

Solid State Relays Zero Switching with Integrated Current Monitoring Types RGC1S, RGS1S

CARLO GAVAZZI



- Product width ranging from 22.5mm to 70mm
- Available with or without integrated heatsink
- Partial load failure detection
- Ratings up to 600VACrms & 85AACrms @ 40°C
- Up to 6600A²s for I²t and 1200Vp for blocking voltage
- Control voltage range : 4 - 32 VDC
- Local or remote current set-point
- LED indications for the different faults
- Alarm signal output for SSR or load circuit malfunction
- IP20 protection
- Integrated voltage transient protection with varistor
- RoHS compliant
- Short circuit current rating 100kArms

Product Description

This slim RG design is capable of detecting various failure modes occurring to the heaters and also to the product itself. Failures which can be detected include partial load failure, heater loss, open circuit SSR, short circuit SSR and SSR over temperature. A normally closed, potential free alarm, opens in the event of a system or power semiconductor fault.

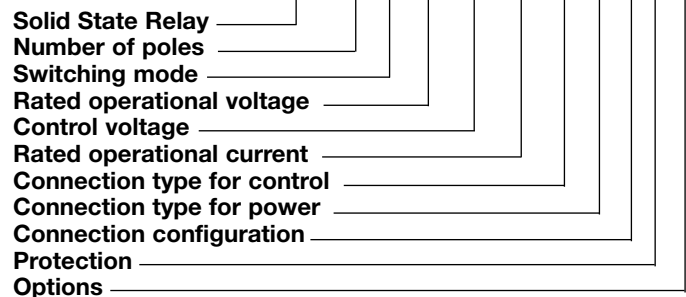
A load current setpoint has to be TEACHed to the SSR either locally by the TEACH button

on the front of the device or remotely through the provided terminal.

This product is available either with integrated heatsink (RGC1S series) and also without heatsink (RGS1S series). The minimum product width is 22.5mm. The control and auxiliary terminals are double box clamps to facilitate safe looping whilst the power terminals are either screw terminals or box clamps depending on the model selected.

Note: Specifications stated at 25°C unless specified.

Ordering Key **RGC 1 S 60 D 30 G K E P**



Ordering Key

| 1-Phase SSR | Switching Mode | Rated V, Blocking V* | Control Voltage | Rated Current ¹ | I ² t Data | Connection Input | Connection Output | Connection Configuration | Protection |
|---------------------------|-----------------------|-------------------------|-----------------|--|---|------------------|-----------------------------|--------------------------|---------------------------------------|
| RGC1: with heatsink | S: Zero cross with | 60:600VAC +10% -15%, | D: 4-32VDC | 2: 20AAC 3: 30AAC 4: 40AAC 6: 60AAC 9: 85AAC | 0: Standard 1: High I ² t | G: Box Clamp | K: Screw G: Box Clamp | E: Contactor U: SSR | P: Over- temperature protection |
| RGS1: with no heatsink | current sensing | 1200Vp | | | | | | | |

* Rated voltage, Blocking voltage

1: refer to derating curves for RGC models and heatsink selection tables for RGS models

Selection Guide: RGC1S (with integrated heatsink)

| Rated Output Voltage, Blocking Voltage | Connection Control/ Power | Control Voltage | Configuration | Rated operational current (P _t value in brackets) | | |
|---|------------------------------|--------------------|---------------|--|----------------------------------|------------------------------|
| | | | | 20AAC (525A ² s) | 30AAC (1800A ² s) | 30AAC (6600A ² s) |
| 600VAC, 1200Vp | Box Clamp/ Screw | 4 - 32VDC | E | RGC1S60D20GKEP | RGC1S60D30GKEP | RGC1S60D31GKEP |
| Rated Output Voltage, Blocking Voltage | Connection Control/ Power | Control Voltage | Configuration | Rated operational current (P _t value in brackets) | | |
| | | | | 40AAC (6600A ² s) | 60AAC (6600A ² s) | 85AAC (6600A ² s) |
| 600VAC, 1200Vp | Box Clamp/ Box Clamp | 4 - 32VDC | E U | RGC1S60D41GGEP RGC1S60D41GGUP | RGC1S60D61GGEP RGC1S60D61GGUP | RGC1S60D90GGEP - |

Selection Guide: RGS1S (with no heatsink)

| Rated Output Voltage, Blocking Voltage | Connection Control/ Power | Control Voltage | Configuration | Rated operational current (P _t value in brackets) | | |
|---|------------------------------|--------------------|---------------|--|------------------------------|------------------------------|
| | | | | 20AAC (525A ² s) | 30AAC (1800A ² s) | 30AAC (6600A ² s) |
| 600VAC, 1200Vp | Box Clamp / Screw | 4 - 32VDC | E | RGS1S60D20GKEP | RGS1S60D30GKEP | RGS1S60D31GKEP |
| Rated Output Voltage, Blocking Voltage | Connection Control/ Power | Control Voltage | Configuration | Rated operational current (P _t value in brackets) | | |
| | | | | 60AAC (6600A ² s) | | |
| 600VAC, 1200Vp | Box Clamp/ Box Clamp | 4 - 32VDC | E U | RGS1S60D61GGEP RGS1S60D61GGUP | | |

Output Voltage Specifications

| | |
|---------------------------|--------------------------------|
| Operational Voltage Range | 42-600 VAC +10% -15% on max |
| Blocking Voltage | 1200 Vp |
| Internal Varistor | 625V |

Output Specifications

| | RG.1S..20 | RG.1S..30 | RG.1S..31 | RGC1S..41 | RG.1S..61 | RGC1S..90 |
|---|-------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Rated operational current ² | | | | | | |
| AC-51 @ T _a =25°C RGC1S | 25.5 AAC | 30 AAC | 30 AAC | 49 AAC | 75 AAC | 85 AAC |
| AC-51 @ T _a =40°C RGC1S | 23 AAC | 30 AAC | 30 AAC | 40 AAC | 60 AAC | 85 AAC |
| Max. AC-51 rating RGS1S | 23 AAC | 30 AAC | 30 AAC | n/a | 60 AAC | n/a |
| Minimum TEACH Current ³ | 1.2 AAC | 1.2 AAC | 1.2 AAC | 1.2 AAC | 5 AAC | 5 AAC |
| Minimum partial load current | 0.2 AAC | 0.2 AAC | 0.2 AAC | 0.2 AAC | 0.83 AAC | 0.83 AAC |
| Detectable partial load failure | >16.67% from current setpoint | | | | | |
| Rep. overload current - UL508, PF=0.4-0.5 T _{AMB} =40°C, t _{ON} =1s, t _{OFF} =9s, 50cycles | 60 AAC | 84 AAC | 84 AAC | 126 AAC | 144 AC | 168 AAC |
| Max.off-state leakage current | 3 mAAC | 3 mAAC | 3 mAAC | 3 mAAC | 3 mAAC | 3 mAAC |
| Max. Transient Surge Current (I _{tsm}) | 325 Ap | 600 Ap | 1150 Ap | 1150 Ap | 1150 Ap | 1150 Ap |
| I _t (10ms) Minimum | 525 A ² s | 1800 A ² s | 6600 A ² s | 6600 A ² s | 6600 A ² s | 6600 A ² s |
| Critical dv/dt (@ T _j init = 25°C) | 1000 V/μs | 1000 V/μs | 1000 V/μs | 1000 V/μs | 1000 V/μs | 1000 V/μs |

2: refer to derating curves for RGC models and heatsink selection tables for RGS models

3: refer to EMC specifications

General Specifications

| | | | |
|---------------------------------|-----------------------|--|---|
| Latching voltage (across L1-T1) | ≤ 20 VAC | Pollution degree | 2 (non-conductive pollution with possibilities of condensation) |
| Operational frequency range | 45 - 65 Hz | Over-voltage category | III (fixed installations) |
| Power factor | > 0.5 @ Vrated | Isolation | |
| Finger protection | IP20 | Input to Output IN1, IN2, A1+, A2- to L1, T1 | 2500Vrms |
| LEDs status indication | | Alarm to Output 11+, 12- to L1, T1 | 2500Vrms |
| Supply ON | Green, half intensity | Alarm to Input 11+, 12- to A1+, A2-, IN1, IN2 | 500Vrms |
| Control ON | Green, full intensity | Input & Output to Case | 4000Vrms |
| Load ON | Yellow | | |
| Fault | Red ⁴ | | |

Supply Specifications (A1+, A2-)

| | |
|----------------------|---|
| Rated supply voltage | 24 VDC -15%, +20% |
| Reverse protection | Yes |
| Max. supply current | 50 mA |
| Fan supply RGC1S..90 | Supplied directly to fan 24VDC +/-10%, 50mA nominal |

Remote TEACH specifications (IN1)

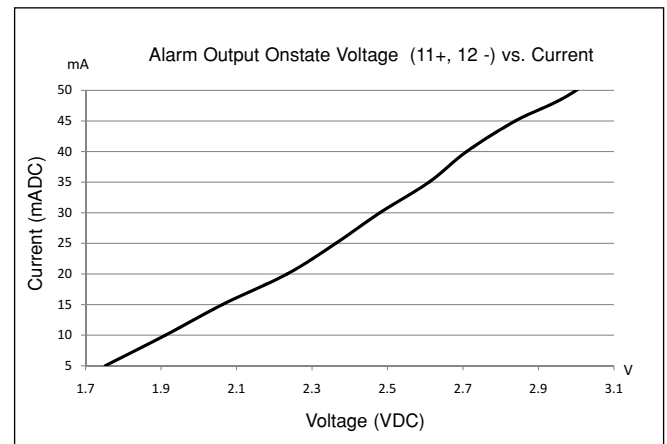
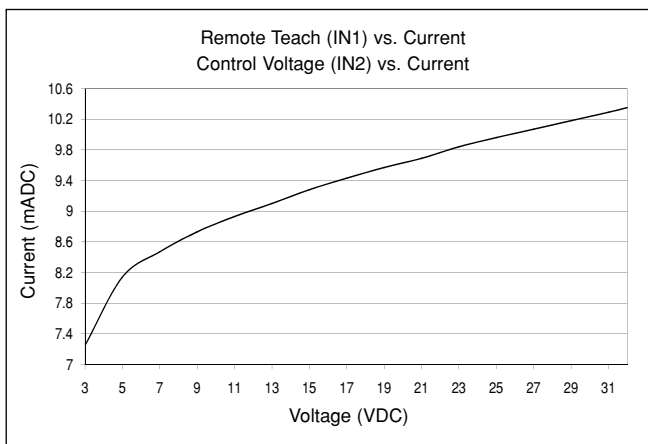
| | |
|------------------------------------|----------------|
| Control voltage range ⁵ | 4 - 32 VDC |
| Input current | refer to chart |
| Reverse protection | Yes |

