

Solid State Relays 1-Phase with Integrated Heatsink Soft Start Switching Types RGC1P..K..



- 1-pole AC solid state contactors
- Soft start switching for short wave infrared heaters
- Rated operational voltage: up to 660 VAC
- Rated operational current: up to 63 AAC
- Control input: 24VDC
- Integrated varistor protection on output
- Load ON LED indication
- 100kA short circuit current rating according to UL508
- DIN or panel mount



Product Description

The RGC1P..K provides a solution for starting of loads having a high cold to hot resistance ratio and hence it is very common for such loads to exhibit a high inrush current when switched on from a cold state. Such behaviour is very common for short wave infrared heaters.

When a control signal is applied to the RGC1P..K, a soft start is performed. The soft start time is settable through

an accessible potentiometer. Once the soft start is complete, the RGC1P..K output switches ON and OFF according to the control signal. Soft starting is performed again if the control signal has been missing for more than 5 seconds.

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.

Ordering Key

RGC 1 P 60 K 42 E D

Solid state relay _____
Number of poles _____
Type of switching _____
Rated operational voltage _____
Control input _____
Rated operational current _____
Configuration layout _____
External supply _____

Type Selection

SSR with heatsink	Type of switching	Rated voltage (Ue), Blocking voltage	Control input	Rated current ¹ @40°C, I _{2t}	Connection configuration	External supply (Us)
RGC1: 1-pole switching	P: Proportional (Soft starting)	23: 85 - 265 VAC, 800 Vp 48: 190 - 550 VAC, 1200 Vp 60: 410 - 660 VAC, 1200 Vp	K: 24 VDC +/-20%	30: 30 AAC, 1,800 A ² s 42: 43 AAC, 18,000 A ² s 62: 63 AAC, 18,000 A ² s	E: Contactor	D: 24 VDC/ AC

1: Refer to Current Derating

Selection Guide

Output voltage, Ue	Control input	External supply, Us	Power connection	Rated operational current @ 40°C (I _{2t}) Product width		
				30 AAC (1,800 A²s) 35 mm	43 AAC (18,000 A²s) 35 mm	63 AAC (18,000 A²s) 70 mm
85 - 265 VAC	19.2 - 28.8 VDC	24 VDC/AC	Screw Box	RGC1P23K30ED	-	-
				-	RGC1P23K42ED	RGC1P23K62ED
190 - 550 VAC	19.2 - 28.8 VDC	24 VDC/AC	Screw Box	RGC1P48K30ED	-	-
				-	RGC1P48K42ED	RGC1P48K62ED
410 - 660 VAC	19.2 - 28.8 VDC	24 VDC/AC	Screw Box	RGC1P60K30ED	-	-
				-	RGC1P60K42ED	RGC1P60K62ED

General Specifications

Operational frequency range	45 to 65 Hz	Pollution degree	2 (non-conductive pollution with possibilities of condensation)
Power factor	> 0.7 @ rated voltage		
Touch Protection	IP20		
LED status indication ²		Over-voltage category	III (fixed installations)
Green	Control ON, fully ON	Isolation	
Yellow	Supply ON, flashing 0.5s ON, 0.5s OFF Load ON	L1, T1, A1, GND, Us to case L1, T1 to A1, GND, Us	4000 Vrms 2500 Vrms

2: Refer to LED Indications section

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
Leakage current @ rated voltage	≤ 5 mAAC	≤ 5 mAAC	≤ 5 mAAC
Internal Varistor across output	Yes	Yes	Yes

Output Specifications

	RGC1P..30	RGC1P..42	RGC1P..62
Rated operational current per pole ³ AC-51 @ Ta=25 °C AC-51 @ Ta=40 °C AC-55b @ Ta=40 °C	30 AAC 30 AAC 30 AAC	50 AAC 43 AAC 43 AAC	73 AAC 63 AAC 63 AAC
Minimum operational current	250 mAAC	500 mAAC	500 mAAC
Rep. Overload Current PF = 0.7 UL508: T=40°C, tON=1s, tOFF=9s, 50cycles	84 AAC	126 AAC	168 AAC
Maximum transient surge current (I _{tsm}), t=10ms	600 Ap	1900 Ap	1900 Ap
I _{2t} for fusing (t=10ms), minimum	1800 A²s	18000 A²s	18000 A²s
Critical dv/dt (@ T _j init = 40°C)	1000 V/us	1000 V/us	1000 V/us

3: refer to Current Derating

Input Specifications

Control input (A1 - GND)	19.2 - 28.8 VDC
Pick up voltage	19.2 VDC
Drop out voltage	10.0 VDC
Maximum initialisation time	250 ms
Response time (Input to Output)	2 half cycles
Input impedance	100k ohms
Reverse protection	Yes
Input protection vs. surges ⁴	Yes
Overvoltage protection	up to 30 VDC

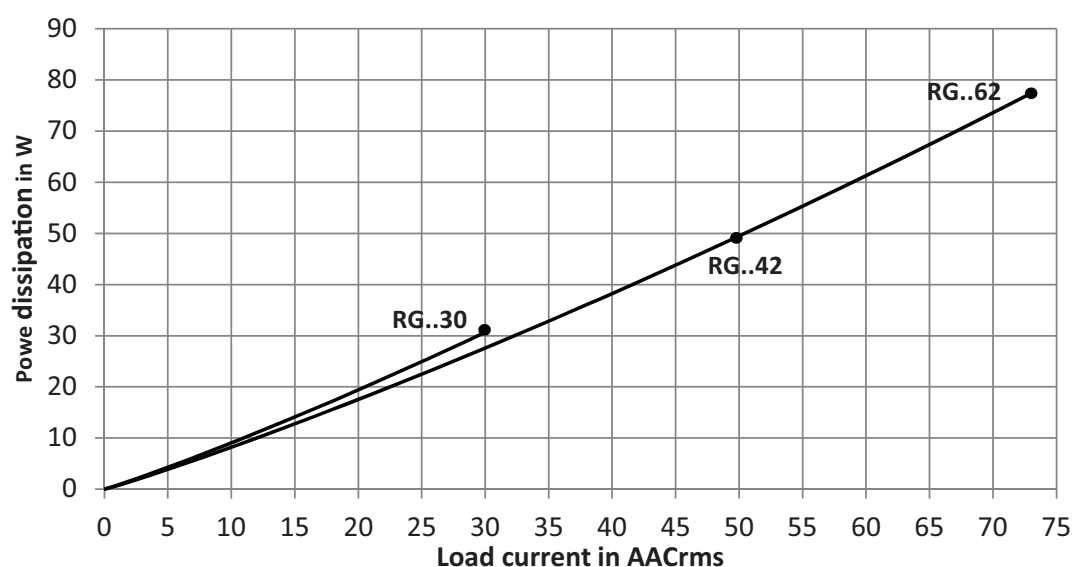
4: Refer to Electromagnetic Compatibility section

