RGC1D, RGS1D

DC switching, solid state relays



Main features

- IGBT power semiconductor
- 17.5 mm product width
- Rated operational voltage: up to 1000 VDC
- Rated operational current: up to 25 ADC
- Control voltage range: 4.5-32 VDC
- Input polarity protection
- Removable IP20 cover
- Integrated free-wheeling diode for output protection
- Max. transient peak voltage: 1200 V

Description

This product series is mainly intended to switch a string of photovoltaic panels with a maximum string voltage of 1000 VDC and up to 25 ADC in only 17.5 mm width. It may be used in other DC application as well.

The control port is protected against reverse polarity while the IGBT at the output is protected against back voltage with an integrated freewheeling diode.

RGS1D is the panel mount version while the RGC1D has an integrated heatsink.

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

Applications

Photovoltaic panels, railways

Main functions

- DC switching solid state relay
- 4 kV isolation between input and output

Order code

RG □ 1D1000 □ KKE

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	-		
□	S	Solid state relay without integrated heatsink	
	C	Solid state contactor (with integrated heatsink)	
1	-	1-pole switching	
D	-	DC switching	
1000	-	Rated voltage: 1000 VDC, 1200 Vp	
D	D	Control voltage: 4.5 - 32 VDC	
□	15	Rated current: 15 ADC	With integrated heatsink
	25	Rated current: 25 ADC	Not available for RGC1D... version
K	-	Screw connection for control terminals	
K	-	Screw connection for power terminals	
E	-	Contactor configuration	
□	-		No additional options
	DIN	DIN rail mount	Option with the RGS1D.. version only
	HT	Pre-attached thermal pad	Option with the RGS1D.. version only

Selection guide - RGS1D.. (panel mount solid state relay)

Rated voltage	Control voltage	Max. transient peak voltage	Maximum rated operational current
			25 ADC
1000 VDC	4.5 - 32 VDC	1200 Vp	RGS1D1000D25KKE

Selection guide - RGC1D.. (with integrated heatsink)

Rated voltage	Control voltage	Max. transient peak voltage	Rated operational current @ 40°C
			15 ADC
1000 VDC	4.5 - 32 VDC	1200 Vp	RGC1D1000D15KKE

Selection guide - RGS1D..HT (RGS with pre-attached thermal pad)

Rated voltage	Control voltage	Max. transient peak voltage	Maximum rated operational current
			25 ADC
1000 VDC	4.5 - 32 VDC	1200 Vp	RGS1D1000D25KKEHT

Selection guide - RGS1D..DIN (option with pre-mounted DIN rail adaptor)

Rated voltage	Control voltage	Max. transient peak voltage	Rated operational current @ 40°C
			6 ADC
1000 VDC	4.5 - 32 VDC	1200 Vp	RGS1D1000D15KKEDIN

Carlo Gavazzi compatible components

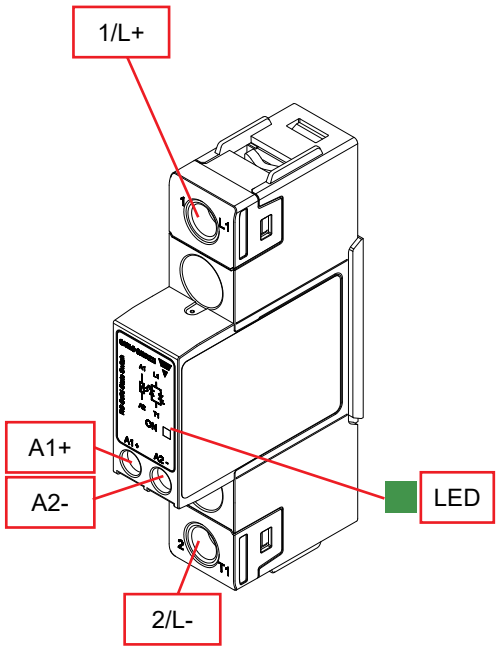
Description	Component code	Notes
Screw kits	SRWKITM5X30MM	- RGS screw kit for mounting solid state relay to heatsink - Screw type: Torx T20, size M5 x 30 mm - Packing quantity: 20 pcs.
Thermal pads	RGHT	Pack of 10 RGS thermal pads with size 34.6 x 14mm
RGS DIN clip	RGS1DIN	DIN clip accessory for mounting RGS on DIN rail
Heatsinks	RHS	Heatsink and accessories