Alarm Specifications (11+, 12-)

| | |
|------------------------------|----------------------|
| Output Type | PNP Open Collector |
| Normal State ⁶ | Normally Closed |
| Maximum rating | 35Vdc, 50mADC |
| Visual Indication | Red LED ⁴ |
| Alarm output onstate voltage | refer to chart |

Control Specifications (IN2)

| | |
|--------------------------------------|---------------------------|
| Control voltage range ^{5,7} | 4 - 32 VDC |
| Pick-up voltage | 3.8 VDC |
| Drop-out voltage | 1 VDC |
| Maximum reverse voltage | 32 VDC |
| Input current | refer to chart |
| Max Response time pick-up | 0.5 cycle + 500us @ 24VDC |
| Min Response time drop-out | 0.5 cycle + 500us @ 24VDC |



4: refer to Alarm LED Indications

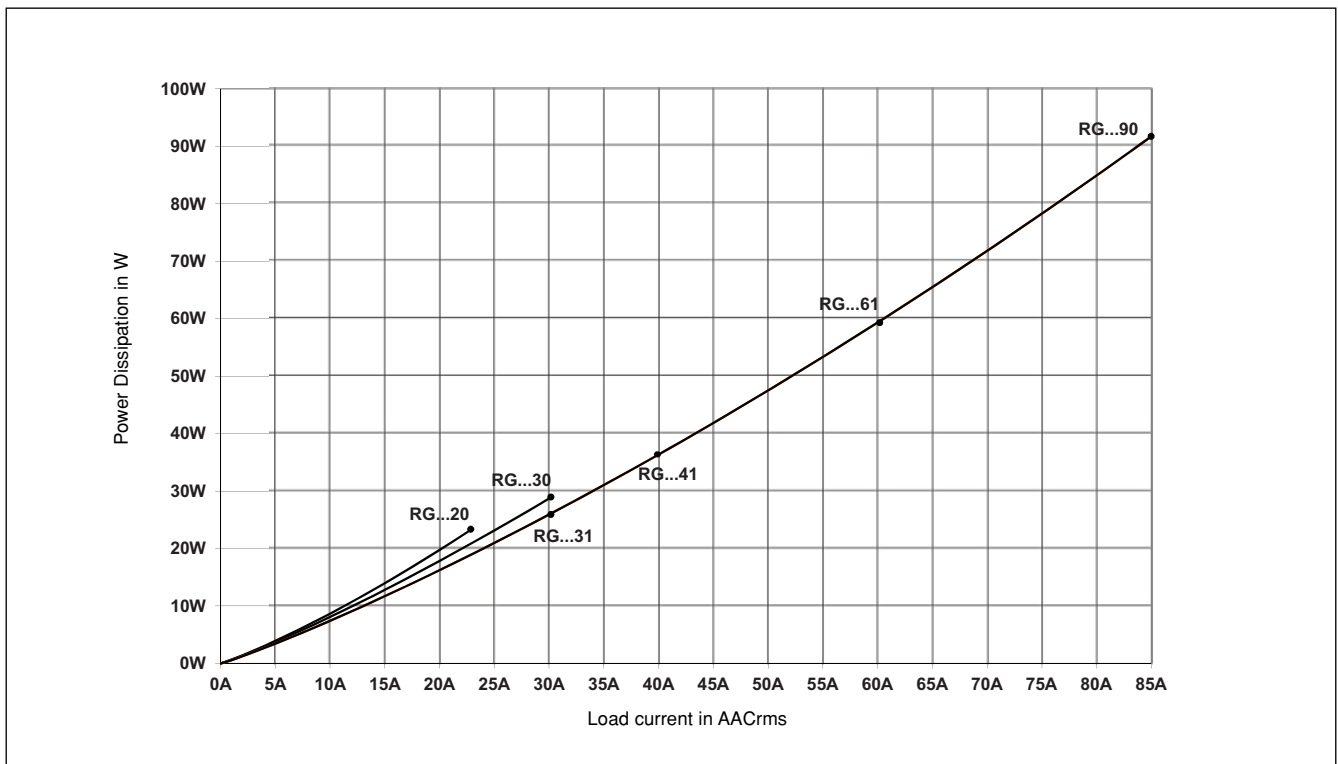
5: DC control to be supplied by a Class 2 power source

6: The alarm will open in the case when the power supply is removed

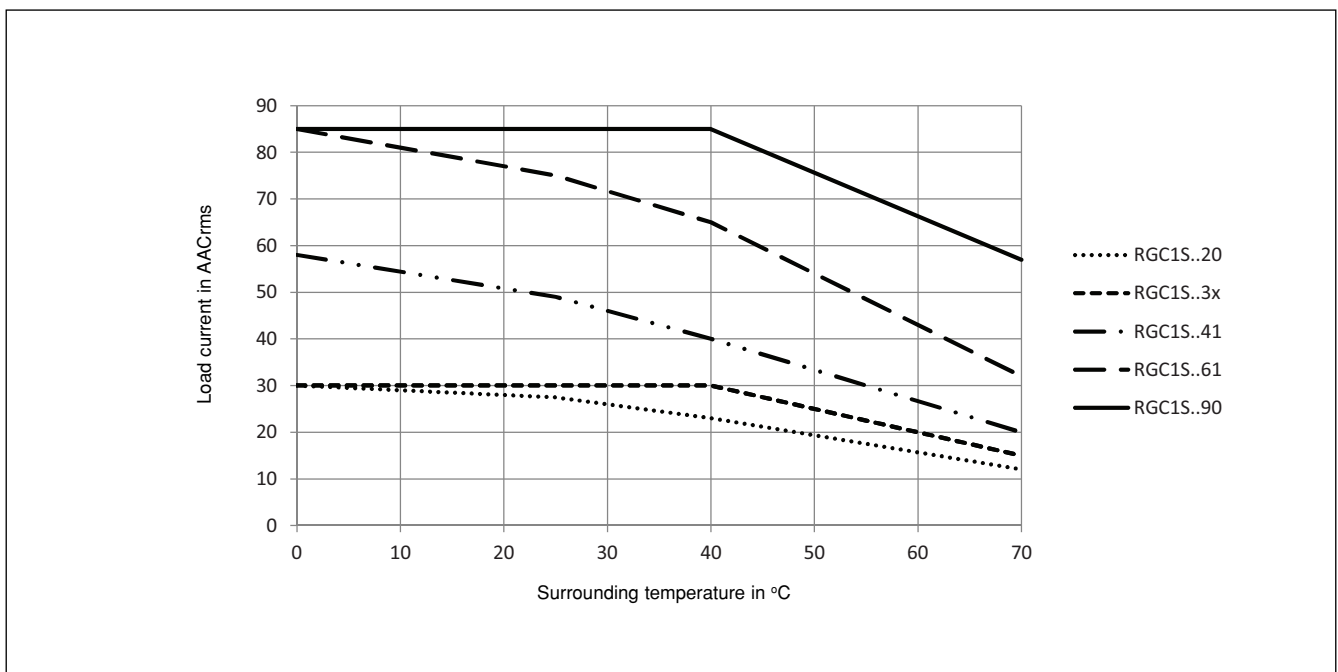
7: Minimum duty cycle is 120ms ON, 120ms OFF

The duty cycle must allow for stabilisation of load current in order to have a correct current set point