5: To be supplied from a Class 2 power source

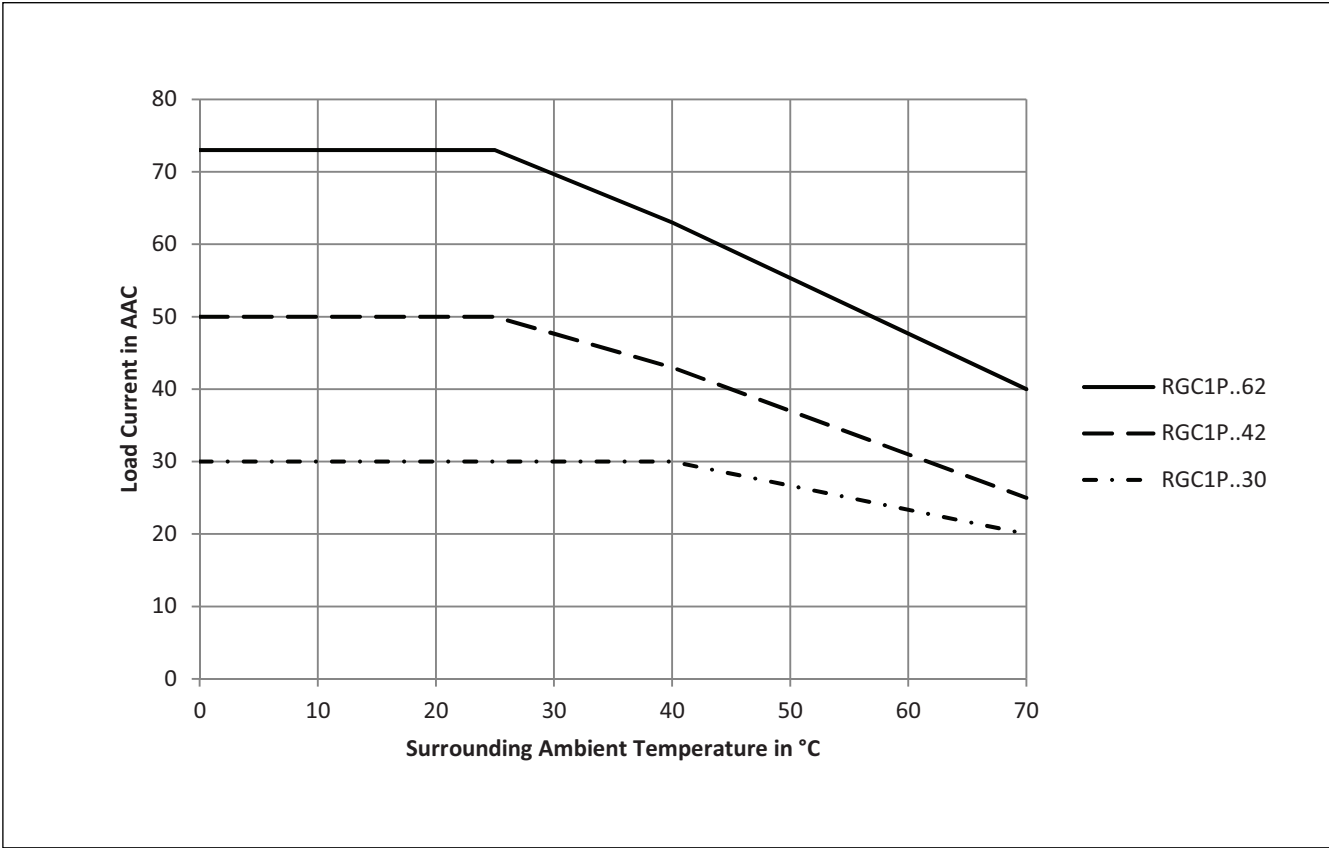
Supply Specifications

Supply voltage range (Us) ⁵	24 VDC, -15% / +20% 24 VAC, -15% / +15%
Overvoltage protection	up to 32 VDC/AC for 30 sec.
Reverse Protection	Yes
Surge Protection ⁴	Yes, integrated
Max. supply current	30 mA