Carlo Gavazzi further reading

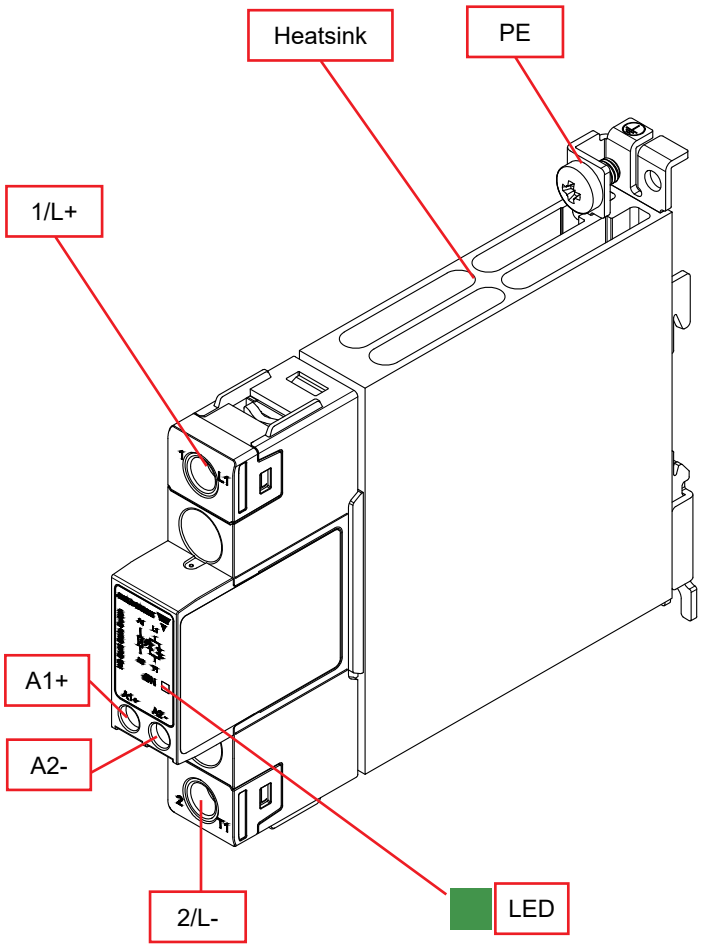
Information	Where to find it	Notes
Datasheet	https://gavazziautomation.com/images/PIM/DATASHEET/ENG/SSR_Accessories.pdf	Solid state relay accessories (including Heatsinks)
	https://www.gavazziautomation.com/nsc/HQ/EN/heat_sink_selector_tool	Online Heatsink selector tool

Structure

RGS1D



RGC1D



Element	Component	Function
1/L+	Power connection	Mains connection
2/L-	Power connection	Load connection
A1+, A2-	Control connection	Terminals for control voltage
LED	Control indicator	Indicates presence of control voltage
Heatsink	Integrated heatsink	DIN rail mounting
PE	Protective Earth	Connection for Protective Earth, PE screw not provided with RGC1D

Features

General data

Material	PA66 or PA6 (UL94 V0), RAL7035 Glow wire ignition temperature and Glow wire flammability index conform to EN 60335-1 requirements
Mounting	RGS1D: Panel mount RGC1D: DIN mount RGS1D...DIN: DIN mount
Touch protection	IP20
Overvoltage category	III, 6 kV (1.2/50 µs) rated impulse withstand voltage
Isolation	Input and Output to case 4000 Vrms Input to Output 4000 Vrms

Performance

Output specifications

	RGC1D..15	RGS1D..15DIN	RGS1D..25
Max. operational current: DC-1 @ 60°C	8 ADC	4 ADC	25 ADC[1]
Max. operational current: DC-1 @ 40°C	15 ADC	6 ADC	
Output protection	Integrated free wheeling diode		
Leakage current @ rated voltage	<1.5 mADC		
Minimum operational current	20 mADC		
Maximum transient surge current (t=10 µs)	200 ADC		

1. Max rated current with suitable heatsink. Refer to heatsink selection tables

Output voltage specifications

Operational voltage range **IEC[2]** **UL508[2]**	 24 - 1000 VDC 24 - 600 VDC
Maximum transient peak voltage	1200 Vp
Maximum onstate voltage drop	1.6 VDC