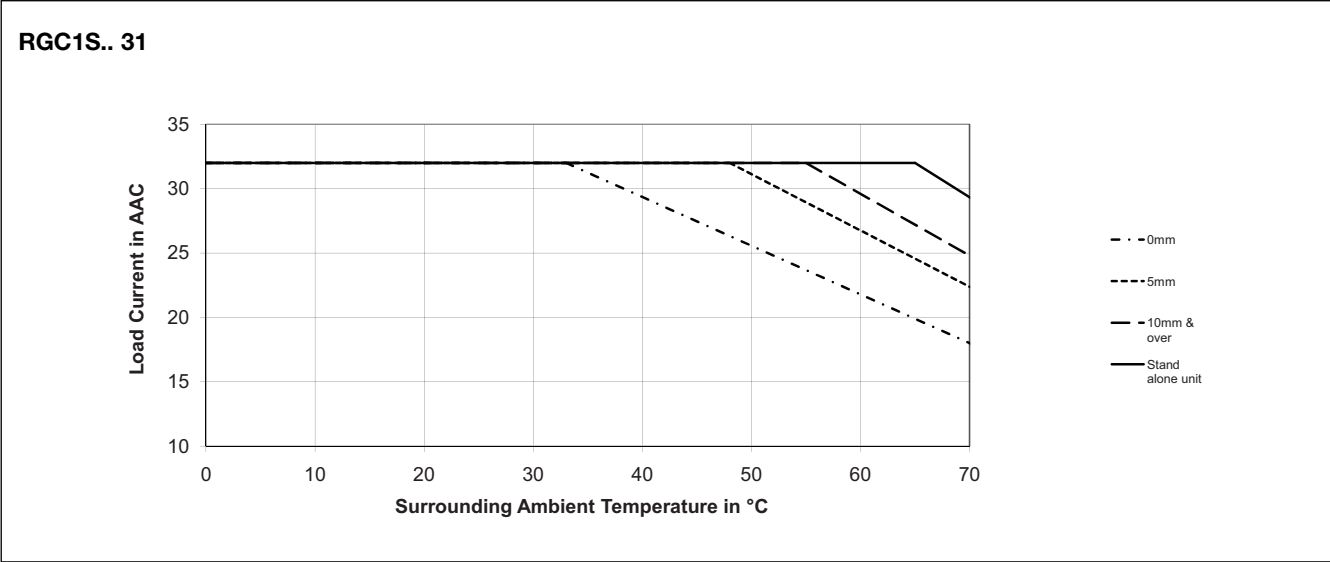
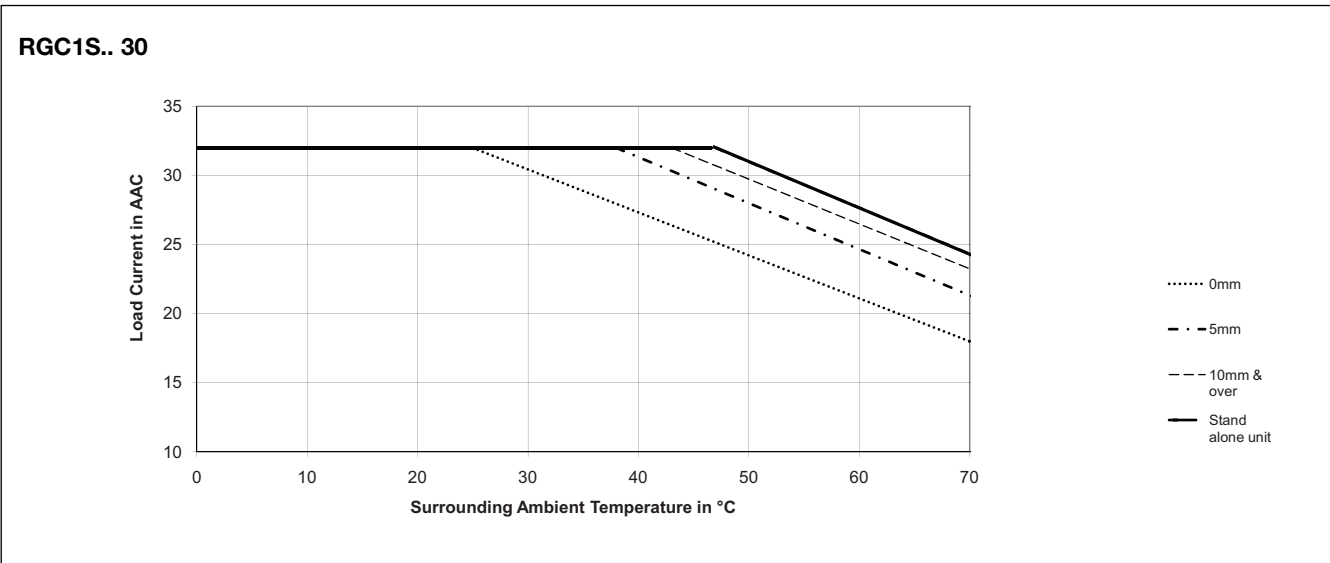
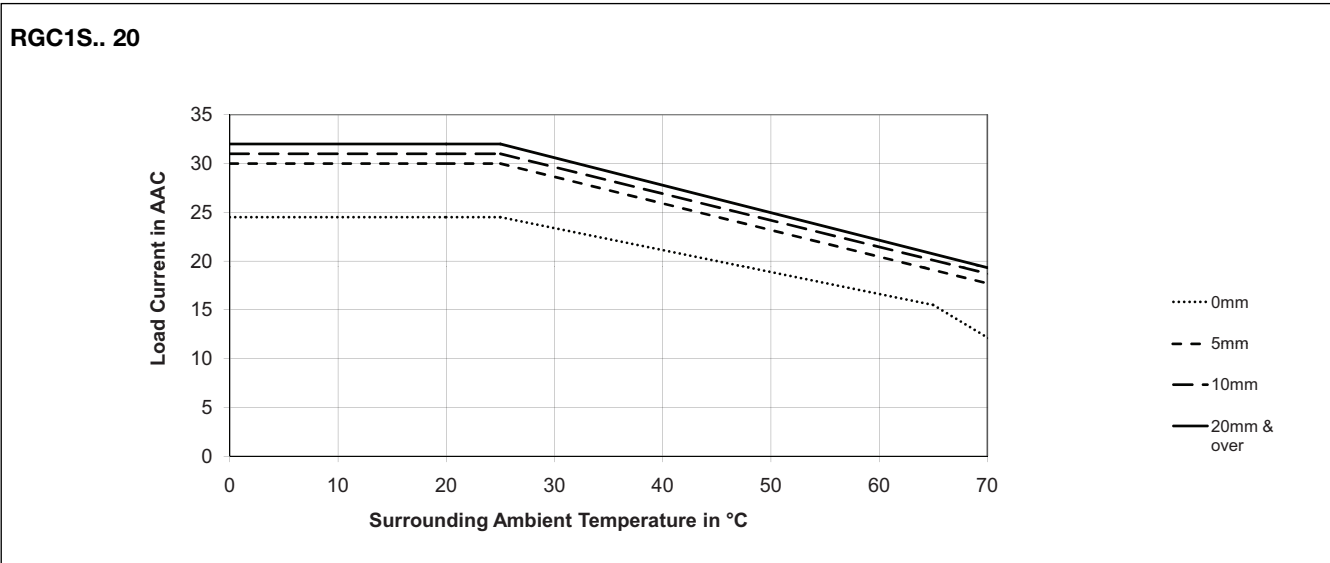
Output Power Dissipation