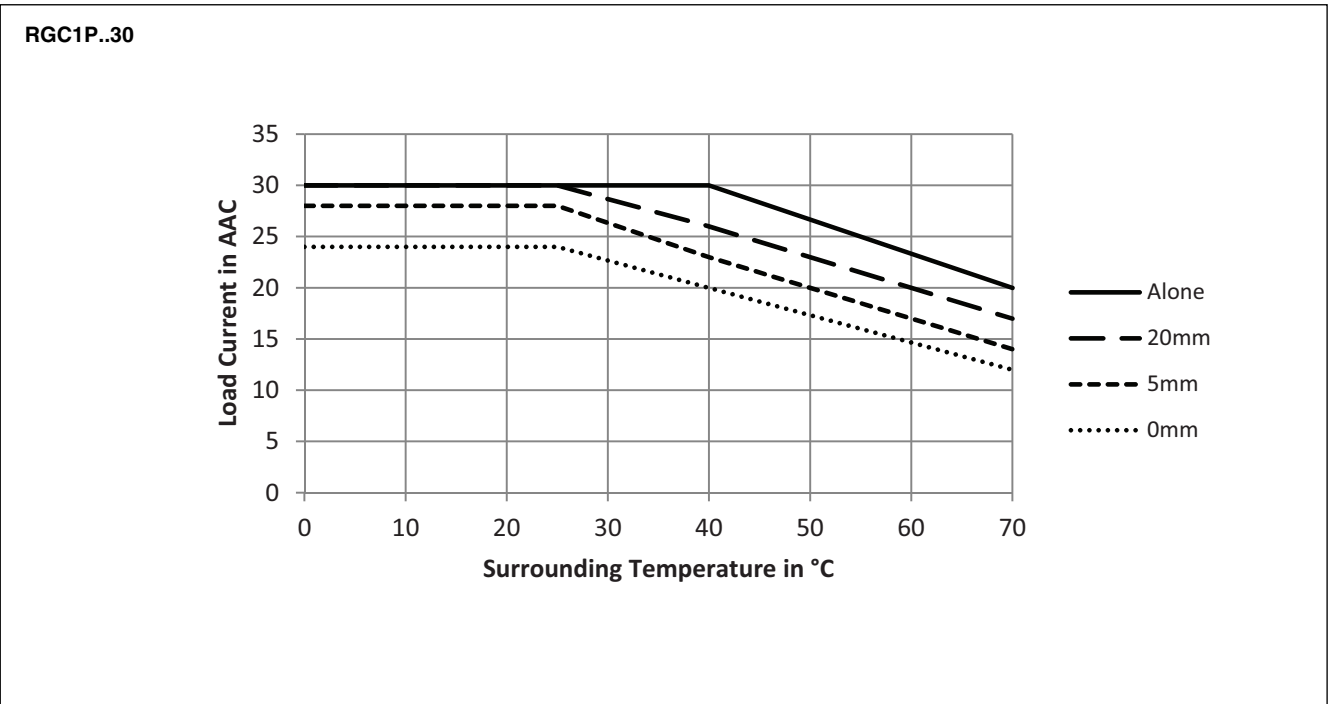
Output Power Dissipation



Current Derating (UL508)

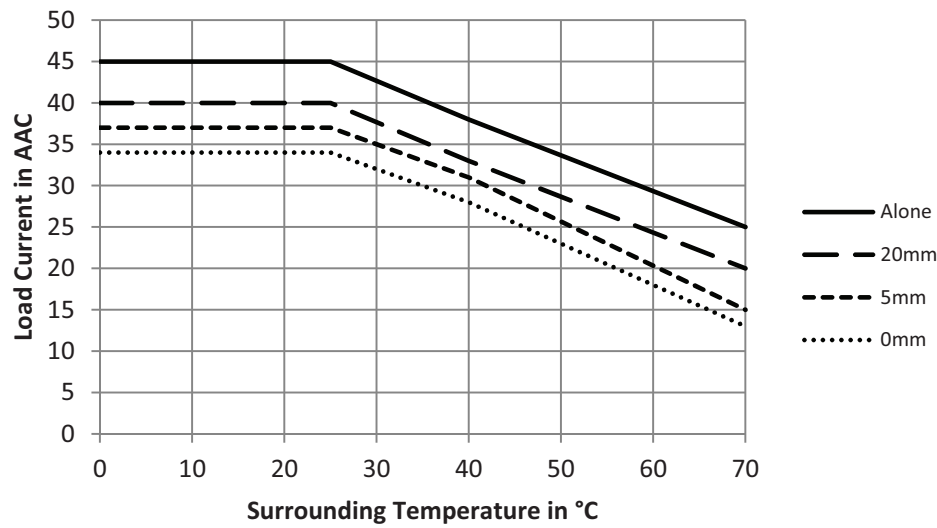


Current Derating vs Spacing Curves

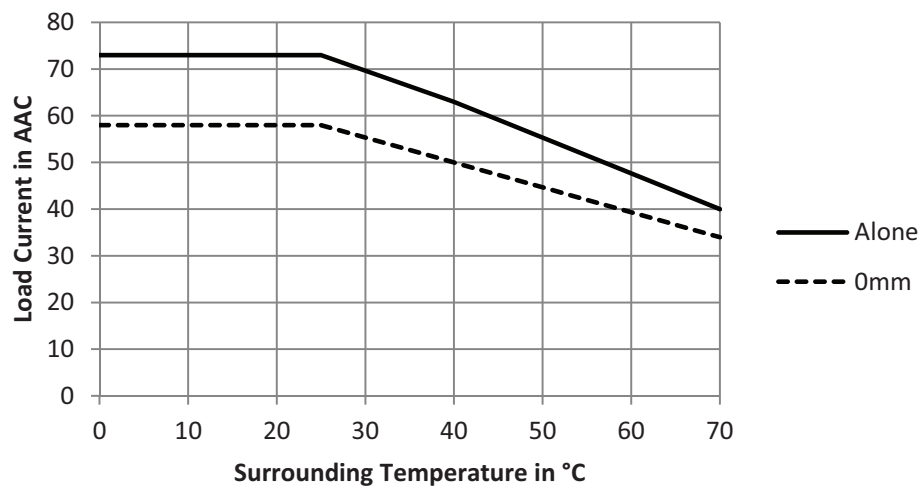


Current Derating vs Spacing Curves

RGC1P..42



RGC1P..62



Environmental and Housing Specifications

Operating Temperature	-40°C to +70°C (-40°F to +158°F)	GWIT & GWFI (for plastic)	conform to EN 60335-1 requirements
Storage Temperature	-40°C to +100°C (-40°F to +212°F)	Installation altitude	0-1000m. Above 1000m derate linearly by 1% of FLC per 100m up to a maximum of 2000m
RoHS (2011/65/EU)	Compliant	Weight	
Impact resistance (EN50155, EN61373)	15/11 g/ms	RGC1P..30, 42	approx. 450g
Vibration resistance (2-100Hz, EN50155, EN61373)	2g per axis	RGC1P..62	approx. 805g
Relative humidity	95% non-condensing @ 40°C		
Material	PA66, RAL7035		
UL flammability rating (for plastic)	UL 94 V0		

Product Interface

The diagram shows the RGC1P Solid State Controller with its terminal block and a detailed view of the ramp up time setting knob. The knob has markings for 0s and 5s. The terminal block includes terminals 1/L1, 2/T1, A1-GND, and Us+/-.