2. -15% on lower voltage limit

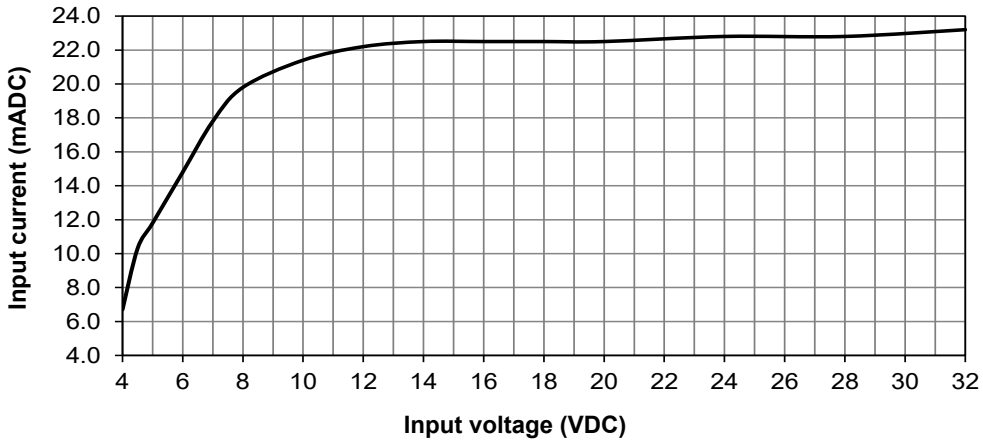
Input specifications

Control voltage range	4.5 - 32 VDC
Pick-up voltage[3]	4.0 VDC
Drop-out voltage	1.0 VDC
Maximum reverse voltage	32 VDC
Maximum response time pick-up	Refer to Time characteristics
Maximum response time drop-out	Refer to Time characteristics
Input current	See diagrams below

Note: Ideally, the control signal should be applied through a contactless switch (for example, open collector)

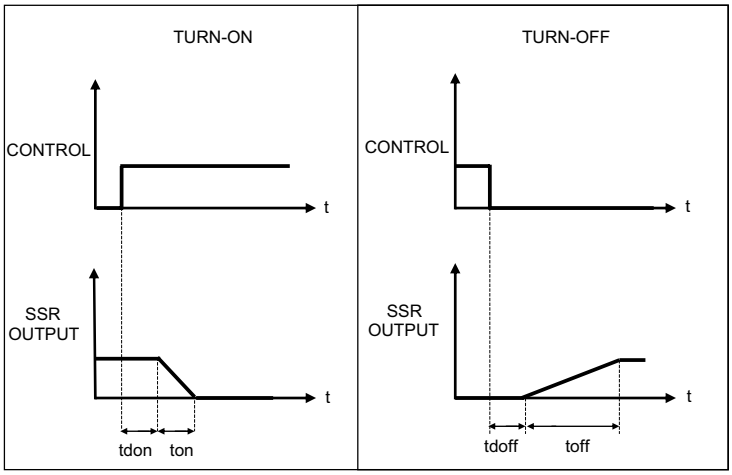
3. Pickup voltage should be minimum 6 VDC for EMC conformance.

Input current vs. input voltage

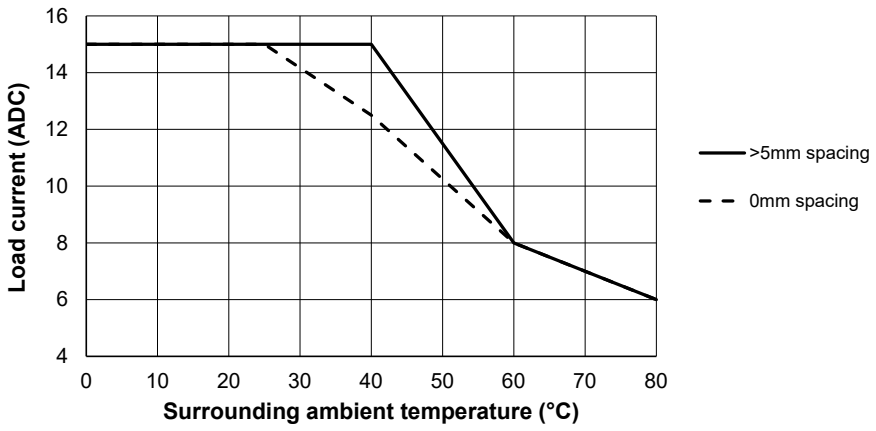


Time characteristics

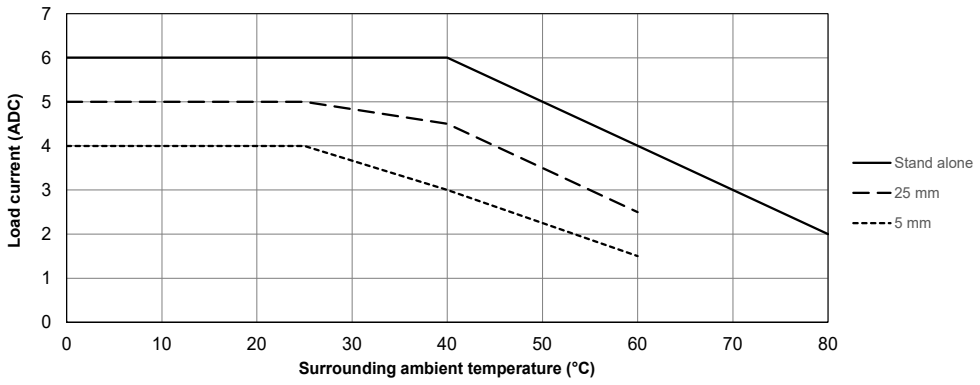
CHARACTERISTICS	
Turn on time (ton)	50µs
Turn on delay (tdon)	50µs
Turn off time (toff)	200µs
Turn off delay (tdoff)	50µs
Switching Frequency	20Hz