Current Derating (UL508) for RGC1S

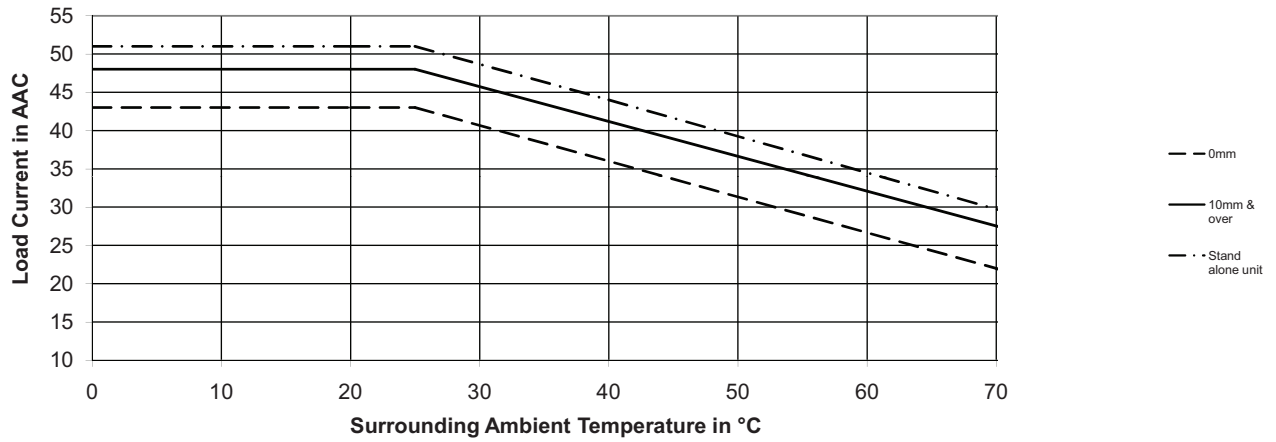


Derating vs. Spacing Curves for RGC1S

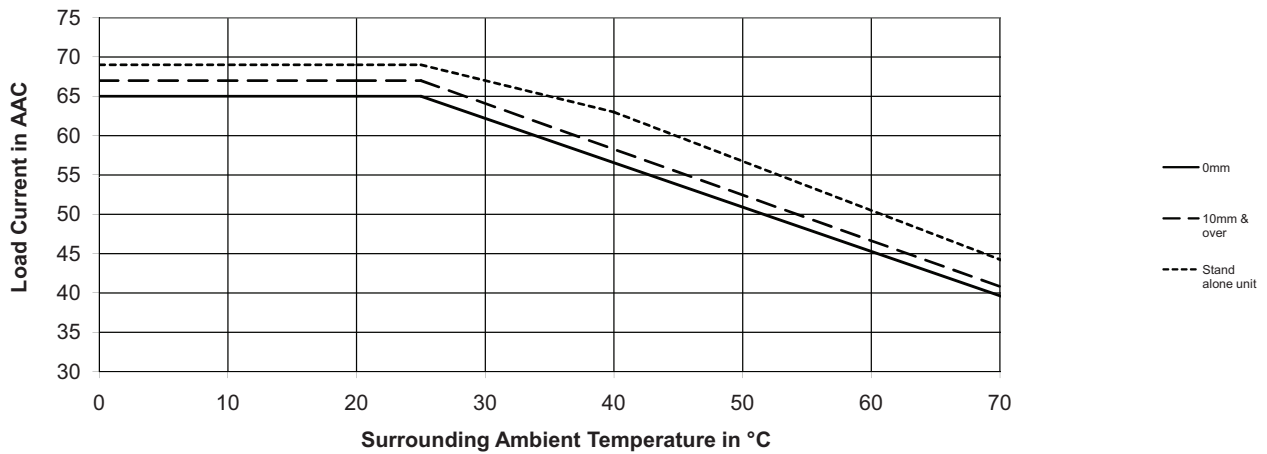


Derating vs. Spacing Curves for RGC1S

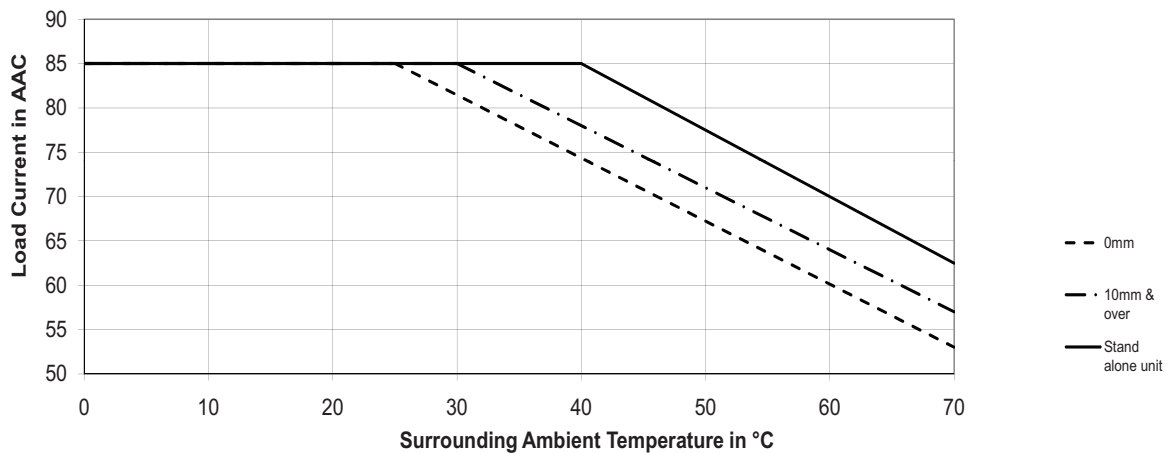
RGC1S.. 41



RGC1S.. 61



RGC1S.. 90



Heatsink Selection for RGS1S

RGS1S60D20GKEP

| Load current [A] | Thermal resistance [K/W] | | | | | | Power dissipation [W] |
|------------------|--------------------------|-------|-------|-------|-------|-------|-----------------------|
| | 20 | 30 | 40 | 50 | 60 | 70 | |
| 23.0 | 3.45 | 3.02 | 2.59 | 2.16 | 1.73 | 1.29 | 23.2 |
| 20.7 | 3.93 | 3.44 | 2.95 | 2.46 | 1.97 | 1.48 | 20.3 |
| 18.4 | 4.55 | 3.98 | 3.41 | 2.84 | 2.27 | 1.70 | 17.6 |
| 16.1 | 5.35 | 4.68 | 4.01 | 3.34 | 2.67 | 2.01 | 15.0 |
| 13.8 | 6.44 | 5.63 | 4.83 | 4.02 | 3.22 | 2.41 | 12.4 |
| 11.5 | 8.00 | 7.00 | 6.00 | 5.00 | 4.00 | 3.00 | 10.0 |
| 9.2 | 10.39 | 9.09 | 7.79 | 6.50 | 5.20 | 3.90 | 7.7 |
| 6.9 | 14.50 | 12.69 | 10.88 | 9.07 | 7.25 | 5.44 | 5.5 |
| 4.6 | 23.06 | 20.18 | 17.29 | 14.41 | 11.53 | 8.65 | 3.5 |
| 2.3 | 50.39 | 44.09 | 37.79 | 31.49 | 25.20 | 18.90 | 1.6 |
| | 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 ⁸ | < 0.25 K/W |

RGS1S60D30GKEP

| Load current [A] | Thermal resistance [K/W] | | | | | | Power dissipation [W] |
|------------------|--------------------------|-------|-------|-------|-------|-------|-----------------------|
| | 20 | 30 | 40 | 50 | 60 | 70 | |
| 32.0 | 2.62 | 2.29 | 1.97 | 1.64 | 1.31 | 0.98 | 30.5 |
| 28.8 | 2.98 | 2.60 | 2.23 | 1.86 | 1.49 | 1.12 | 26.9 |
| 25.6 | 3.43 | 3.00 | 2.57 | 2.14 | 1.71 | 1.29 | 23.3 |
| 22.4 | 4.01 | 3.51 | 3.01 | 2.51 | 2.01 | 1.51 | 19.9 |
| 19.2 | 4.81 | 4.21 | 3.61 | 3.01 | 2.41 | 1.80 | 16.6 |
| 16.0 | 5.94 | 5.20 | 4.46 | 3.71 | 2.97 | 2.23 | 13.5 |
| 12.8 | 7.69 | 6.73 | 5.76 | 4.80 | 3.84 | 2.88 | 10.4 |
| 9.6 | 10.68 | 9.34 | 8.01 | 6.67 | 5.34 | 4.00 | 7.5 |
| 6.4 | 16.89 | 14.78 | 12.67 | 10.56 | 8.45 | 6.33 | 4.7 |
| 3.2 | 36.77 | 32.17 | 27.58 | 22.98 | 18.38 | 13.79 | 2.2 |
| | 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 ⁸ | < 0.25 K/W |

RGS1S60D31GKEP

| Load current [A] | Thermal resistance [K/W] | | | | | | Power dissipation [W] |
|------------------|--------------------------|-------|-------|-------|-------|-------|-----------------------|
| | 20 | 30 | 40 | 50 | 60 | 70 | |
| 23.0 | 2.91 | 2.54 | 2.18 | 1.82 | 1.45 | 1.09 | 27.5 |
| 28.8 | 3.29 | 2.88 | 2.47 | 2.06 | 1.65 | 1.23 | 24.3 |
| 25.6 | 3.78 | 3.30 | 2.83 | 2.36 | 1.89 | 1.42 | 21.2 |
| 22.4 | 4.41 | 3.86 | 3.31 | 2.76 | 2.21 | 1.65 | 18.1 |
| 19.2 | 5.27 | 4.61 | 3.95 | 3.29 | 2.63 | 1.98 | 15.2 |
| 16.0 | 6.49 | 5.68 | 4.87 | 4.06 | 3.25 | 2.44 | 12.3 |
| 12.8 | 8.37 | 7.32 | 6.28 | 5.23 | 4.19 | 3.14 | 9.6 |
| 9.6 | 11.59 | 10.14 | 8.69 | 7.24 | 5.79 | 4.34 | 6.9 |
| 6.4 | 18.26 | 15.98 | 13.70 | 11.41 | 9.13 | 6.85 | 4.4 |
| 3.2 | 39.58 | 34.63 | 29.69 | 24.74 | 19.79 | 14.84 | 2.0 |
| | T_A | | | | | | |
| | Ambient temp [°C] | | | | | | |

| | |
|---|------------|
| Maximum junction temperature | 125°C |
| Heatsink temperature | 100°C |
| Junction to case thermal resistance, Rthjc | <0.2 K/W |
| Case to heatsink thermal resistance, Rthcs ⁸ | < 0.25 K/W |

RGS1S60D61GG.P

| Load current [A] | Thermal resistance [K/W] | | | | | | Power dissipation [W] |
|------------------|--------------------------|-------|-------|-------|------|------|-----------------------|
| | 20 | 30 | 40 | 50 | 60 | 70 | |
| 60.0 | 1.33 | 1.16 | 0.99 | 0.82 | 0.65 | 0.48 | 58.9 |
| 54.0 | 1.55 | 1.35 | 1.16 | 0.97 | 0.77 | 0.58 | 51.7 |
| 48.0 | 1.79 | 1.56 | 1.34 | 1.12 | 0.89 | 0.67 | 44.7 |
| 42.0 | 2.10 | 1.84 | 1.58 | 1.31 | 1.05 | 0.79 | 38.1 |
| 36.0 | 2.53 | 2.21 | 1.90 | 1.58 | 1.26 | 0.95 | 31.6 |
| 30.0 | 3.14 | 2.74 | 2.35 | 1.96 | 1.57 | 1.18 | 25.5 |
| 24.0 | 4.07 | 3.56 | 3.05 | 2.54 | 2.04 | 1.53 | 19.6 |
| 18.0 | 5.67 | 4.97 | 4.26 | 3.55 | 2.84 | 2.13 | 14.1 |
| 12.0 | 9.01 | 7.88 | 6.75 | 5.63 | 4.50 | 3.38 | 8.9 |
| 6.0 | 19.63 | 17.18 | 14.72 | 12.27 | 9.81 | 7.36 | 4.1 |
| | T_A | | | | | | |
| | Ambient temp [°C] | | | | | | |

| | |
|---|------------|
| Maximum junction temperature | 125°C |
| Heatsink temperature | 100°C |
| Junction to case thermal resistance, Rthjc | <0.2 K/W |
| Case to heatsink thermal resistance, Rthcs ⁸ | < 0.25 K/W |

8: Thermal resistance case to heatsink values are applicable upon application of a fine layer of silicon based thermal paste HT02S from Electrolube between SSR and heatsink.

Heatsink Selection for RGS1S...HT (upon request)

RGS1A60D20GKEPHT

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

| | |
|--|-----------|
| Maximum junction temperature | 125°C |
| Heatsink temperature | 100°C |
| Junction to case thermal resistance, R _{thjc} | <0.45 K/W |
| Case to heatsink thermal resistance, R _{thcs} | < 0.9 K/W |

RGS1A60D30GKEPHT

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

| | |
|--|------------|
| Maximum junction temperature | 125°C |
| Heatsink temperature | 100°C |
| Junction to case thermal resistance, R _{thjc} | <0.3 K/W |
| Case to heatsink thermal resistance, R _{thcs} | < 0.85 K/W |

RGS1S60D31GKEPHT

| Load current [A] | Thermal resistance [K/W] | | | | | | Power dissipation [W] |
|------------------|--------------------------|-------|-------|-------|-------|-------|-----------------------|
| | 20 | 30 | 40 | 50 | 60 | 70 | |
| 32.0 | 2.82 | 2.45 | 2.09 | 1.73 | 1.36 | 1.00 | 27.5 |
| 28.8 | 3.29 | 2.88 | 2.47 | 2.06 | 1.65 | 1.23 | 24.3 |
| 25.6 | 3.78 | 3.30 | 2.83 | 2.36 | 1.89 | 1.42 | 21.2 |
| 22.4 | 4.41 | 3.86 | 3.31 | 2.76 | 2.21 | 1.65 | 18.1 |
| 19.2 | 5.27 | 4.61 | 3.95 | 3.29 | 2.63 | 1.98 | 15.2 |
| 16.0 | 6.49 | 5.68 | 4.87 | 4.06 | 3.25 | 2.44 | 12.3 |
| 12.8 | 8.37 | 7.32 | 6.28 | 5.23 | 4.19 | 3.14 | 9.6 |
| 9.6 | 11.59 | 10.14 | 8.69 | 7.24 | 5.79 | 4.34 | 6.9 |
| 6.4 | 18.26 | 15.98 | 13.70 | 11.41 | 9.13 | 6.85 | 4.4 |
| 3.2 | 39.58 | 34.63 | 29.69 | 24.74 | 19.79 | 14.84 | 2.0 |
| | T _A | | | | | | |
| | Ambient temp [°C] | | | | | | |

