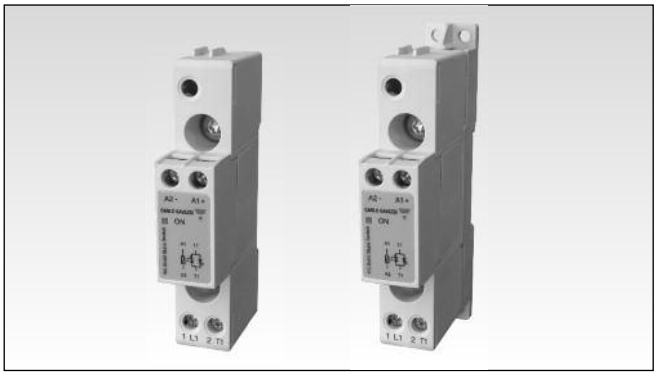
Solid State Relays
Industrial, 1-Phase, 17.5mm with built-in Varistor
Types RGS..U, RGS..UDIN



- **Zero cross switching AC solid state relay**
- **Rated Operational voltage: Up to 600Vrms**
- **Rated Operational current: Up to 30Arms**
- **Up to 1800A²s for I²t**
- **Control voltages: 3-32 VDC, 20-275 VAC (24-190VDC)**
- **Input connection: Screw terminal**
- **Output connection: Box clamp**
- **Design according to IEC/EN60947-4-2, IEC/EN60947-4-3, IEC/EN62314, UL508, CSA22.2 No. 14-10**
- **Integrated voltage transient protection with varistor**
- **RoHS compliant**
- **100 kA short circuit current rating according to UL508**
- **VDE approval**
- **Option for DIN mounting (RGS...DIN)**

Product Description

Aim of this solid state switching device is to switch heater loads and motor loads frequently. This range offers solutions up to 30AAC in 17.5mm width. Input connections are via a screw connection, having a captivated washer allowing for safe looping. Output connections are provided via box clamps. Other options with integrated heatsink are available in RGC ranges.

The RGS...DIN provides an option for DIN mounting of the RGS series. AC51 rating @ 40°C is 10AAC.

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

Ordering Key

RGS 1 A 60 D 30 K G U _

- **Solid state relay**
- **Number of poles**
- **Switching mode**
- **Rated operational voltage**
- **Control voltage**
- **Rated operational current**
- **Connection type for control**
- **Connection type for power**
- **Connection configuration**
- **Option**

Ordering Key

1Phase SSR with no heatsink	Rated Voltage	Control Voltage	Rated Current	Connection Control	Connection Power	Connection Configuration	Options[1]
RGS1A: ZC	23: 230V +10% - 15%	D: 3 - 32 VDC (4-32VDC)	20: 20A, 1200Vp 30: 30A, 1200Vp	K: Screw	G: Box clamp	U: SSR	HT: Thermal pad
RGS1B: IO	60: 600V +10% -15%	A: 20 - 275VAC (24-190 VDC)					H51: Heatsink RHS37A DIN: DIN rail mount X40: Bulk packaging of 40pcs.

1. Add suffix 'HT' to RGS part number for RGS with attached thermal pad. Add suffix 'H51' to RGS part number for factory mounted RGS on heatsink RHS37A. Add suffix 'DIN' to RGS part number for DIN rail mountable RGS.

Selection Guide - RGS.. (ZC = Zero Cross Switching, IO = Instant-On Switching)

Rated Output Voltage	Blocking Voltage	Connection Control/ Power	Control Voltage	Rated operational current @ 40°C 20 AAC	30 AAC
230VAC, ZC	800Vp	Screw/Box Clamp	3-32VDC	RGS1A23D20KGU	RGS1A23D30KGU
		Screw/Box Clamp	20-275VAC, 24-190VDC	RGS1A23A20KGU	RGS1A23A30KGU
600VAC, ZC	1200Vp	Screw/Box Clamp	4-32VDC	RGS1A60D20KGU	RGS1A60D30KGU
		Screw/Box Clamp	20-275VAC, 24-190VDC	RGS1A60A20KGU	RGS1A60A30KGU
600VAC, IO	1200Vp	Screw/Box Clamp	4-32VDC	RGS1B60D20KGU	RGS1B60D30KGU

Selection Guide - RGS..DIN (RGS for DIN Rail Mounting)

Rated Output Voltage	Blocking Voltage	Connection Control/ Power	Control Voltage	Rated operational current @ 40°C (I²t value in brackets) 10 AAC (525A²s)
230VAC, ZC	800Vp	Screw/Box Clamp	3-32VDC	RGS1A23D20KGUDIN
600VAC, ZC	1200Vp	Screw/Box Clamp	4-32VDC	RGS1A60D20KGUDIN

Output Voltage Specifications

	RGS..23..	RGS..60..
Operational Voltage Range	24-240 VAC, +10%, -15% on max	42-600 VAC, +10% -15% on max
Blocking Voltage	800Vp	1200 Vp
Internal Varistor	275V	625V

General Specifications

Latching voltage (across L1-T1)	20V
Operational frequency range	45 to 65Hz
Power factor	> 0.5 @ Vrated
CE marking	Yes
Touch Protection	IP20
Control input status	continuously ON Green LED, when control input is applied