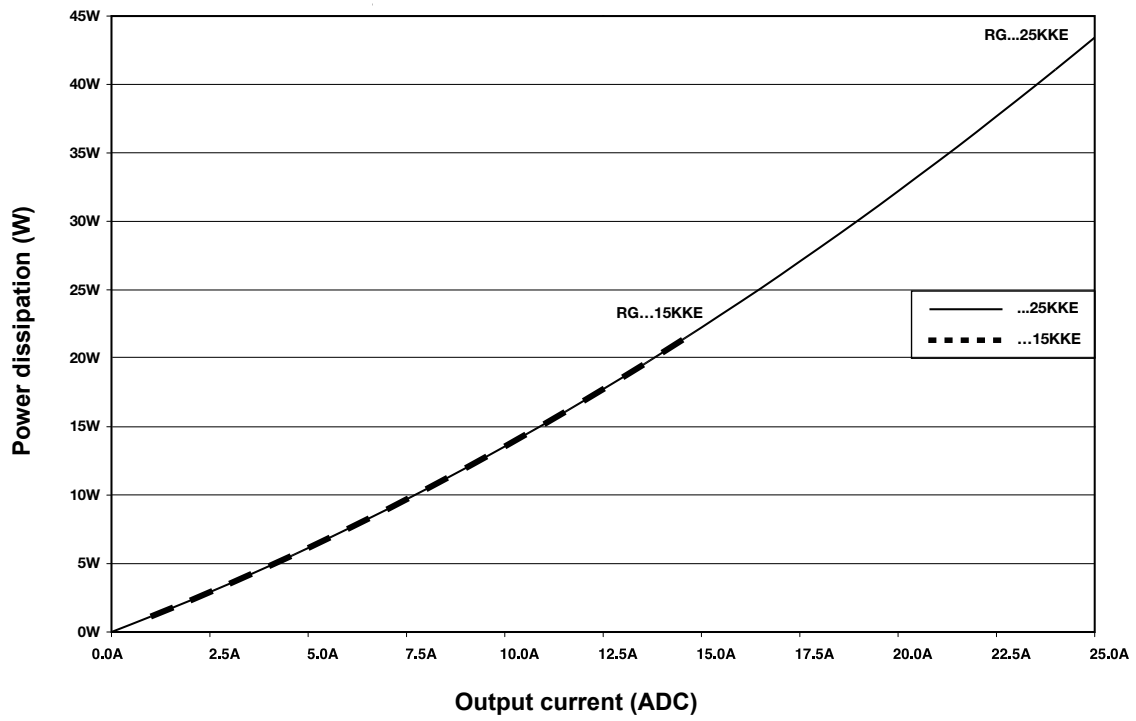
Current derating for RGC1D



Current derating vs. spacing for RGS1D..DIN



Output power dissipation



Heatsink selection for RGS...

Thermal resistance [°C/W] of RGS1D..25

Load current [A]	Surrounding ambient temperature [°C]						
	20	30	40	50	60	70	80
25	1.82	1.59	1.36	1.13	0.90	0.67	0.44
22.5	2.12	1.86	1.59	1.33	1.06	0.80	0.53
20	2.48	2.17	1.86	1.55	1.24	0.93	0.62
17.5	2.96	2.59	2.22	1.85	1.48	1.11	0.74
15	3.60	3.15	2.70	2.25	1.80	1.35	0.90
12.5	4.51	3.95	3.38	2.82	2.26	1.69	1.13
10	5.90	5.17	4.43	3.69	2.95	2.21	1.48
7.5	8.26	7.23	6.20	5.16	4.13	3.10	2.07
5	13.03	11.41	9.78	8.15	6.52	4.89	3.26
2.5	nh	nh	nh	nh	13.75	10.31	6.87