Terminals Labelling:

- 1/L1: Line connection
- 2/T1: Load connection
- A1-GND: Control input, 19.2 - 28.8 VDC
- Us (+, ~): External supply, positive signal or AC signal
- Us (-, ~): External supply, ground or AC signal

LED Indications

LED	Status	Timing Diagram
CONTROL (green)	Supply voltage (Us) ON	[Timing diagram showing a high pulse]
	Control input ON	[Timing diagram showing a high pulse]
	Mains loss	[Timing diagram showing a pulse with 0.5s duration]
	SSR internal error	[Timing diagram showing a pulse with 0.5s duration]
LOAD (yellow)	LOAD ON	[Timing diagram showing a high pulse]

Agency Approvals and Conformances

Conformance	IEC/EN 60947-4-3	Agency Approvals	UL Listed: UL508, NMFT E172877 cUL Listed: CSA 22.2 No.14-13, NMFT7 E172877
 		Short Circuit Current Rating	100kArms, UL508

Electromagnetic Compatibility

EMC Immunity	EN/IEC 61000-6-2	Electrical fast transient (Burst) immunity	EN/IEC 61000-4-4
Electrostatic discharge (ESD) immunity	EN/IEC 61000-4-2	Output: 2kV, 5 kHz	Performance Criteria 1
Air discharge, 8 kV	Performance Criteria 2	Us: 2kV, 5 kHz	Performance Criteria 1
Contact, 4 kV	Performance Criteria 2	A1, GND: 1 kV, 5 kHz	Performance Criteria 1
Electrical surge immunity	EN/IEC 61000-4-5	Radiated radio frequency immunity	EN/IEC 61000-4-3
Output, line to line, 1 kV	Performance Criteria 2	10V/m, 80 - 1000 MHz	Performance Criteria 1
Output, line to earth, 2 kV	Performance Criteria 2	10V/m, 1.4 - 2.0 GHz	Performance Criteria 1
A1, GND	Performance Criteria 2	3V/m, 2.0 - 2.7 GHz	Performance Criteria 1
Line to earth, 1 kV	Performance Criteria 2	Conducted radio frequency immunity	EN/IEC 61000-4-6
Us +, Us -	Performance Criteria 2	10V/m, 0.15 - 80 MHz	Performance Criteria 1
Line to line, 500 V	Performance Criteria 2	Voltage Dips	EN/IEC 61000-4-11
Line to earth, 500 V	Performance Criteria 2	0% for 0.5/1 cycle	Performance Criteria 2
		40% for 10 cycles	Performance Criteria 2
		70% for 250 cycles	Performance Criteria 2
		Voltage Interruptions	EN/IEC 61000-4-11
		0% for 5000 ms	Performance Criteria 2
EMC Emission	EN/IEC 61000-6-4	emission (radiated)	EN/IEC 55011
Radio interference voltage emission (conducted)	EN/IEC 55011	30 - 1000 MHz	Class A (industrial)
0.15 - 30 MHz	Class A (with external filtering)		
Radio interference field			

Note:

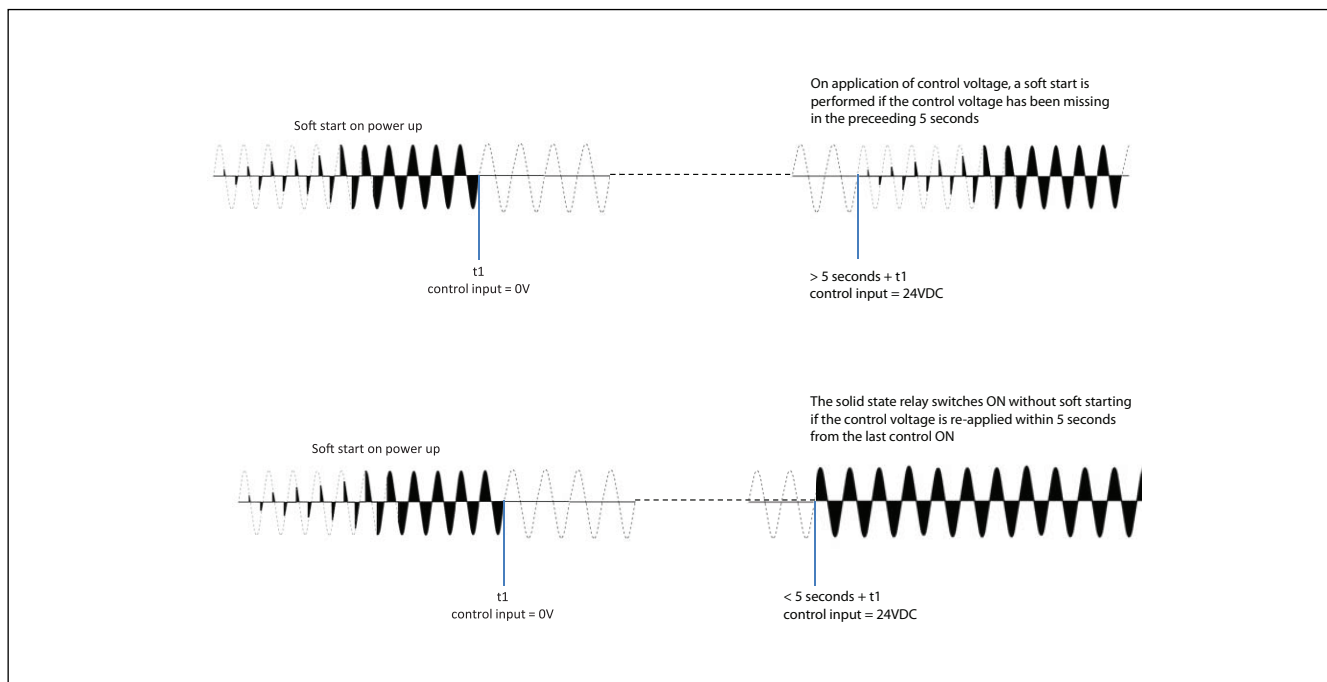
- Control input lines must be installed together to maintain products susceptibility to Radio Frequency Interference.
- Use of AC solid state relays may according to the application and the load current, cause conducted radio interferences. Use of mains filters may be necessary for cases where the user must meet E.M.C requirements. The filtering 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.
- Surge tests on RGC..A models were carried out with the signal line impedance 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 (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, 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 (Performance Criteria C): Temporary loss of function is allowed, provided the function can be restored by manual operation of the control.