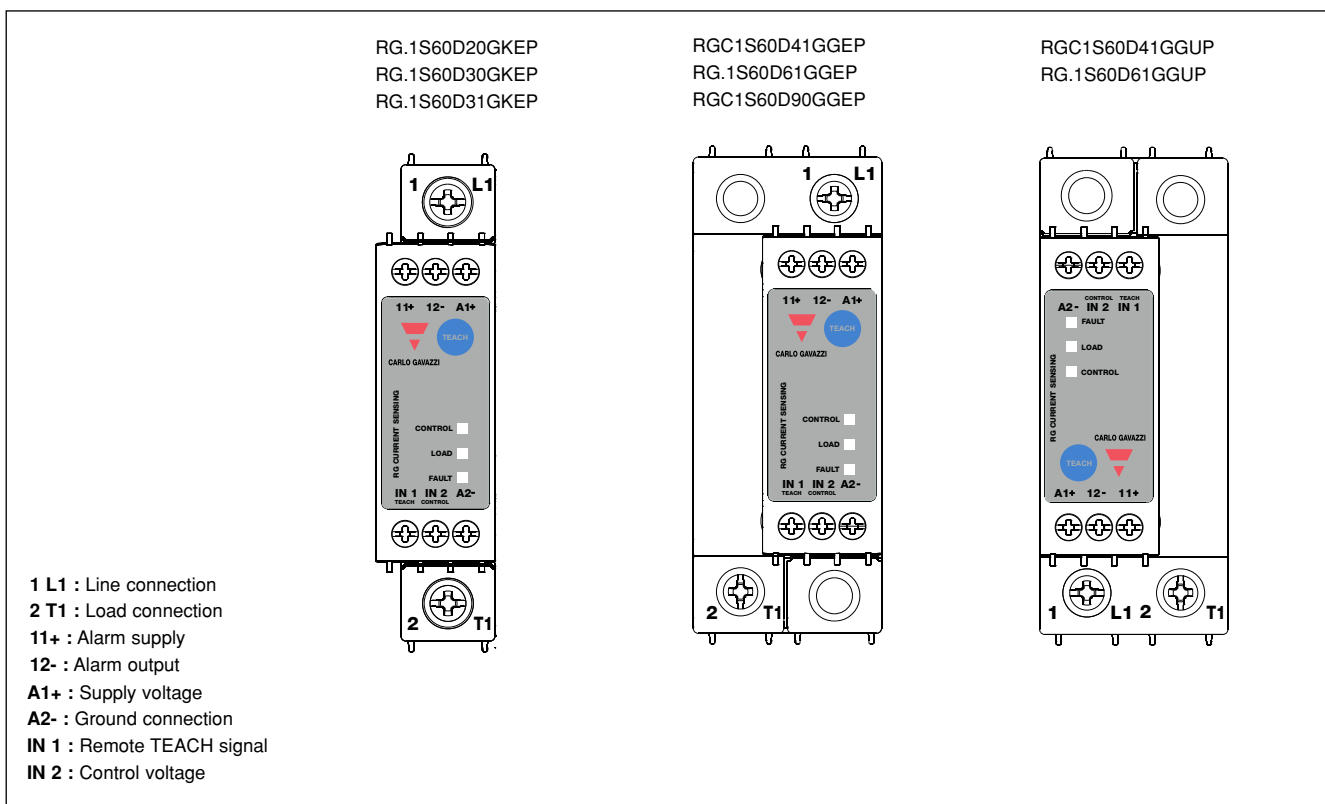
| | |
|--|-----------|
| Maximum junction temperature | 125°C |
| Heatsink temperature | 100°C |
| Junction to case thermal resistance, R _{thjc} | <0.2 K/W |
| Case to heatsink thermal resistance, R _{thcs} | < 0.8 K/W |

RGS1S60D61GG.PHT

| Load current [A] | Thermal resistance [K/W] | | | | | | Power dissipation [W] |
|------------------|--------------------------|-------|-------|-------|------|------|-----------------------|
| | 20 | 30 | 40 | 50 | 60 | 70 | |
| 60.0 | 0.78 | 0.61 | 0.44 | 0.27 | 0.10 | --- | 58.9 |
| 54.0 | 1.03 | 0.84 | 0.65 | 0.45 | 0.26 | 0.06 | 51.7 |
| 48.0 | 1.35 | 1.12 | 0.90 | 0.68 | 0.45 | 0.23 | 44.7 |
| 42.0 | 1.76 | 1.50 | 1.23 | 0.97 | 0.71 | 0.45 | 38.1 |
| 36.0 | 2.32 | 2.00 | 1.69 | 1.37 | 1.05 | 0.74 | 31.6 |
| 30.0 | 3.12 | 2.72 | 2.33 | 1.94 | 1.55 | 1.16 | 25.5 |
| 24.0 | 4.07 | 3.56 | 3.05 | 2.54 | 2.04 | 1.53 | 19.6 |
| 18.0 | 5.67 | 4.97 | 4.26 | 3.5 | 2.84 | 2.13 | 14.1 |
| 12.0 | 9.01 | 7.88 | 6.75 | 5.63 | 4.50 | 3.38 | 8.9 |
| 6.0 | 19.63 | 17.18 | 14.72 | 12.27 | 9.81 | 7.36 | 4.1 |
| | T _A | | | | | | |
| | Ambient temp [°C] | | | | | | |

| | |
|--|-----------|
| Maximum junction temperature | 125°C |
| Heatsink temperature | 100°C |
| Junction to case thermal resistance, R _{thjc} | <0.2 K/W |
| Case to heatsink thermal resistance, R _{thcs} | < 0.8 K/W |

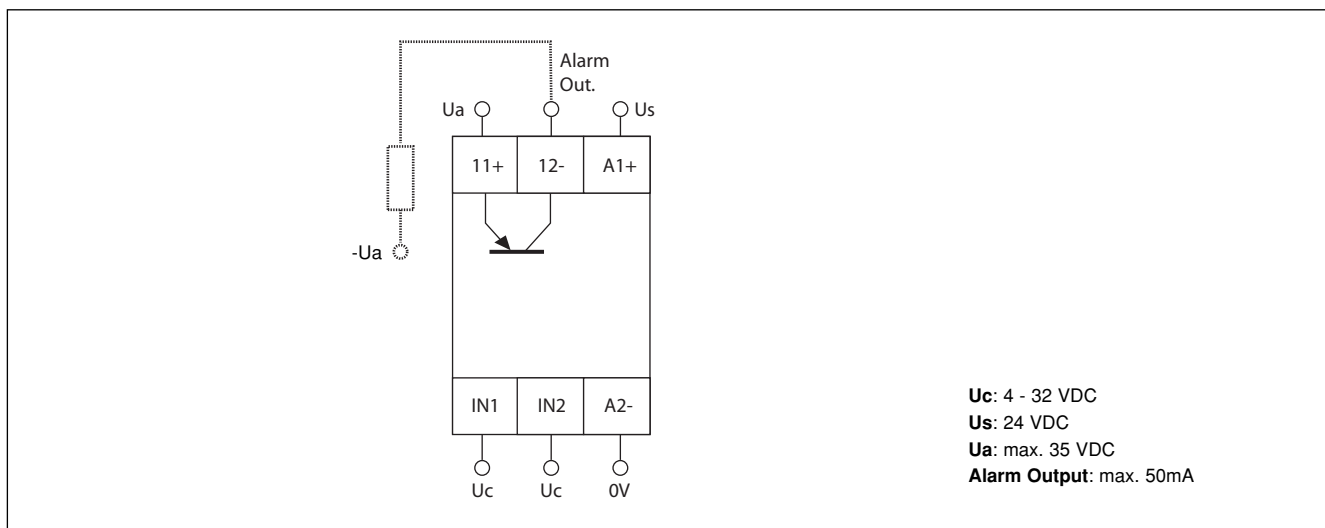
Terminal Markings



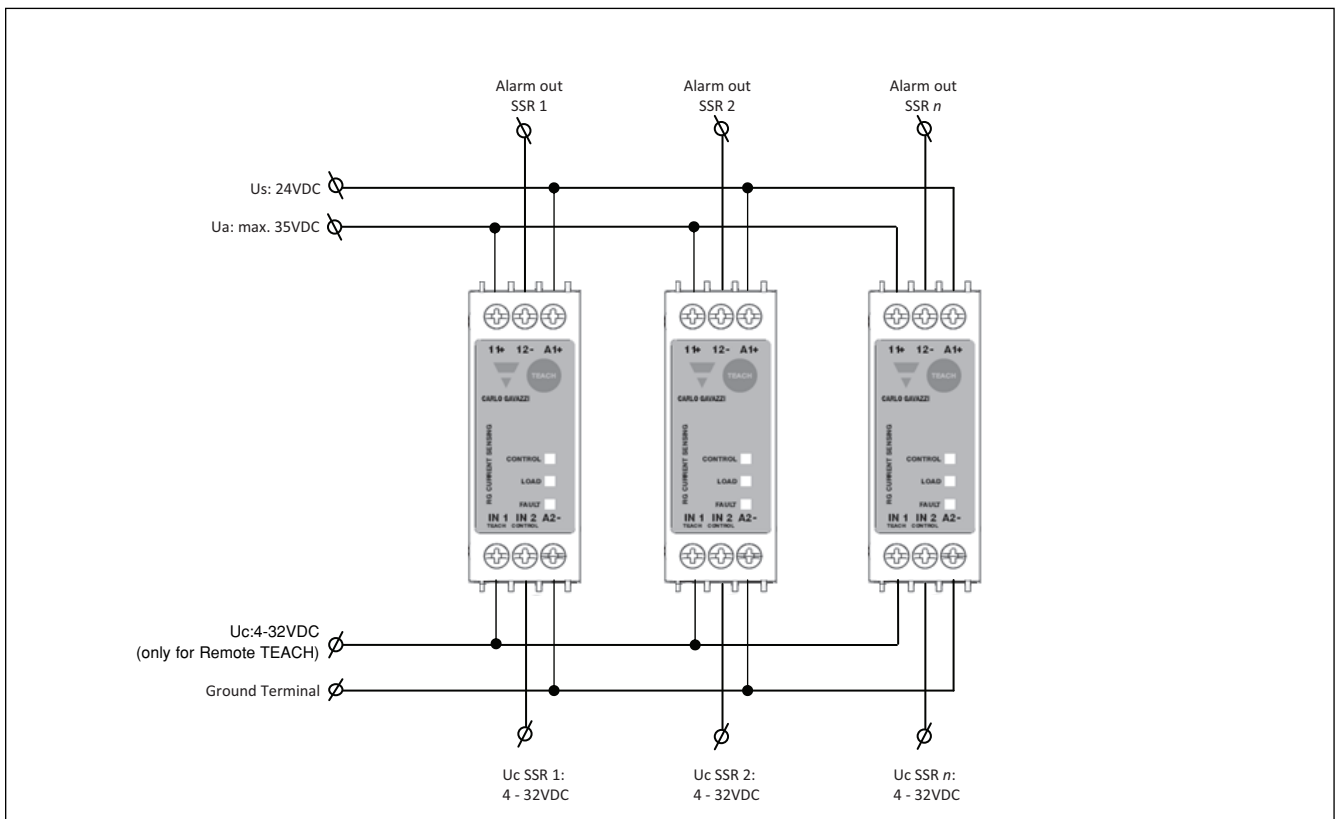
Note:

- Local TEACH by pressing front button for more than 3 sec but less than 5 sec
- Fan supply (24VDC) for RGC1A60D90GGEP has to be supplied directly to fan

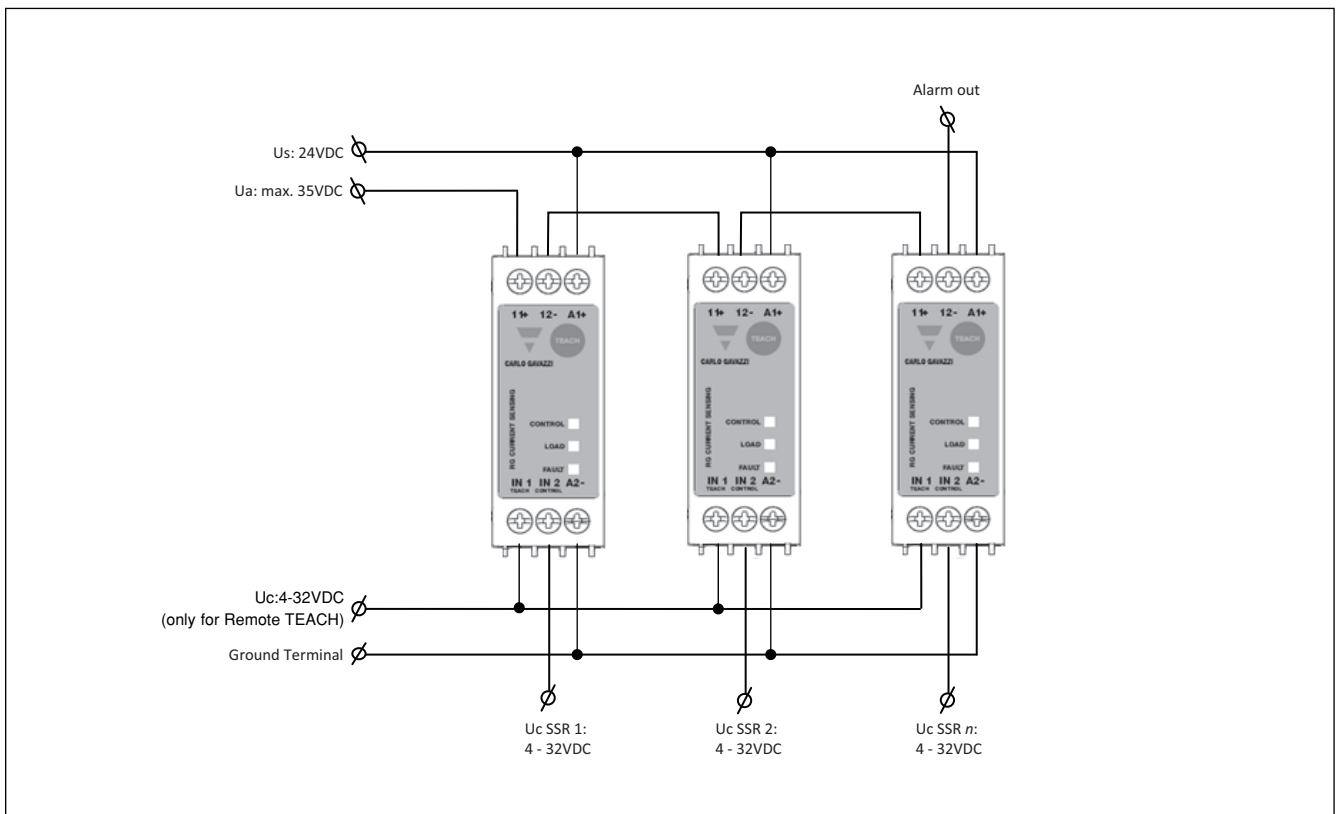
Connection Diagram




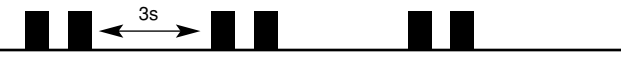



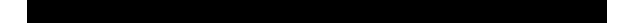
Connection Diagram for Separate Alarm Outputs



Connection Diagram for Series Alarm Outputs



Alarm LED Indications (Red LED)

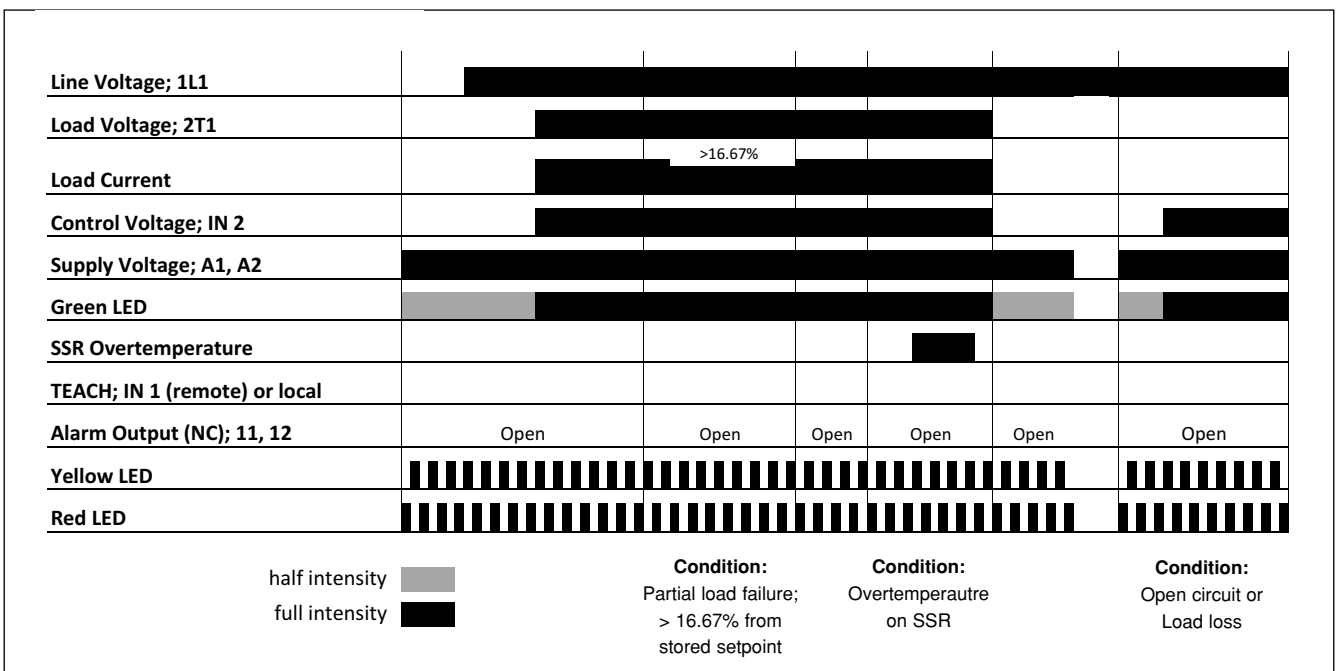
| Flashes | Description of Fault | Timing Diagram |
|---------|----------------------|--|
| 1 | Locked TEACH |  |
| 2 | Open SSR / Heater |  |
| 3 | SSR Overtemperature |  |
| 4 | SSR Short Circuit |  |
| 50% | No TEACH setpoint |  |
| 100% | Partial Load Failure |  |

Mode of Operation

Introduction:

The RG.1S must have a stored current setpoint to operate as a Solid State Relay with a Sensing function. The current setpoint is the nominal operating current that is expected through the SSR when all heater loads are functioning properly. The SSR is shipped without having a stored setpoint. This current setpoint is to be stored upon a TEACH procedure as explained below. The wrong setpoint is stored if heater loads are faulty or mains supply voltage is not close to operating voltage during the TEACH procedure.

SSR Operation without the TEACH procedure



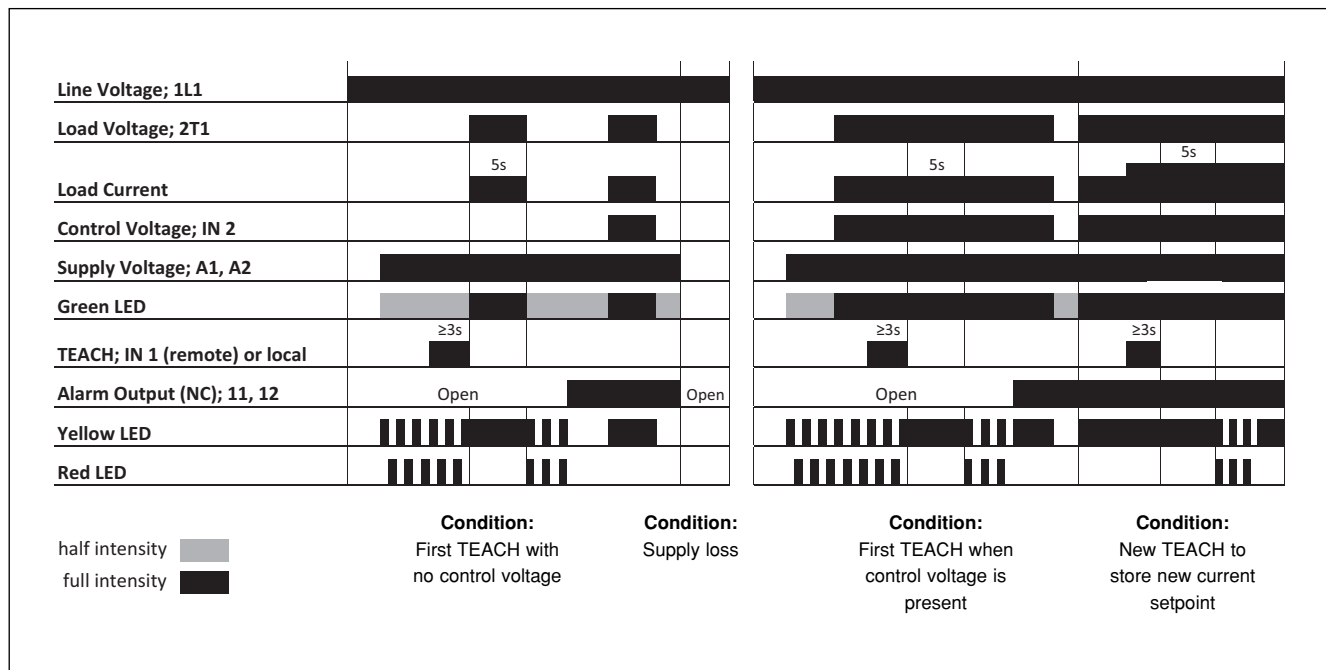
Upon application of supply voltage, the yellow and red LED will flash continuously in sequence (i.e., scroll) indicating that the device has no current setpoint stored. The green LED is ON at half intensity indicating the presence of supply voltage. As soon as control voltage is applied the green LED will be ON at full intensity. The alarm output, which is normally closed, is open to indicate that the SSR has no stored setpoint.