Thermal resistance [°C/W] of RGS1D..25..HT

Load current [A]	Surrounding ambient temperature [°C]						
	20	30	40	50	60	70	80
25	1.16	0.93	0.70	0.47	0.24	---	---
22.5	1.53	1.26	1.00	0.73	0.47	0.20	---
20	2.00	1.69	1.38	1.07	0.76	0.45	0.14
17.5	2.62	2.25	1.88	1.51	1.14	0.77	0.40
15	3.46	3.01	2.56	2.11	1.66	1.21	0.76
12.5	4.51	3.95	3.38	2.82	2.26	1.69	1.13
10	5.90	5.17	4.43	3.69	2.95	2.21	1.48
7.5	8.26	7.23	6.20	5.16	4.13	3.10	2.07
5	13.03	11.41	9.78	8.15	6.52	4.89	3.26
2.5	nh	nh	nh	nh	13.75	10.31	6.87

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

Thermal data

	RGS1D..25..
Max. junction temperature	125°C
Heatsink temperature	100°C
Junction to case thermal resistance, R_{thjc}	<0.36°C/W
Case to heatsink thermal resistance, R_{thcs} [4]	<0.32°C/W
Case to heatsink thermal resistance, R_{thcs_HT} [5]	<0.90°C/W

4. 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.
5. Thermal resistance case to heatsink values for RGS..HT are applicable for the RGHT thermal pad

Compatibility and conformance

Approvals	RGC1D:			
	RGS1D:			
Standards compliance	RGC1D:		RGS1D:	
	LVD: EMCD: UL: cUL:	EN 60947-1 EN 61000-6-2, EN 61000-6-3 UL508 (E172877), NMFT C22.2 No. 14 (E172877), NMFT7	LVD: EMCD: cURus: CSA:	EN 60947-1 EN 61000-6-2, EN 61000-6-3 UL508 Recognized (E172877), NMFT2, NMFT8 C22.2 No. 14 (204075)

Electromagnetic compatibility (EMC) - Immunity	
Electrostatic discharge (ESD)	EN/IEC 61000-4-2 8 kV air discharge, 4 kV contact (PC1) 16 kV air discharge, 8 kV contact (PC2)
Radiated radio frequency	EN/IEC 61000-4-3 10 V/m, from 80 MHz to 1 GHz (PC1) 10 V/m, from 1.0 to 2.7 GHz (PC1)
Electrical fast transient (burst)	EN/IEC 61000-4-4 Output: 4 kV, 5 kHz /100 kHz (PC2) Input: 1 kV, 5 kHz / 100 kHz (PC1)
Conducted radio frequency	EN/IEC 61000-4-6 10 V/m, from 0.15 to 80 MHz (PC1)
Electrical surge	EN/IEC 61000-4-5 Output, line to line: 1 kV (PC1) Output, line to earth: 2 kV (PC1) Input, line to line: 1 kV (PC1) Input, line to earth: 2 kV (PC1)
Voltage Dips, Short Interruptions and Voltage Variations on Input Lines Immunity tests	EN/IEC 61000-4-29 0% @ 1, 3, 10, 30, 100, 300, 1000 ms (PC2) 30% @ 10, 30, 100, 300, 1000 ms (PC2) 70% @ 10, 30, 100, 300, 1000 ms (PC2) -20% @ 10, 30, 100, 300, 1000ms, 3s, 10s (PC2) +20% @ 10, 30, 100, 300, 1000ms, 3s, 10s (PC2)
Voltage Dips, Short Interruptions and Voltage Variations Immunity tests	EN/IEC 61000-4-11 0% for 5000 ms (PC2) 40% @ 200 ms (PC2) 60% @ 10, 30, 100, 300, 1000 ms (PC2)

Electromagnetic compatibility (EMC) - Emissions	
Radio interference field emission (radiated)	EN/IEC 55011 Class B: from 30 to 1000 MHz
Radio interference voltage emissions (conducted)	EN/IEC 55011 Class B: from 0.15 to 30 MHz

Note:

- Control input lines must be installed together to maintain products' susceptability to Radio Frequency interference.

• 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.

Environmental specifications

Operating temperature	-40°C to 80°C (-40°F to +176°F)
Storage temperature	-40°C to 100°C (-40°F to +212°F)
Relative humidity	95% non-condensing @ 40°C
Pollution degree	2 (non-conductive pollution with possibilities of condensation)
Vibration resistance	2g / axis (5g / axis for RGS1D) (2-100Hz, IEC 60068-2-6, EN 50155, EN 61373)
Impact resistance	15/11 g/ms (EN 50155, EN 61373)
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:

Type 1 protection implies that after a short circuit, the device under test will no longer be in a functioning state.