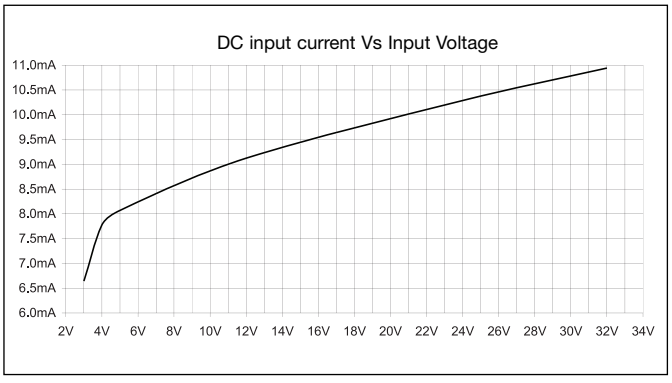
Pollution degree	2 (non-conductive pollution with possibilities of condensation)
Over-voltage category	III (fixed installations)
Isolation Input to Output Input&Output to Case	 4000Vrms 4000Vrms

Input Specifications (@ 25°C unless otherwise specified)

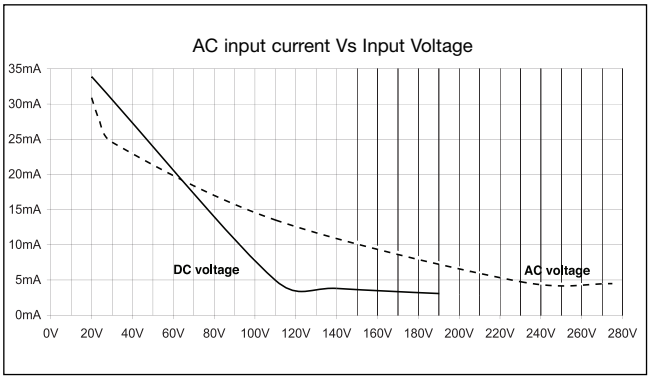
		RGS..D..[2]	RGS..A..
Control voltage range	RGS..23..	3 - 32 VDC	20 - 275 VAC, 24 (-10%) - 190 VDC
	RGS..60..	4 - 32 VDC	20 - 275 VAC, 24 (-10%) - 190 VDC
Pick-up voltage	RGS..23.. RGS..60..	3.0 VDC 3.8 VDC	20 VAC/DC
Drop-out voltage	RGS..23.. RGS..60..	1 VDC 1 VDC	5 VAC/DC
Maximum Reverse voltage		32 VDC	-
Response time pick-up ZC (RGS1A..)		0.5 cycle + 500µs @ 24VDC	2 cycles @ 230VAC/110VDC
Response time pick-up IO (RGS1B..)		350µs @ 24 VDC	N/A
Response time drop-out		0.5 cycle + 500µs @ 24VDC	0.5 cycle + 40ms @ 230VAC/110VDC
Input current @ 40°C		See diagrams below	See diagrams below

2: DC control to be supplied by a Class 2 power source

RG..D..



RG..A..



Motor Ratings[3]: HP (UL508) / kW (EN/IEC 60947-4-2) @ 40°C

	115 VAC	230 VAC	400 VAC	480 VAC	600 VAC
RGS..20	½HP / 0.18kW	1-½HP / 0.37kW	2HP / 0.75kW	3HP / 1.1kW	3HP / 1.5kW
RGS..30	¾HP / 0.37kW	2HP / 1.1kW	3HP / 1.5kW	5HP / 2.2kW	5HP / 3.7kW

3: Refer to heatsink selection table

Output Specifications

	RGS..20..	RGS..30..
Rated operational current AC-51 rating @ Ta=40°C (IEC60947-4-3/UL508)[3]	23 AAC	30 AAC
AC-53a rating @ Ta=40°C (IEC60947-4-2/ UL508)	5 AAC	8 AAC
Number of motor starts (x:6, Tx:6s, F:50%) at 40°C [3, 4]	30	30
Min. operational current	150 mAAC	250 mAAC
Rep. overload current - UL508: T_{AMB}=40°C, t_{ON}=1s, t_{OFF}=9s, 50cycles	60 AAC	84 AAC
Maximum Trasient Surge Current (I_{TSM}), t = 10ms	325Ap	600Ap
Maximum Off-state leakage current @ rated voltage	3 mAAC	3 mAAC
I^2t for fusing (t=10ms) Minimum	525 A^2s	1800A^2s
Crititcal dv/dt (@ Tj init = 40°C)	1000V/us	1000V/us

4 x: multiple of AC-53a current rating, Tx: duration of current surge, F: duty cycle.