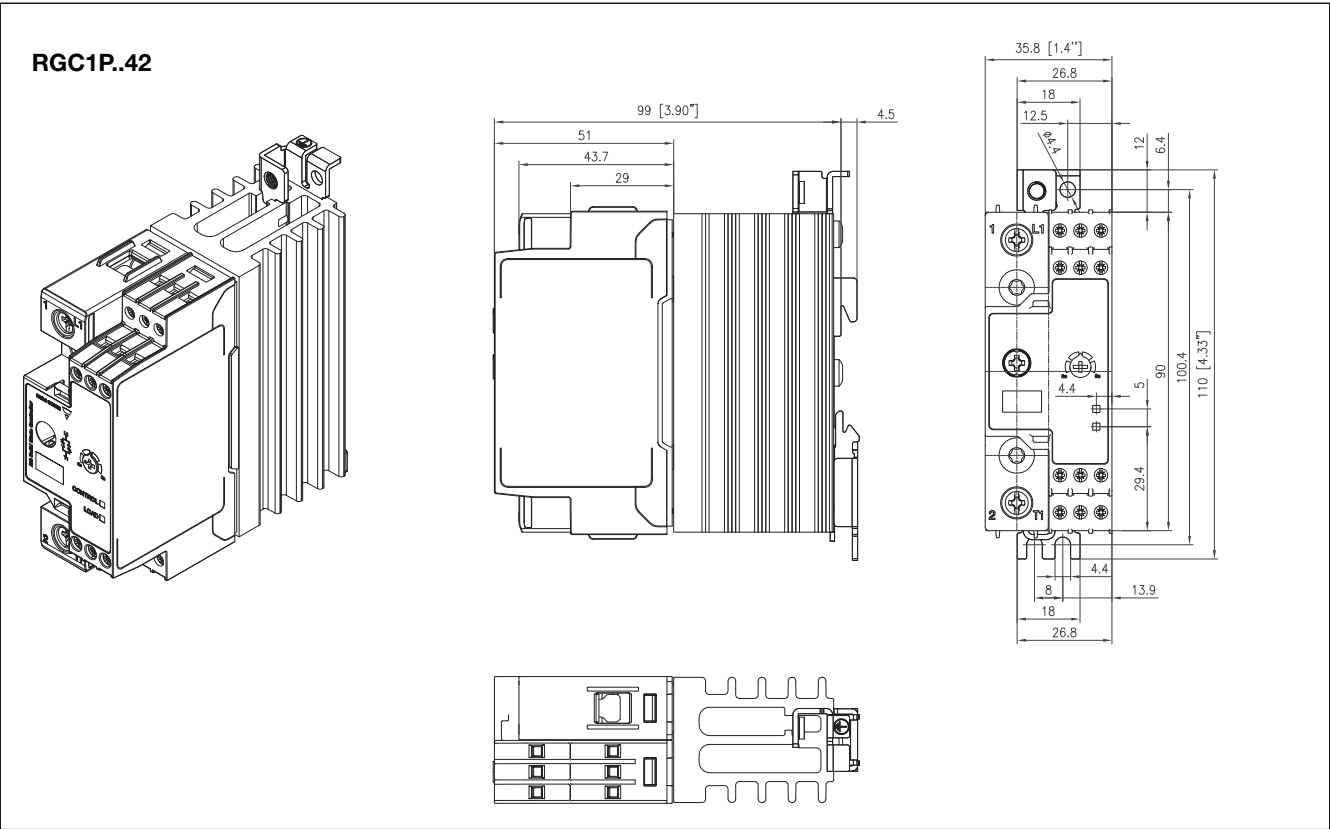
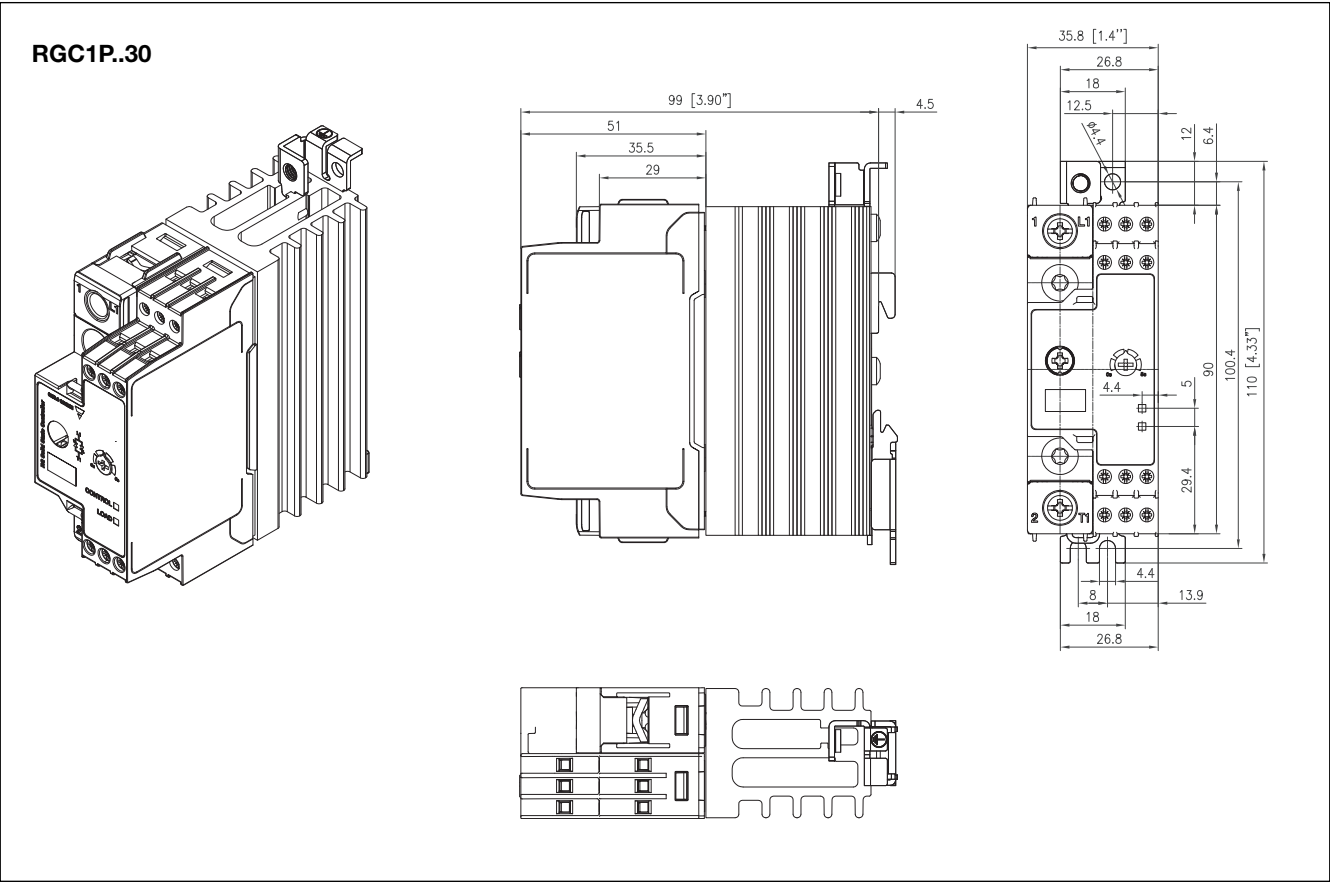
Mode of Operation