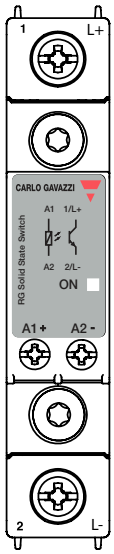
In case, however the short circuit has to be interrupted. The fuse between enclosure and supply shall not open. The door or cover of the enclosure shall not be blown open. There shall be no damage to condcutors ot terminals and the condcutors shall not separate from terminals. There shall be no breakage 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 5,000ADC, 600Volts maximum when protected by fuses. Tests at 5,000A were performed with RK5 fuses, time delay; please refer to the table below for maximum allowed ampere rating of the fuse. Use fuses only.

Protection co-ordination type 1 according to UL 508				
Part No.	**Prospective short circuit current [kA]**	**Max fuse size [A]**	**Class**	**Voltage [VDC]**
RGC..15	5	25	RK5	Max. 600
RGS..25		25	RK5	

Protection co-ordination type 1 according to IEC/EN 60947-4-1				
Part No.	**Prospective short circuit current [kA]**	**SIBA**		**Voltage [VDC]**
		Max fuse size [A]	**Part number**	
RGC..15	5	16	9008010.16	Max. 600
RGS..25		25	9008010.25	

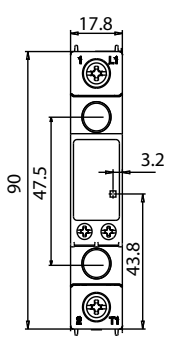
Terminal layout

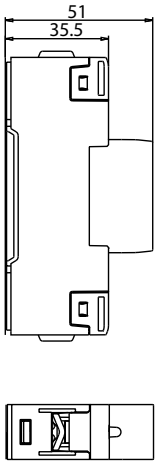


1/L+: Mains supply connection
2/L-: Load connection
A1 (+): Positive control signal
A2 (-): Control ground