Output Specifications for RGS..DIN

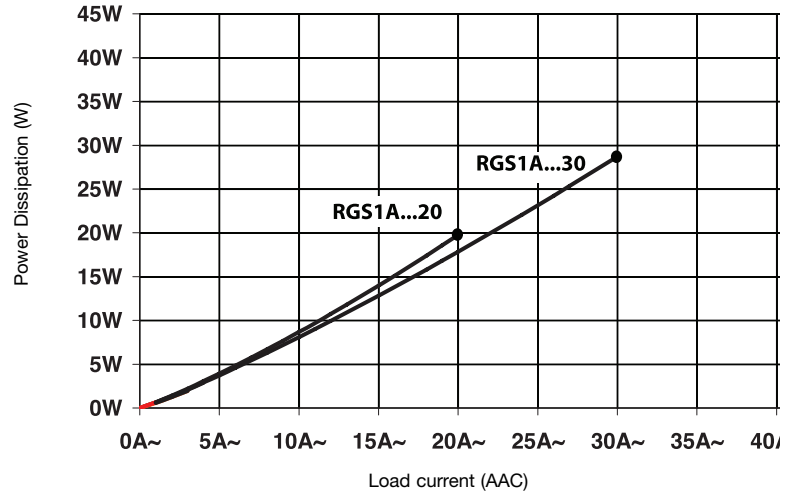
	RGS..20..DIN
Rated operational current [5] AC-51 rating @ Ta = 40°C AC-53a rating @ Ta = 40°C	10 AAC 5 AAC
Min. operational current	150 mA
Maximum transient surge current I_{TSM}, t=10ms	325Ap
Maximum Off-state leakage current @ rated voltage	3 mAAC
I^2t for fusing (t=10ms) Minimum	525 A^2s
Crititcal dv/dt (@ Tj init = 40°C)	1000V/us

5. Refer to Derating Curves

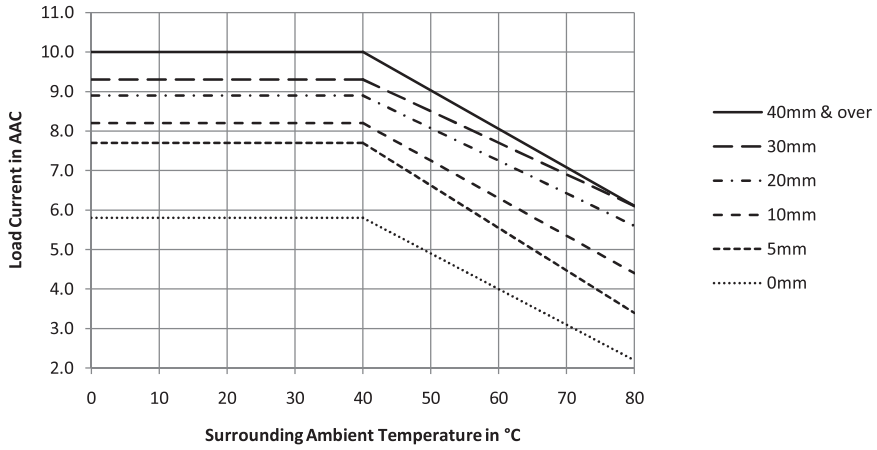
Agency Approvals and Conformances

Conformance	IEC/EN 62314 IEC/EN 60947-4-2 IEC/EN 60947-4-3
Agency Approvals	UL508 Recognised (E172877) CSA 22.2 No.14-10 (204075) VDE (0660-109)
Short Circuit Current rating	100kA, UL508

Output Power Dissipation



Derating vs. Spacing Curves for RGS...DIN



Electromagnetic Compatibility

EMC Immunity	IEC/EN 61000-6-2
Electrostatic Discharge (ESD)	
Immunity	IEC/EN 61000-4-2
Air discharge, 8kV	Performance Criteria 1
Contact, 4kV	Performance Criteria 1
Electrical Fast Transient	
(Burst) Immunity	IEC/EN 61000-4-4
Output: 2kV, 5kHz	Performance Criteria 1
Input: 1kV, 5kHz	Performance Criteria 1
Electrical Surge Immunity	IEC/EN 61000-4-5
Output, line to line, 1kV	Performance Criteria 1
Output, line to earth, 2kV	Performance Criteria 1
Input, line to line, 1kV	Performance Criteria 2
Input, line to earth, 2kV	Performance Criteria 2

Radiated Radio Frequency	
Immunity	IEC/EN 61000-4-3
10V/m, 80 - 1000 Mhz	Performance Criteria 1
10V/m, 1.4 - 2.0GHz	Performance Criteria 1
3 V/m, 2.0 - 2.7GHz	Performance Criteria 1
Conducted Radio Frequency Immunity	IEC/EN 61000-4-6
10V/m, 0.15 - 80 MHz	Performance Criteria 1
Voltage Dips Immunity	IEC/EN 61000-4-11
0% for 10ms/20ms	Performance Criteria 2
40% for 200ms	Performance Criteria 2
70% for 500ms	Performance Criteria 2
Voltage Interruptions Immunity	IEC/EN 61000-4-11
0% for 5000ms	Performance Criteria 2

EMC Emission	IEC/EN 61000-6-4
Radio Interference	
Voltage Emission (Conducted)	IEC/EN 55011
0.15 - 30MHz	Class A (industrial) with filters - see filter information
	IEC/EN 60947-4-2, 60947-4-3 Class A (no filtering needed)

Radio Interference	
Field Emission (Radiated)	IEC/EN 55011
30 - 1000MHz	Class A (industrial)

Filtering - IEC/EN 55011 Class A compliance (for class B compliance contact us)

Part Number	Suggested filter for compliance	Maximum Heater current
RGS1A23..20	68 nF / 275 V / X1	20 A
RGS1A23..30	220 nF / 275 V / X1	30 A
RGS1A60..20	100 nF / 760 V / X1	20 A
RGS1A60..30	330 nF / 760 V / X1	30 A

Note:

- 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. DC input type require surge suppression for full compliance to EN55011.
- Performance Criteria 1: No degradation of performance or loss of function is allowed when the product is operated as intended.
- Performance Criteria 2: 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: Temporary loss of function is allowed, provided the function can be restored by manual operation of the controls.

