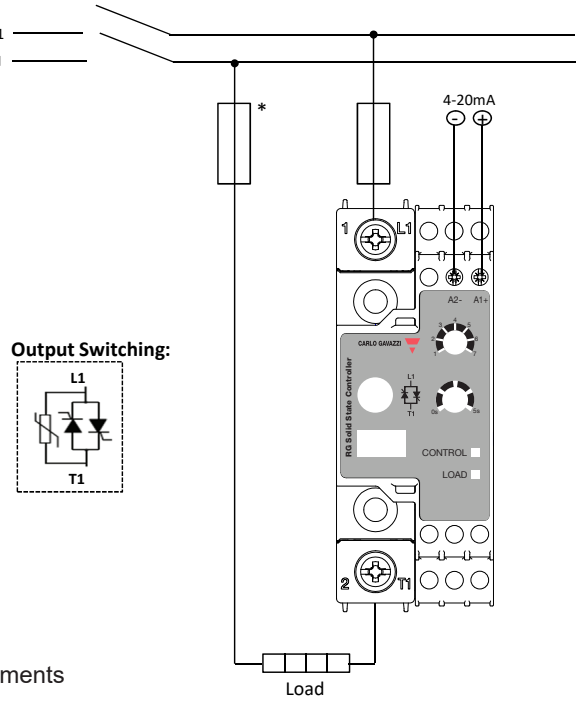




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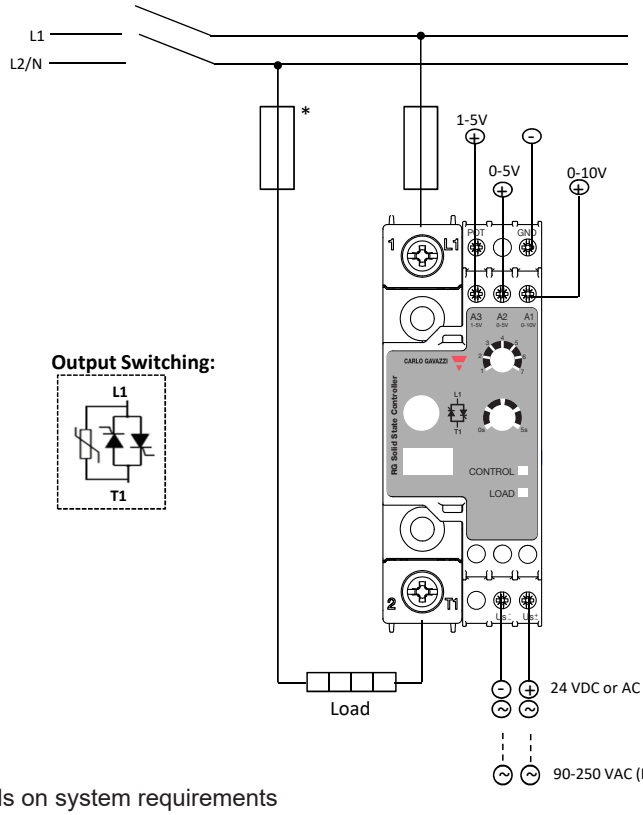
## Connection diagram

RGC1P..AA..

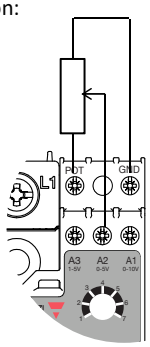



* depends on system requirements

RGC1P..V..




External potentiometer connection:

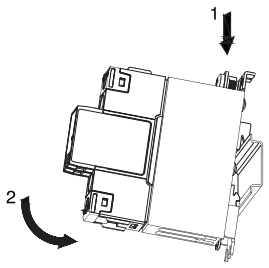



* depends on system requirements

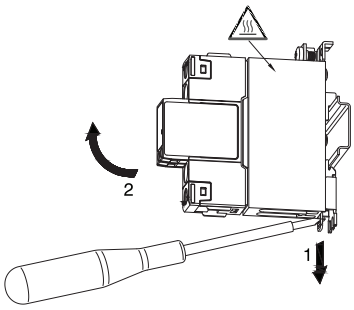


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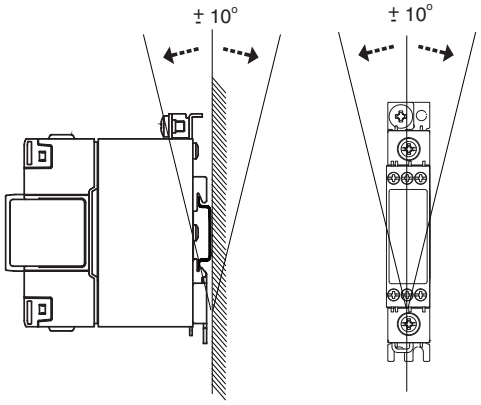
## Mounting instructions