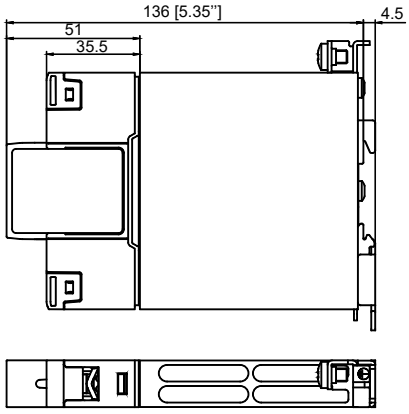
Dimensions

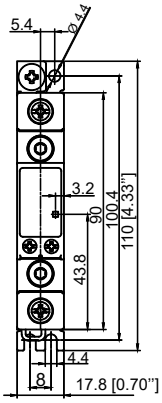
RGS1D



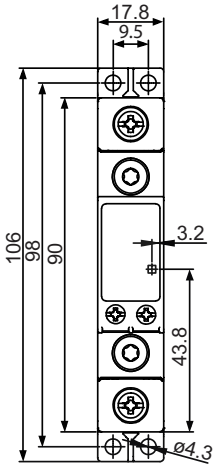


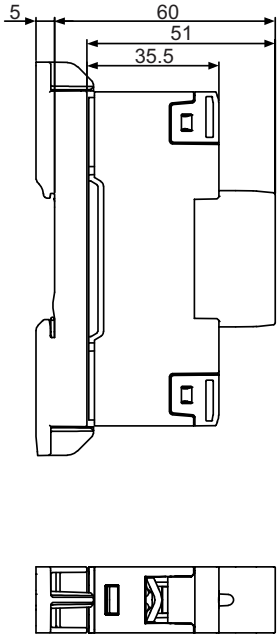
RGC1D





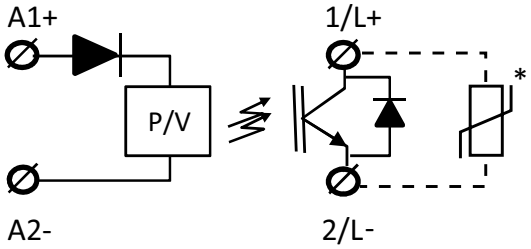
RGS1D..DIN





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

Functional diagram



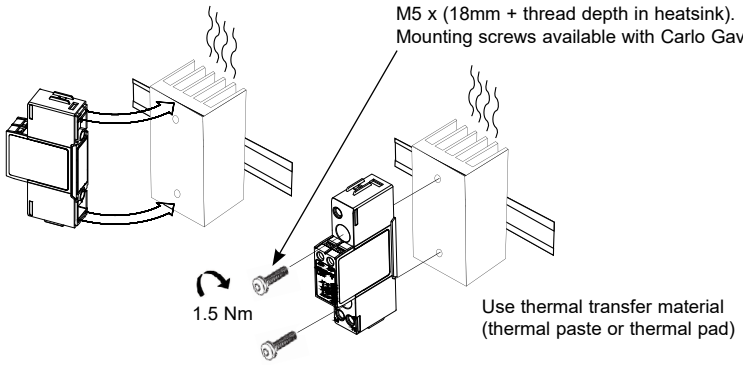
* varistor not included

Mounting instructions for RGS1D

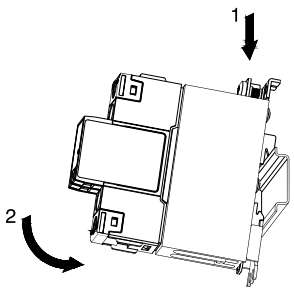
Thermal stress will reduce the lifetime of the SSR. Therefore it is necessary to select the appropriate heatsinks, taking into account the surrounding temperature, load current and the duty cycle.

A fine layer of thermally conductive silicone paste must be applied to the back of the SSR. RGS should be mounted on the heatsink with two M5 x 30 mm screws. Gradually tighten each screw (alternating between the two) until both are tightened with a torque of 0.75 Nm. Then tighten both screws to their final mounting torque of 1.5 Nm.

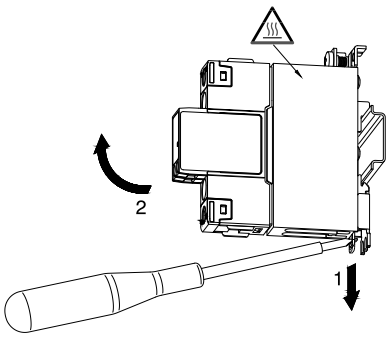
In case of a thermal pad attached to the back of the SSR, no thermal paste is required. The RGS is gradually tightened (alternating between the 2 screws) to a maximum torque of 1.5 Nm.