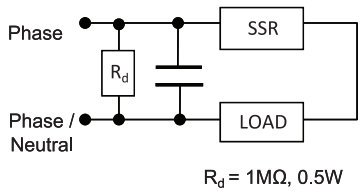
Environmental Specifications

Operating Temperature	-40°C to 80°C (-40°F to +176°F)
Storage Temperature	-40°C to 100°C (-40°F to +212°F)
RoHS (2002/95/EC)	Compliant
Impact resistance (EN 50155, EN 61373)	15/11 g/ms
Vibration resistance (2-100Hz, IEC60068-2-26, EN 50155, EN 61373)	5g per axis

Relative humidity	95% non-condensing @ 40°C
UL flammability rating (housing)	UL 94 V0
Installation altitude	0-1000m. Above 1000m derate linearly by 1% of FLC per 100m up to a maximum of 2000m

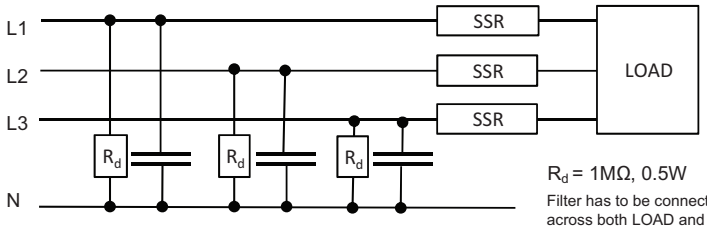
Filter Connection diagram

1 Phase



R_d = 1MΩ, 0.5W

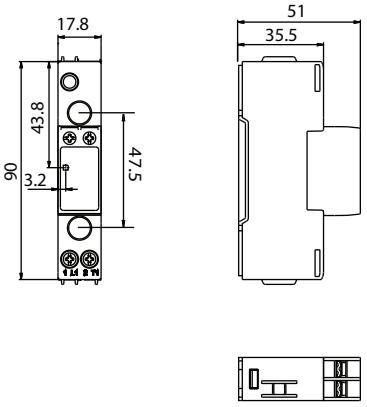
3 Phase



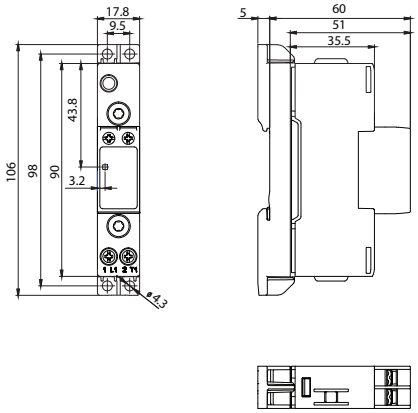
R_d = 1MΩ, 0.5W
Filter has to be connected across both LOAD and SSR

Terminal Layout and Dimensions

RGS ....KGU



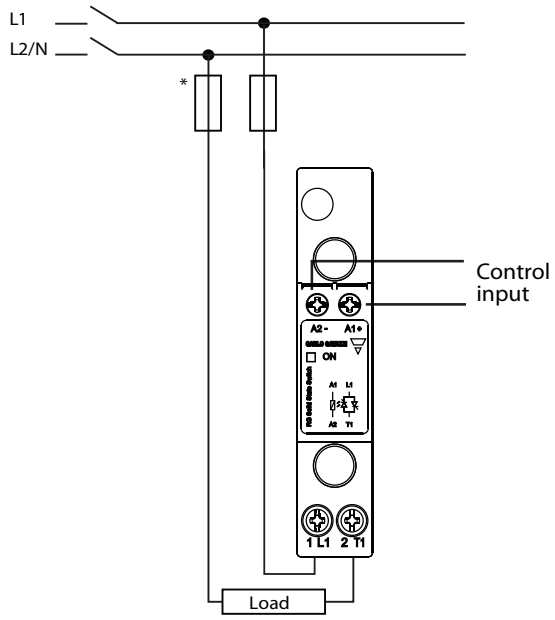
RGS ....KGUDIN



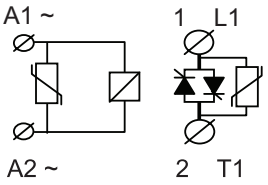
1/L1: Supply connection
2/T1: Load connection
A1 (+): Positive control signal
A2 (-): Control ground

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

Connection Diagram

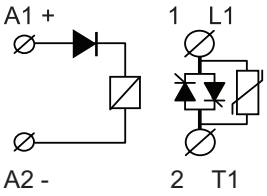


AC Controlled



In AC controlled types only (RG..A..) a varistor is placed across A1/A2 terminals.

DC Controlled



In DC controlled types only (RG..D..) a diode is placed in series with the control circuit for protection against reverse biased connection.