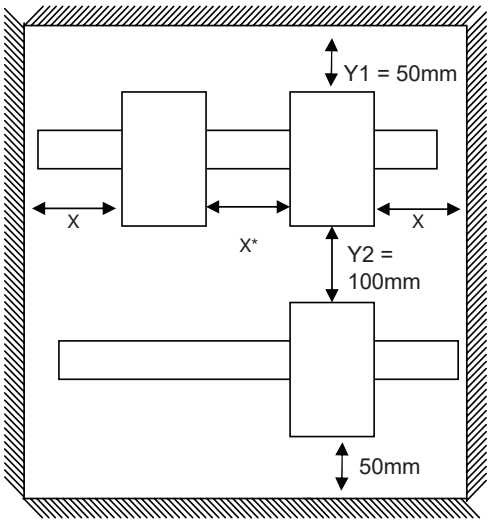

Mounting on DIN rail




Dismounting from DIN rail




## Installation instructions



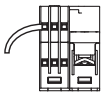

* Refer to Current derating vs spacing curves. Spacing between SSR and panel walls should be > 5 mm.



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# Connection Specifications

| Power connections | | | |
|---|---|---|---|
| **Terminals** | 1/L1, 2/T1 | | |
| **Conductors** | Use 75°C copper (Cu) conductors | | |
| | RGC1P..12, RGC1P..30 | | RGC1P..42, RGC1P..50, RGC1P..62 |
| |  |  |  |
| **Connection type** | M4 screw with captivated washer | | M5 screw with box clamp |
| **Stripping length** | 12 mm | | 11 mm |
| **Rigid (solid & stranded) UL/cUL rated data** | 2x 2.5 – 6.0 mm²<br>2x 14 – 10 AWG | 1x 2.5 – 6.0 mm²<br>1x 14 – 10 AWG | 1x 2.5 – 25.0 mm²<br>1x 14 – 3 AWG |
| **Flexible with end sleeve** | 2x 1.0 – 2.5 mm²<br>2x 2.5 – 4.0 mm²<br>2x 18 – 14 AWG<br>2x 14 – 12 AWG | 1x 1.0 – 4.0 mm²<br>1x 18 – 12 AWG | 1x 2.5 – 16.0 mm²<br>1x 14 – 6 AWG |
| **Flexible without end sleeve** | 2x 1.0 – 2.5 mm²<br>2x 2.5 – 6.0 mm²<br>2x 18 – 14 AWG<br>2x 14 – 10 AWG | 1x 1.0 – 6.0mm²<br>1x 18 –10 AWG | 1x 4.0 – 25.0 mm²<br>1x 12 – 3 AWG |
| **Torque specifications** | Pozidriv 2<br>UL: 2.0 Nm (17.7 lb-in)<br>IEC: 1.5 – 2.0 Nm (13.3 – 17.7 lb-in) | | Pozidriv 2<br>UL: 2.5 Nm (22 lb-in)<br>IEC: 2.5 – 3.0 Nm (22 – 26.6 lb-in) |
| **Aperture for termination lug (fork or ring)** | 12.3 mm | | n/a |
| **Protective Earth (PE) connection** | M5, 1.5 Nm (13.3 lb-in)<br>M5 PE screw is not provided with the solid state relay. PE connection is required when product is intended to be used in Class 1 applications according to EN/IEC 61140 | | |

| Control connections | |
|---|---|
| **Terminals** | GND, A1, A2, A3, POT, Us |
| **Conductors** | Use 60/75°C copper (Cu) conductors |
| |  |
| **Connection type** | M3 screw with box clamp |
| **Stripping length** | 8 mm |
| **Rigid (solid & stranded) UL/cUL rated data** | 1x 1.0 - 2.5 mm²<br>1x 18 - 12 AWG |
| **Flexible with end sleeve** | 1x 0.5 - 2.5 mm²<br>1x 20 - 12 AWG |
| **Torque specification** | Pozidriv 1<br>UL 0.5 Nm (4.4 lb-in),<br>IEC: 0.4-0.5 Nm (3.5-4.4 lb-in) |



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