If mains supply is present upon application of control voltage the SSR will switch ON despite having no stored current setpoint. However, even though the SSR switches ON, the Sensing features associated with the RG.1S are disabled as shown in the above operations diagram. The Sensing features will be enabled ONLY once the TEACH procedure explained below is completed.

For SSR to switch ON upon application of control voltage, supply voltage has to be present across terminals A1, A2.

Mode of Operation (cont.)

The TEACH procedure



The TEACH procedure can be performed either locally or remotely. For local TEACH, the front 'TEACH' button on the SSR has to be pressed for at least 3 seconds (but less than 5 seconds). Remote TEACH can be performed by applying a high signal on terminal IN 1 for a duration of at least 3 seconds (but less than 5 seconds).

Supply voltage has to be present across terminals A1, A2 for the TEACH function to be performed and SSR to operate.

TEACH in the absence of a control signal

It is possible to TEACH the SSR without the presence of a control signal. In case of no previous stored setpoint (factory default), red and yellow LED will flash accordingly indicating this. The TEACH function will start as soon as the push button is released. The SSR will switch fully ON for 5 seconds (yellow LED ON during these 5 seconds) at the end of which, a load current setpoint is recorded. If TEACH procedure is successful the yellow and red LED will blink together for three times to indicate a successful setpoint measurement. The alarm output across terminals 11, 12 closes indicating a normal situation.

In case of an unsuccessful TEACH, the red & yellow LED will scroll continuously indicating that no current setpoint is stored. If load current does not stabilise during the 5 seconds TEACH sequence, it will not be possible to store setpoint. Another attempt to do a TEACH may be done until setpoint is recorded.

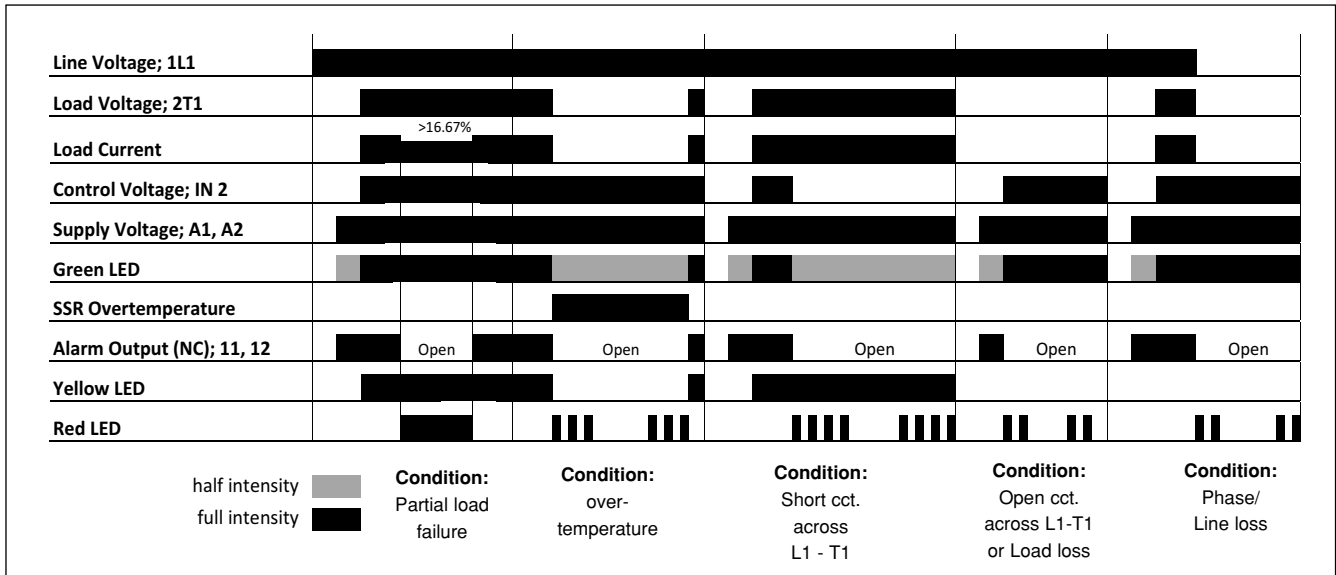
TEACH when control signal is present

In this case the TEACH procedure is identical to the TEACH procedure when there is no control signal. During the 5 seconds TEACH the status of the load switching will not be distinguished from unTEACHed state since load was ON before TEACH. Load remains ON as long as control voltage is present.

If SSR is in a LOCKed position (see below) it will not be possible to perform a new TEACH. SSR has to be unLOCKed first.

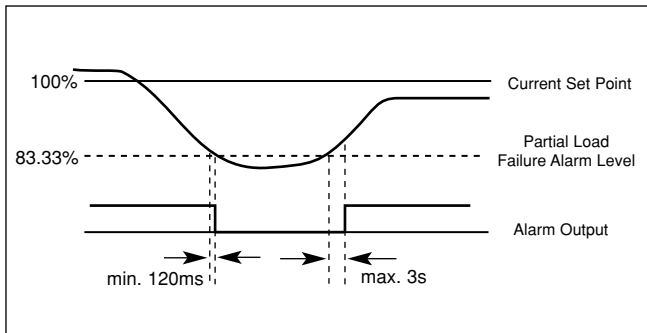
Mode of Operation (cont.)

Fault Conditions



Partial Load Failure

This occurs when the load current decreases by more than 16.67% as compared to the stored setpoint. During this failure mode the SSR remains ON but alarm output opens to indicate an alarm condition. The red LED is continuously ON during this condition. If current rises back to normal levels the alarm indications switch to the normal state.



Over Temperature

If the SSR derating curve is exceeded during normal operation, an over-temperature condition is detected and the SSR output switches OFF. A visual alarm is indicated by the red blinking LED (3 flashes - see details in ALARM LED INDICATIONS) and alarm signal opens. The alarm resets automatically when the overtemperature condition is no longer present.

SSR Short Circuit

This condition is detected in the absence of a control signal and load current (in the region of 800mA and over) still flowing through the SSR. A visual indication is given by the red blinking LED (4 flashes - see details in ALARM LED INDICATIONS) and open alarm across terminals 11, 12. The yellow LED stays ON even though the green LED is at half intensity (i.e. absence of control input voltage) to indicate status of load.

SSR Open Circuit / Heater Loss / Line Loss

SSR output remains OFF even after application of the control voltage on terminal IN 2. A visual indication is given by the red blinking LED (2 flashes - see details in ALARM LED INDICATIONS) and open alarm across terminals 11, 12.

Alarm auto reset

In all alarm conditions described above, the alarm LED and signal output from terminals 11, 12 reset automatically to the normal condition as soon as the alarm condition is no longer present. There is no need for an alarm reset.

Other functions: TEACH LOCK/UNLOCK

The device can be locked to prevent undesirable local TEACH. This can be done by sending a pulse with a duration between 1s and 1.5s to the remote TEACH terminal IN 1. To TEACH a LOCKed unit, a pulse with duration between 1s and 1.5s has to be applied first to terminal IN 1, before performing the TEACH. The initial condition of the unit after every power up (through A1, A2 terminals) is UNLOCKed.

Agency Approvals and Conformances

| | | | |
|-------------------------------------|--|-------------------------------------|--|
| Conformance & Approvals | RGC1S.. EN/IEC 60947-4-3 EN/IEC 62314 UL508 Listed (E172877) cUL Listed (E172877) | Conformance & Approvals | RGS1S.. EN/IEC 60947-4-3 EN/IEC 62314 UL 508 Recognised (E172877) CSA 22.2 No. 14-10 (204075) |
| Short Circuit Current Rating | 100kA, UL508 | Short Circuit Current Rating | 100kA, UL508 |



Electromagnetic Compatibility

| | | | |
|---|---|---|------------------------|
| EMC Immunity | IEC/EN 61000-6-2 | Radiated Radio Frequency Immunity | IEC/EN 61000-4-3 |
| Electrostatic Discharge (ESD) Immunity | IEC/EN 61000-4-2 | 10V/m, 80 - 1000 MHz | Performance Criteria 1 |
| Air discharge, 8kV | Performance Criteria 1 | 10V/m, 1.4 - 2 GHz | Performance Criteria 1 |
| Contact, 4kV | Performance Criteria 1 | 3V/m, 2 - 2.7 GHz | Performance Criteria 1 |
| Electrical Fast Transient (Burst) Immunity | IEC/EN 61000-4-4 | Conducted Radio Frequency Immunity | IEC/EN 61000-4-6 |
| Output: 2kV, 5kHz | Performance Criteria 1 | 10V/m, 0.15 - 80 MHz | Performance Criteria 1 |
| Input: 1kV, 5kHz | Performance Criteria 1 | Voltage Dips Immunity | IEC/EN 61000-4-11 |
| Electrical Surge Immunity | IEC/EN 61000-4-5 | 0% for 10ms/20ms, | Performance Criteria 2 |
| Output, line to line, 1kV | Performance Criteria 1 | 40% for 200ms | Performance Criteria 2 |
| Output, line to earth, 2kV | Performance Criteria 1 | 70% for 500ms | Performance Criteria 2 |
| DC lines, line to line, 500V | Performance Criteria 2 | Voltage Interruptions Immunity | IEC/EN 61000-4-11 |
| DC lines, line to earth, 500V | Performance Criteria 2 | 0% for 5000ms | Performance Criteria 2 |
| Signal lines, line to earth, 1kV | Performance Criteria 2 | | |
| EMC Emission | IEC/EN 61000-6-4 | Radio Interference | |
| Radio Interference | | Field Emission (Radiated) | IEC/EN 55011 |
| Voltage Emission (Conducted) | IEC/EN 55011 | 30 - 1000MHz | Class A (industrial) |
| 0.15 - 30MHz | Class A (industrial) with filters - see filter information IEC/EN 60947-4-2, 60947-4-3 Class A (no filtering needed) | | |