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.

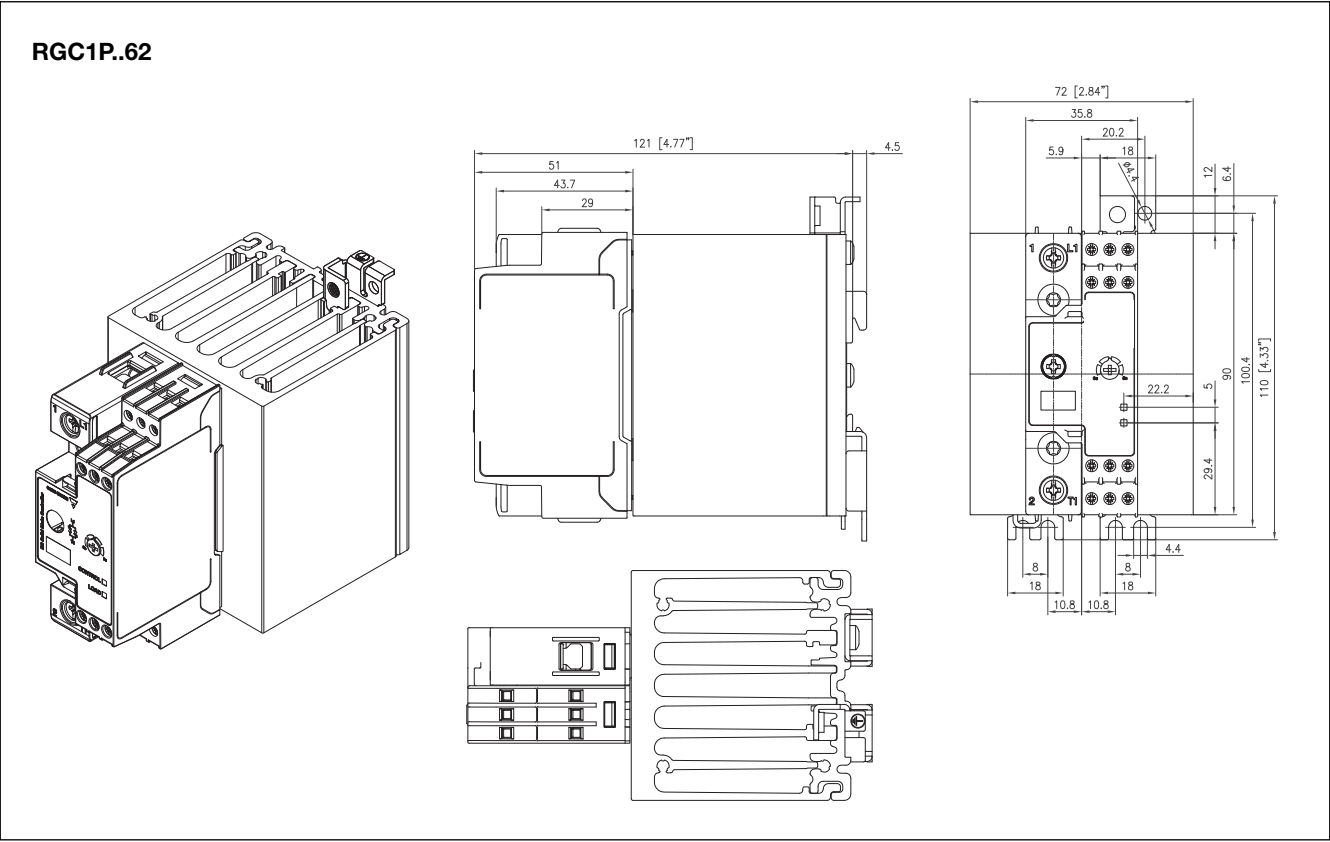
Soft starting is performed only on the first power up and when the control voltage has been missing in the preceeding 5 seconds. If soft start is stopped before soft start completion, it is assumed that a start was performed and the period count for missing control voltage starts as soon as the soft start is stopped.