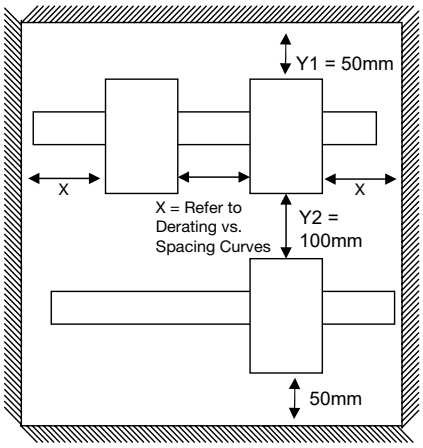
Installation instructions for RGC1D



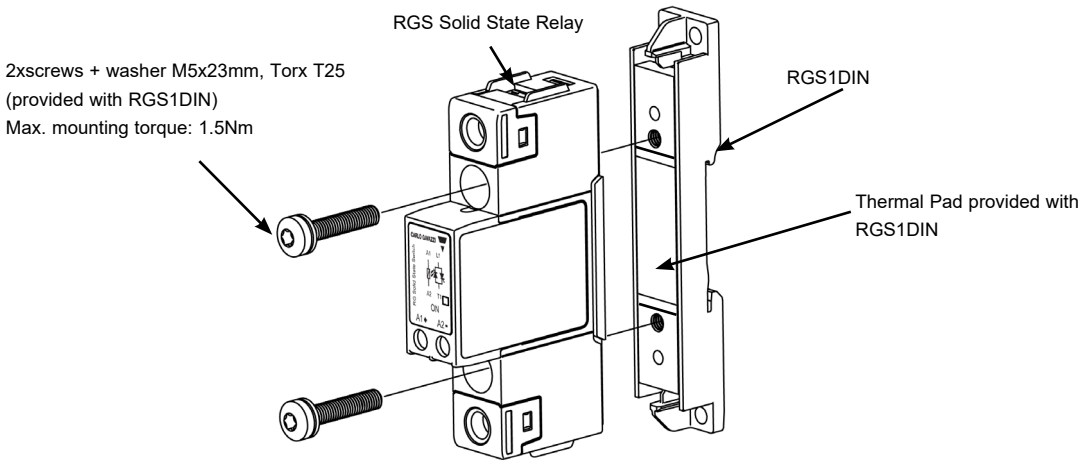
Mounting on DIN rail



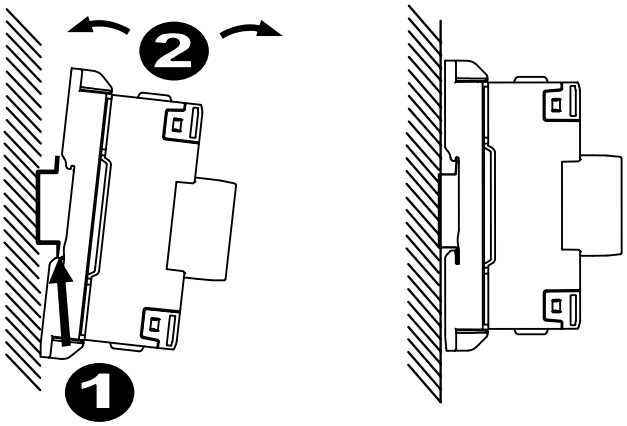
Dismounting from DIN rail



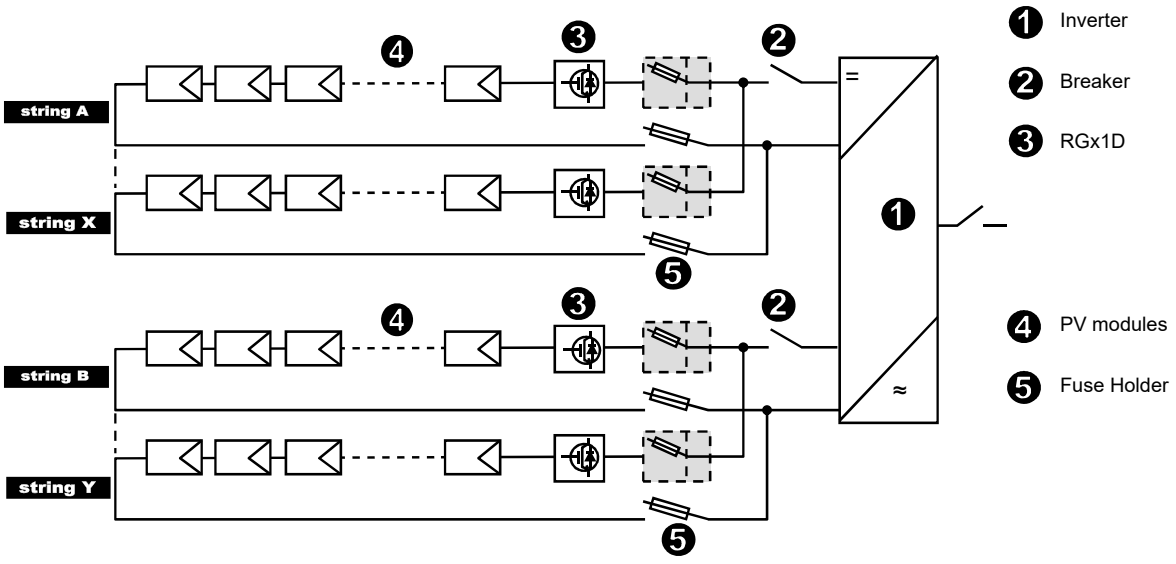
RGS to RGS1DIN mounting instructions



RGS..DIN installation instructions



Application example



Connection Specifications

Power connections		
Terminals	1/L+, 2 /L-	
Conductors	Use 75°C copper (Cu) conductors	
		
Connection type	M4 screw with captivated washer	
Stripping length	12 mm	
Rigid (solid & stranded) **UL/CSA rated data**	2x 2.5 – 6.0 mm² 2x 14 – 10 AWG	1x 2.5 – 6.0 mm² 1x 14 – 10 AWG
Flexible with end sleeve	2x 1.0 – 2.5 mm² 2x 2.5 – 4.0 mm² 2x 18 – 14 AWG 2x 14 – 12 AWG	1x 1.0 – 4.0 mm² 1x 18 – 12 AWG
Flexible without end sleeve	2x 1.0 – 2.5 mm² 2x 2.5 – 6.0 mm² 2x 18 – 14 AWG 2x 14 – 10 AWG	1x 1.0 – 6.0mm² 1x 18 –10 AWG
Torque specifications	Pozidriv bit 2 UL: 2.0 Nm (17.7 lb-in) IEC: 1.5 – 2.0 Nm (13.3 – 17.7 lb-in)	
Aperture for termination lug (fork or ring)	12.3 mm	

Note for RGC1D: M5 PE screw 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		
Terminals	A1+, A2-	
Conductors	Use 60/75°C copper (Cu) conductors	
		
Connection type	M3 screw with captivated washer	
Stripping length	8 mm	
Rigid (solid & stranded) **UL/CSA rated data**	2x 0.5 - 2.5 mm² 2x 18 - 12 AWG	1x 0.5 - 2.5 mm² 1x 18 - 12 AWG
Flexible with end sleeve	2x 0.5 - 2.5 mm² 2x 18 - 12 AWG	1x 0.5 - 2.5 mm² 1x 18 - 12 AWG
Torque specification	Pozidriv 1 UL: 0.5 Nm (4.4 lb-in), IEC: 0.5-0.6 Nm (4.4-5.3 lb-in)	

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