Connection Specifications

POWER CONNECTIONS: 1/L1, 2 /T1

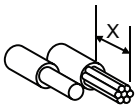
Torque specifications

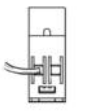
Use 60°C copper (Cu) conductors

M3.5, Pozidriv 2
UL: 2Nm (17.7lb-in)
IEC: 1.5 - 2Nm (13.3 - 17.7 lb-in)

Stripping Length (X) 12mm

Rigid (Solid & Stranded)
UL/ CSA rated data





1 x 1..6 mm²
1 x 18..10 AWG

Flexible with end sleeve

1 x 0.5..2.5mm²
1 x 20..14AWG

Flexible without end sleeve

1 x 1..4 mm²
1 x 18..12 AWG

CONTROL CONNECTIONS: A1(+), A2(-)

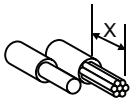
Torque specifications

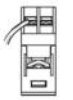
Use 60/75°C copper (Cu) conductors

M3, Pozidriv 1
UL: 0.5Nm (4.4lb-in)
IEC: 0.5 - 0.6Nm (4.4 - 5.3 lb-in)

Stripping Length (X) 8mm

Rigid (Solid & Stranded)





2 x 0.5..2.5mm²
2 x 18..12 AWG

1 x 0.5..2.5mm²
1 x 18..12 AWG

Flexible with end sleeve

2 x 0.5..2.5mm²
2 x 18..12AWG

1 x 0.5..2.5mm²
1 x 18..12AWG

Heatsink Selection

RGS1...20

Load current [A]	Thermal resistance [K/W]							Power dissipation [W]
23.0	3.45	3.02	2.59	2.16	1.73	1.29	0.86	23.2
20.7	3.93	3.44	2.95	2.46	1.97	1.48	0.98	20.3
18.4	4.55	3.98	3.41	2.84	2.27	1.70	1.14	17.6
16.1	5.35	4.68	4.01	3.34	2.67	2.01	1.34	15.0
13.8	6.44	5.63	4.83	4.02	3.22	2.41	1.61	12.4
11.5	8.00	7.00	6.00	5.00	4.00	3.00	2.00	10.0
9.2	10.39	9.09	7.79	6.50	5.20	3.90	2.60	7.7
6.9	14.50	12.69	10.88	9.07	7.25	5.44	3.63	5.5
4.6	23.06	20.18	17.29	14.41	11.53	8.65	5.76	3.5
2.3	50.39	44.09	37.79	31.49	25.20	18.90	12.60	1.6
	20	30	40	50	60	70	80	T_A

Ambient temp [°C]

Maximum junction temperature	125°C
Heatsink temperature	100°C
Junction to case thermal resistance, Rthjc	<0.45 K/W
Case to heatsink thermal resistance, Rthcs[6]	< 0.25 K/W

RGS1...30

Load current [A]	Thermal resistance [K/W]							Power dissipation [W]
32.0	2.62	2.29	1.97	1.64	1.31	0.98	0.66	30.5
28.8	2.98	2.60	2.23	1.86	1.49	1.12	0.74	26.9
25.6	3.43	3.00	2.57	2.14	1.71	1.29	0.86	23.3
22.4	4.01	3.51	3.01	2.51	2.01	1.51	1.00	19.9
19.2	4.81	4.21	3.61	3.01	2.41	1.80	1.20	16.6
16.0	5.94	5.20	4.46	3.71	2.97	2.23	1.49	13.5
12.8	7.69	6.73	5.76	4.80	3.84	2.88	1.92	10.4
9.6	10.68	9.34	8.01	6.67	5.34	4.00	2.67	7.5
6.4	16.89	14.78	12.67	10.56	8.45	6.33	4.22	4.7
3.2	36.77	32.17	27.58	22.98	18.38	13.79	9.19	2.2
	20	30	40	50	60	70	80	T_A

Ambient temp [°C]

Maximum junction temperature	125°C
Heatsink temperature	100°C
Junction to case thermal resistance, Rthjc	<0.3 K/W
Case to heatsink thermal resistance, Rthcs[6]	< 0.25 K/W

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

Heatsink Selection for RGS...HT

RGS1...20..HT

Load current [A]	Thermal resistance [K/W]							Power dissipation [W]
23.0	3.18	2.75	2.32	1.88	1.45	1.02	0.59	23.2
20.7	3.81	3.32	2.83	2.34	1.85	1.35	0.86	20.3
18.4	4.55	3.98	3.41	2.84	2.27	1.70	1.14	17.6
16.1	5.35	4.68	4.01	3.34	2.67	2.01	1.34	15.0
13.8	6.44	5.63	4.83	4.02	3.22	2.41	1.61	12.4
11.5	8.00	7.00	6.00	5.00	4.00	3.00	2.00	10.0
9.2	10.39	9.09	7.79	6.50	5.20	3.90	2.60	7.7
6.9	14.50	12.69	10.88	9.07	7.25	5.44	3.63	5.5
4.6	23.08	20.18	17.29	14.41	11.53	8.65	5.76	3.5
2.3	50.39	44.09	37.79	31.49	25.20	18.90	12.60	1.6
	20	30	40	50	60	70	80	T_A

Ambient temp [°C]

Maximum junction temperature	125°C
Heatsink temperature	100°C
Junction to case thermal resistance, Rthjc	<0.45 K/W
Case to heatsink thermal resistance, Rthcs	< 0.9 K/W