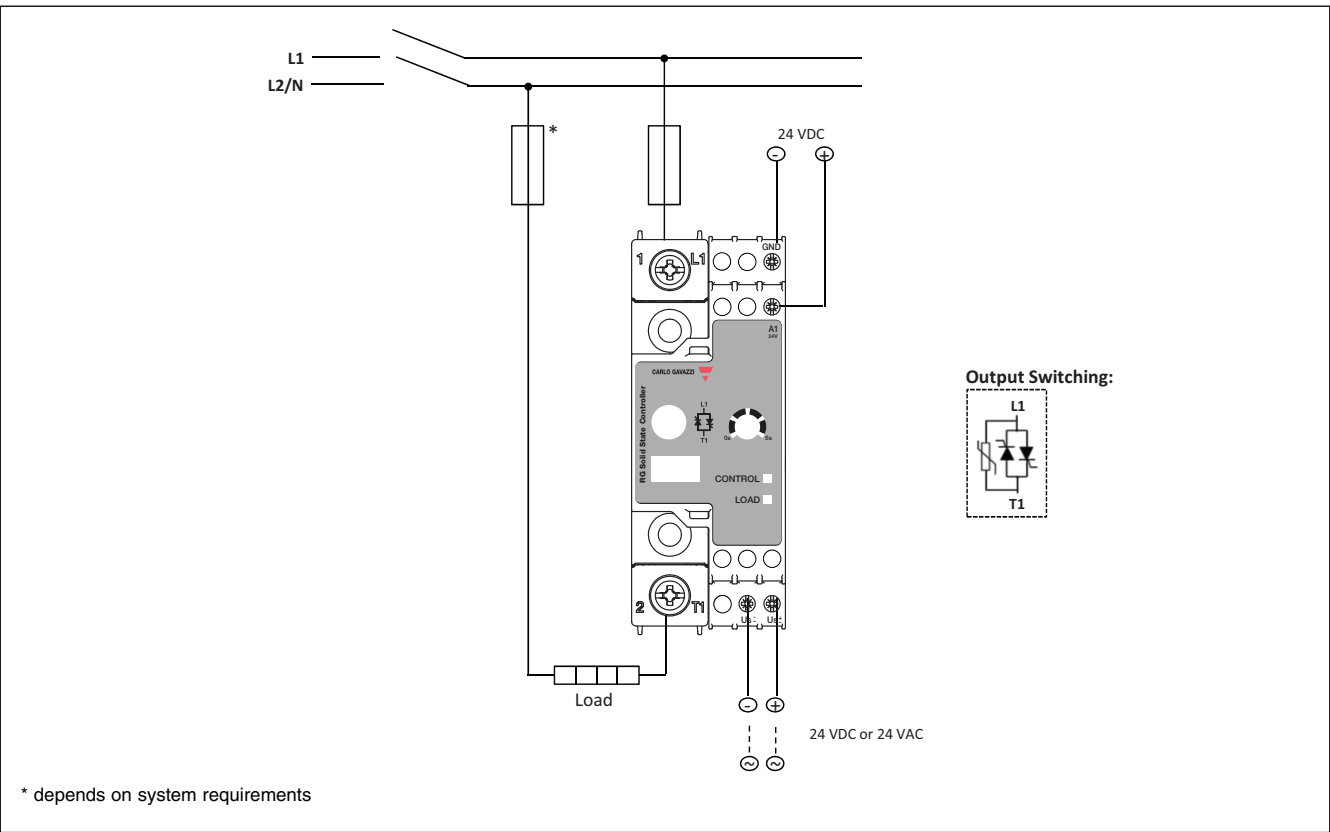
Dimensions



Dimensions



Connection Diagram



Connection Specifications

POWER CONNECTIONS

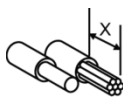





Use 75°C copper (Cu) conductors

1/L1, 2/T1

RGC1P..30

RGC1P..42, RGC1P..62



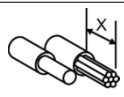


Stripping length (X)		12mm		11mm
Connection type		M4 screw with captivated washer		M5 screw with box clamp
Rigid (solid & stranded)		2x 2.5 - 6.0 mm ² 2x 14 - 10 AWG	1x 2.5 - 6.0 mm ² 1x 14 - 10 AWG	1x 2.5 - 25 mm ² 1x 14 - 3 AWG
UL/cUL rated data				
Flexible with end sleeve		2x 1.0 - 2.5 mm ² 2x 2.5 - 4.0 mm ² 2x 18 - 14 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	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

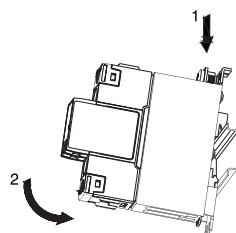
Use 60/75°C copper (Cu) conductors

GND, A1, Us

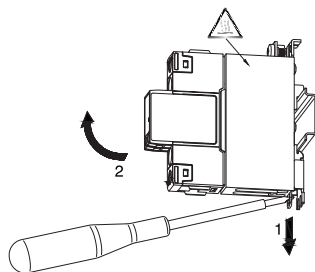


Stripping length (X)		8 mm
Connection type		M3 screw with box clamp
Rigid (solid & stranded)		1x 1.0 - 2.5 mm ² 1x 18 - 12 AWG
UL/cUL rated data		
Flexible with end sleeve		1x 0.5 - 2.5 mm ² 1x 20 - 12 AWG
Torque specification		Pozidriv 1 UL: 0.5Nm (4.4 lb-in) IEC: 0.4-0.5Nm (3.5-4.4 lb-in)

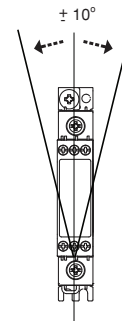
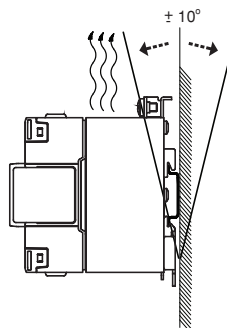
Mounting Instructions



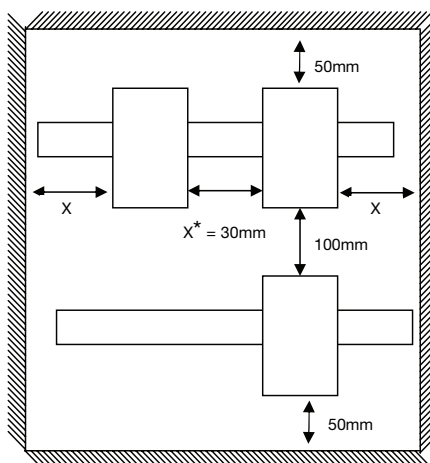
Mounting on DIN rail



Dismounting from DIN rail



Installation Instructions



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.	Short circuit current [kArms]	Max. fuse size [A]	Class	Voltage [VAC]
RGC1P..30	100	30	J or CC	Max. 600
RGC1P..42	100	80	J	Max. 600
RGC1P..62	100	80	J	Max. 600

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

Part No.	Short circuit current [kArms]	Ferraz Shawmut (Mersen)		Siba		Voltage [VAC]
		Max. fuse size [A]	Part No.	Max. fuse size [A]	Part No.	
RGC1P..30	10	40	6.9xx CP GRC 22x58 /40	32	50 142 06.32	Max. 600
	100	40	6.9xx CP URD 22x58 /40	32	50 142 06.32	Max. 600
RGC1P..42	10	63	6.9xx CP URC 14x51 /63	80	50 142 20.80	Max. 600
	10	70	A70QS70-4	80	50 142 20.80	Max. 600
	100	63	6.9xx CP URC 14x51 /63	80	50 142 20.80	Max. 600
	100	70	A70QS70-4	80	50 142 20.80	Max. 600
RGC1P..62	10	100	6.9xx CP GRC 22x58 /100	100	50 142 20.100	Max. 600
	10	100	A70QS100-4	100	50 142 20.100	Max. 600
	100	100	6.621 CP URGD 27x60 /100	100	50 142 20.100	Max. 600
	100	100	A70QS100-4	100	50 142 20.100	Max. 600

xx = 00, without fuse trip indication

xx = 21, with fuse trip indication

Type 2 Protection with Miniature 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
RGC1P..30	1 pole			
	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
	2 pole			
	S202 - Z25 (25A)	S202-B13 (13A)	2.5 4.0	19.0 30.4
RGC1P..42 RGC1P..62	1 pole			
	S201-Z32 (32A)	S201-B16 (16A)	2.5 4.0 6.0	3.0 4.8 7.2
	S201-Z50 (50A)	S201-B25 (25A)	4.0 6.0 10.0 16.0	4.8 7.2 12.0 19.2
	S201-Z63 (63A)	S201-B32 (32A)	6.0 10.0 16.0	7.2 12.0 19.2

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

Note: A prospective current of 6kA 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

Tamper Proof Accessory Kit



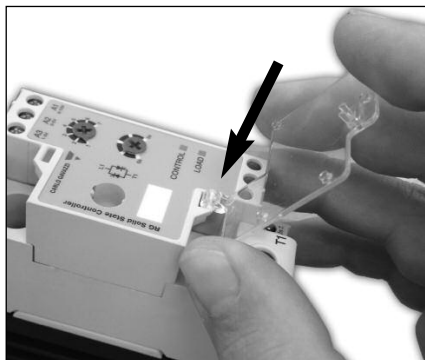
Ordering Key

RGTMP

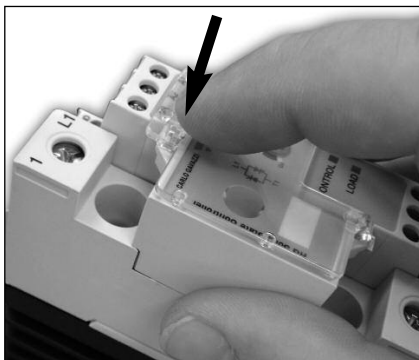
Tamper proof accessory kit for RGS1P, RGC1P series containing:

- x5 transparent covers
- x5 secureness ties

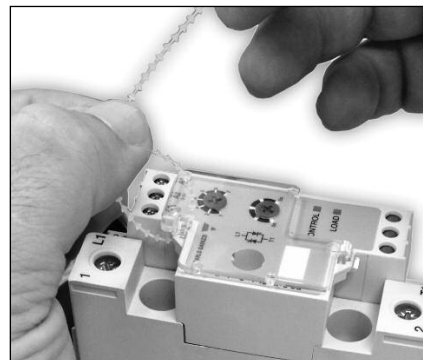
Installation



1: Clip hook of the transparent cover to the bottom loop of the RGx1P control module



2: Close the cover by clipping to the top loop of the RGx1P control module



3: Secure with provided tie