RGS1...30..HT

Load current [A]	Thermal resistance [K/W]							Power dissipation [W]
32.0	2.29	1.96	1.64	1.31	0.98	0.65	0.33	30.5
28.8	2.76	2.39	2.01	1.64	1.27	0.90	0.52	26.9
25.6	3.35	2.92	2.49	2.06	1.63	1.21	0.78	23.3
22.4	4.01	3.51	3.01	2.51	2.01	1.51	1.00	19.9
19.2	4.81	4.21	3.61	3.01	2.41	1.80	1.20	16.6
16.0	5.94	5.20	4.46	3.72	2.97	2.23	1.49	13.5
12.8	7.69	6.73	5.77	4.80	3.84	2.88	1.92	10.4
9.6	10.68	9.34	8.01	6.67	5.34	4.00	2.67	7.5
6.4	16.89	14.78	12.67	10.56	8.45	6.33	4.22	4.7
3.2	36.77	32.17	27.58	22.98	18.38	13.79	9.19	2.2
	20	30	40	50	60	70	80	T_A

Ambient temp [°C]

Maximum junction temperature	125°C
Heatsink temperature	100°C
Junction to case thermal resistance, Rthjc	<0.3 K/W
Case to heatsink thermal resistance, Rthcs	< 0.85 K/W

CARLO GAVAZZI

Mounting Instructions

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

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

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 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 100,000A rms Symmetrical Amperes, 600Volts maximum when protected by fuses. Tests at 100,000A were performed with Class J, fast acting; please refer to the table below for maximum allowed ampere rating of the fuse. Use fuses only. Tests with class J fuses are representative of Class CC fuses.

Co-ordination type 1 (UL508)

Part no.	Max. fuse size [A]	Class	Current [kA]	Voltage [VAC]
RGS..20	10	J	100	Max. 600
	15	CC	100	Max. 600
RGS..30	30	J or CC	100	Max. 600

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

Part No.	Ferraz Shawmut		Siba		Current [kA]	Voltage [VAC]
	Max fuse size [A]	Part number	Max fuse size [A]	Part number		
RGS..20	32	6.9xx CP URD 22x58/32, (xx = 00 or 21)	32	50 142 06.32	100	Max. 600
RGS..30	40	A70QS40-4	32	50 142 06.32	100	Max. 600

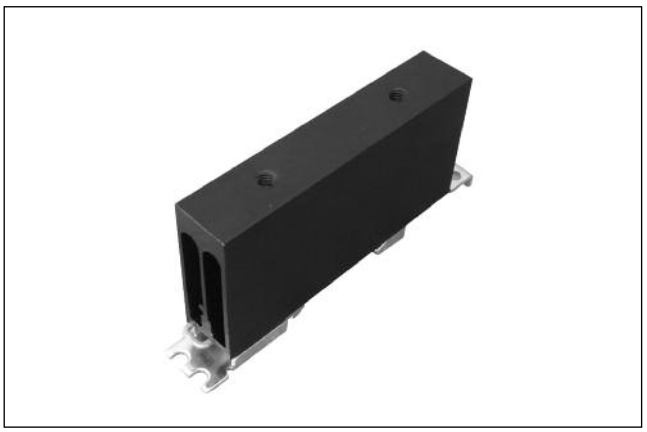
Type 2 Protection with Miniature Circuit Breakers (M.C.B.s)

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][7]
RGS..20	**1 pole**			
	S201 - Z4 (4A)	S201 - B2 (2A)	1.0	21.0
	S201 - Z6 UC (6A)	S201 - B2 (2A)	1.0	21.0
			1.5	31.5
RGS..30	**1 pole**			
	S201 - Z10 (10A)	S201-B4 (4A)	1.0	7.6
			1.5	11.4
			2.5	19.0
	S201 - Z16 (16A)	S201-B6 (6A)	1.0	5.2
			1.5	7.8
			2.5	13.0
			4.0	20.8
	S201 - Z20 (20A)	S201-B10 (10A)	1.5	12.6
			2.5	21.0
	S201 - Z25 (25A)	S201-B13 (13A)	2.5	25.0
			4.0	40.0
	2 pole			
	S202 - Z25 (25A)	S202-B13 (13A)	2.5	19.0
			4.0	30.4

7. 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

Heatsink RHS37A

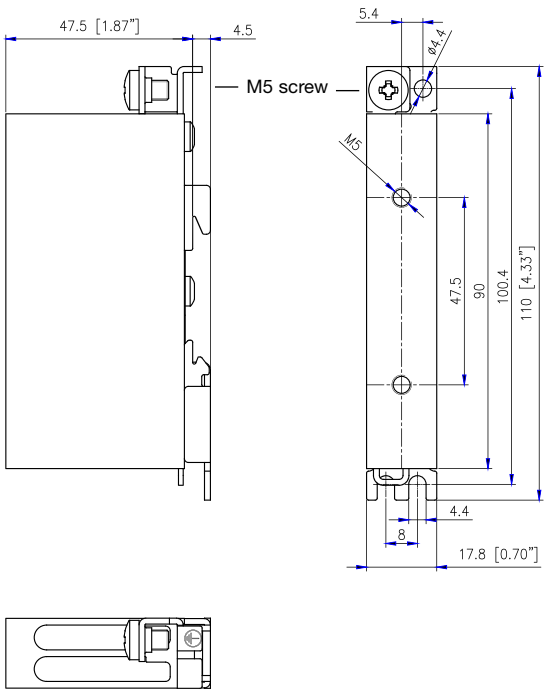


Ordering Key

Heatsink with DIN Rail clip	**RHS37A**
Factory mounted heatsink to RGS	**RGS....H51**

Refer to 'RHS37A' datasheet for further details

RHS37A Dimensions

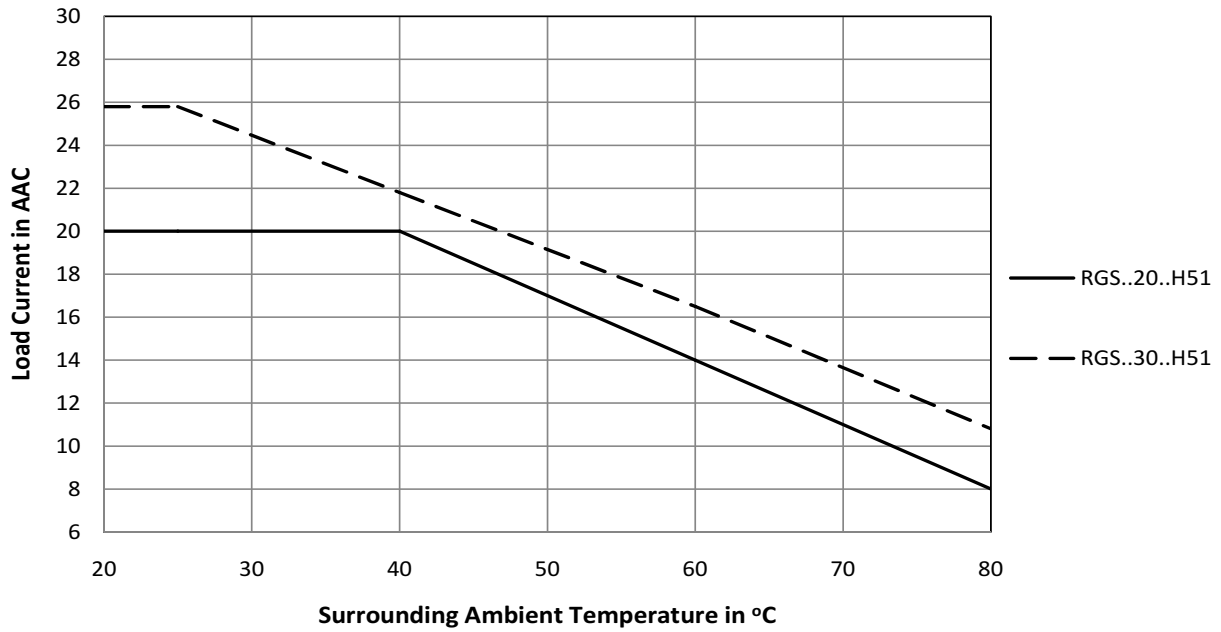


All dimensions in mm

Note: M5 PE screw not provided with SSR. Maximum mounting torque 1.5Nm (13.3 in-lb).
PE connection required when product is intended to be used in Class 1 applications according to EN/IEC 61140.

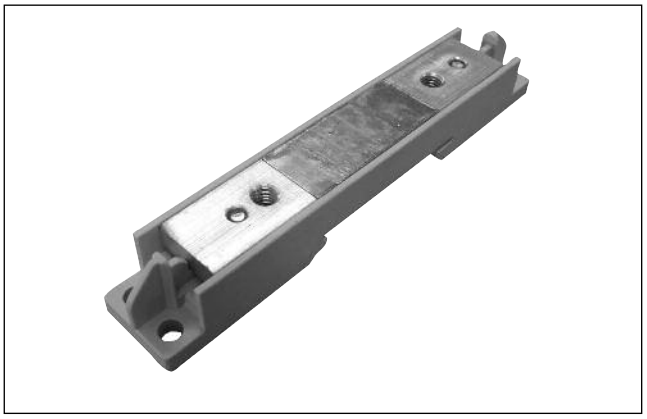
Accessories (cont.)

Derating Curves (RGS assembled to heatsink RHS37A)



Accessories (cont.)

RG DIN Clip

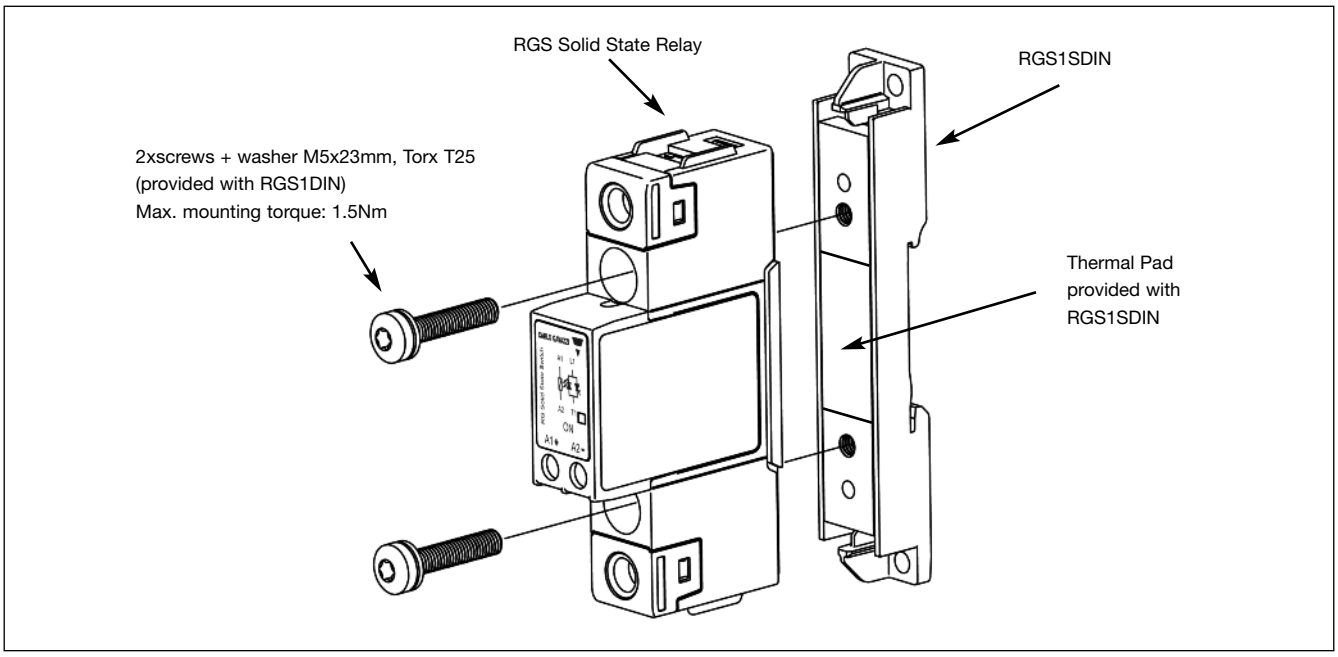


Ordering Key

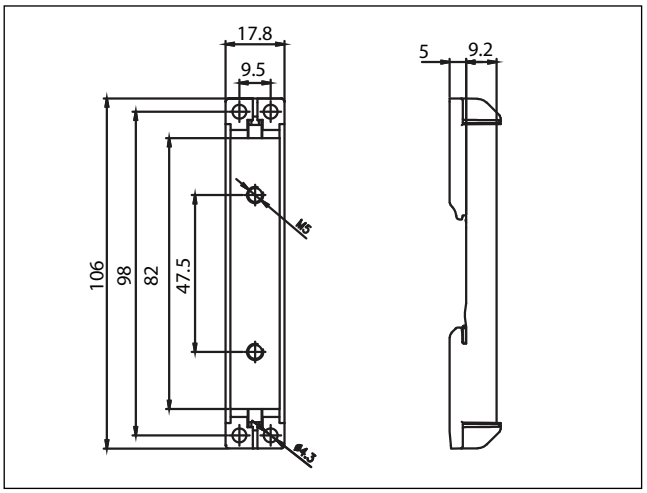
DIN clip mounted to RGS	**RGS....DIN**
DIN clip accessory	**RGS1DIN**

This DIN Clip accessory can be mounted to any RGS model and will enable the RGS to be DIN rail mount. Current rating @40˚C is 10AAC. Refer to 'Current Derating' section. Gradually tighten the SSR, alternating between the 2 screws, to a maximum torque of 1.5Nm.

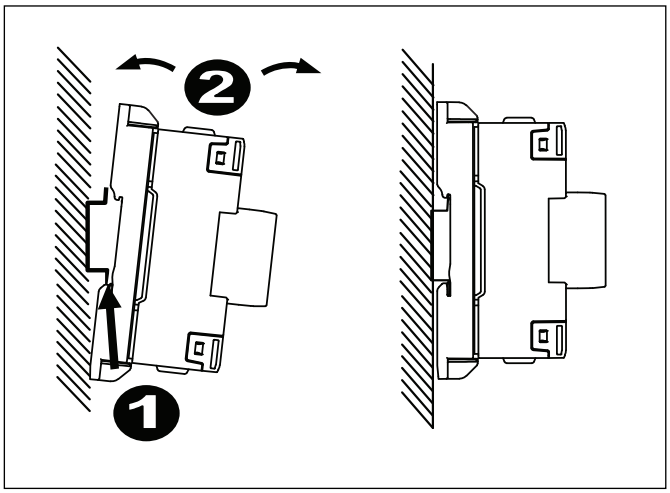
Mounting Instructions for RGS1DIN to RGS



RGS1DIN Dimensions



Installation Instructions



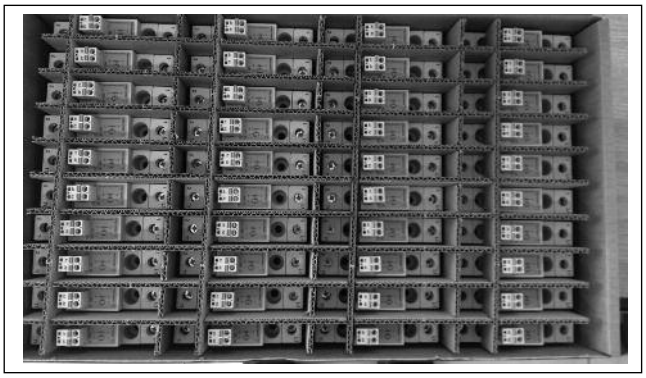
Accessories (cont.)

Thermal Pads

Ordering Key

Thermal pad mounted on RGS	**RGS...HT**
Pack of 10 thermal pads size: 34.6mm x 14mm	**RGHT**

Packaging



Ordering Key

Bulk packaging of 40 pcs. RGS...	**RGS...X40**