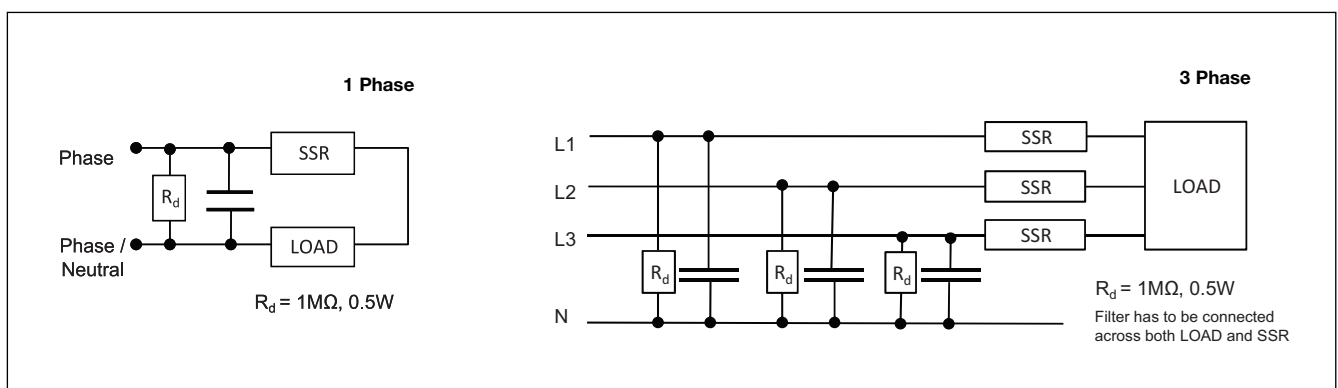
Note:

- Control input lines must be installed together to maintain products' susceptibility to Radio Frequency interference.
- Use of AC solid state relays may, according to the application and the load current, cause conducted radio interferences. Use of mains filters may be necessary for cases where the user must meet E.M.C requirements. The capacitor values given inside the filtering specification tables should be taken only as indications, the filter attenuation will depend on the final application.
- 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.

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

| Part Number | Suggested filter for compliance | Maximum Heater current |
|----------------|---------------------------------|------------------------|
| RG.1S60D20GKEP | 100 nF / 760V / X1 | 20 AAC |
| RG.1S60D30GKEP | 220 nF / 760V / X1 | 30 AAC |
| RG.1S60D31GKEP | 220 nF / 760V / X1 | 30 AAC |
| RGC1S60D41GG.P | 330 nF / 760V / X1 | 40 AAC |
| RG.1S60D61GG.P | 470 nF / 760V / X1 | 65 AAC |
| RGC1S60D90GGEP | 470 nF / 760V / X1 | 65 AAC |

Filter Connection Diagrams



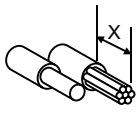
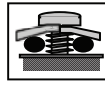
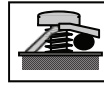



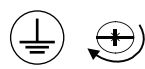
Environmental Specifications

| | |
|---|----------------------------------|
| Operating Temperature | -25°C to 70°C (-13°F to +158°F) |
| Storage Temperature | -40°C to 100°C (-40°F to +212°F) |
| RoHS (2002/95/EC) | Compliant |
| Impact resistance (EN50155, EN61373) | 15/11 g/ms |
| Vibration resistance (2-100Hz, IEC60068-2-26, EN50155, EN61373) | 2g per axis |
| Relative humidity | 95% non-condensing @ 40°C |
| UL flammability rating (housing) | UL 94 V0 |

Connection Specifications

POWER CONNECTIONS: 1/L1, 2 /T1

Use 75°C copper (Cu) conductors

| | | RG..20GKEP; RG..30GKEP; RGC..31GKEP | RG..41GG.P; RG..61GG.P; RG..90GGEP |
|---|---|--|--|
| Stripping Length (X) | | 12mm | 11mm |
| Connection type | | M4 screw with captivated washer | M5 screw with box clamp |
| Rigid (Solid & Stranded) UL/ cUL rated data |  |  2 x 2.5..6 mm ² 2 x 14.. 10 AWG |  1 x 2.5..6 mm ² 1 x 14.. 10 AWG |
| Flexible with end sleeve |  | 2 x 1.0 ... 2.5mm ² 2 x 2.5..4mm ² 2 x 18.. 14 AWG 2 x 14.. 12 AWG | 1 x 2.5..16mm ² 1 x 14.. 6 AWG |
| Flexible without end sleeve |  | 2 x 1.0 ... 2.5mm ² 2 x 2.5.. 6mm ² 2 x 18.. 14 AWG 2 x 14.. 10 AWG | 1 x 4.. 25mm ² 1 x 12.. 3 AWG |
| Torque specifications |  | 2 Nm (17.7 in-lb). M4, Pozidriv 2 | 2.5 Nm (22 in-lb). M5, Pozidriv 2 |
| Aperture for termination lug | | 12.3mm | N/A |
| Protective Earth Connection |  | RGC1S..20 : M4, 1.5Nm (13.3 in-lb) RGC1S..30, 31, 41, 61, 90: M5, 1.5Nm (13.3 in-lb) | |

Note: Protective Earth connection must be connected whenever the product is intended to be used in Class 1 applications according to EN/IEC 61140.

CONTROL CONNECTIONS:

Use 60/75°C copper (Cu) conductors

Torque specifications



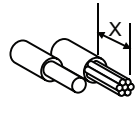



A1(+), A2(-), IN1, IN2, 11 (+), 12(-)

0.5 Nm (4.4 in-lb); M3, Pozidriv 1

Stripping Length (X)

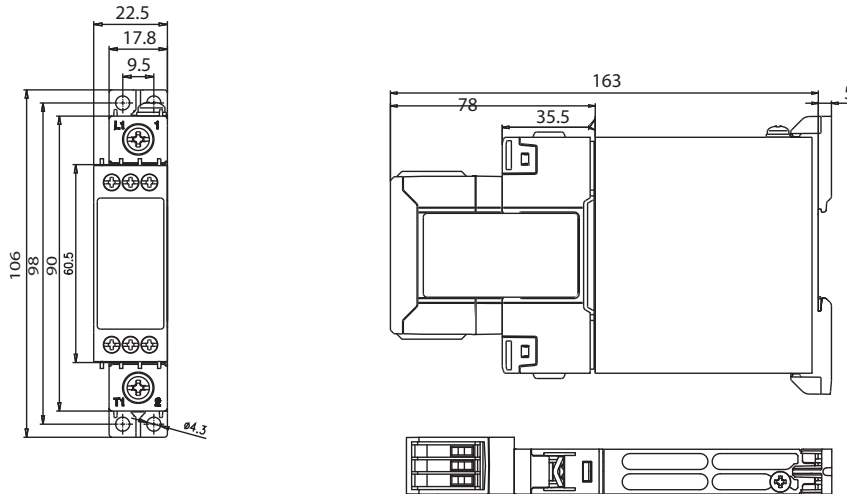
Rigid (Solid & Stranded)

UL/ cUL rated data

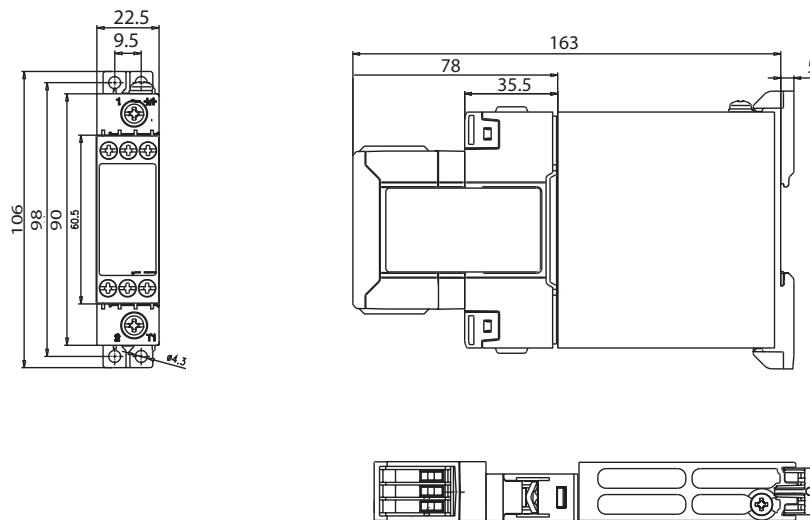
| | | 6mm | 13mm |
|---|---|--|--|
| Rigid (Solid & Stranded) UL/ cUL rated data |  |  2 x 0.5..2.5mm ² 2 x 18..12 AWG |  1 x 0.2..2.5mm ² 1 x 24..12 AWG |
| Flexible with end sleeve |  | 2 x 0.5..2.5mm ² 2 x 18..12AWG | 1 x 0.2..2.5mm ² 1 x 24..12AWG |

Dimensions

RGC1S60D20GKEP
RGS1S60D20GKEP (without heatsink)



RGC1S60D30GKEP , RGC1S60D31GKEP
RGS1S60D30GKEP , RGS1S60D31GKEP (without heatsink)

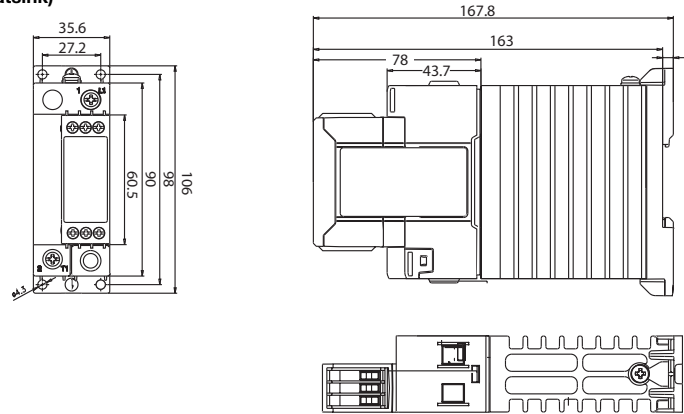


* Housing width tolerance +0.5mm, -0mm...as per DIN43880

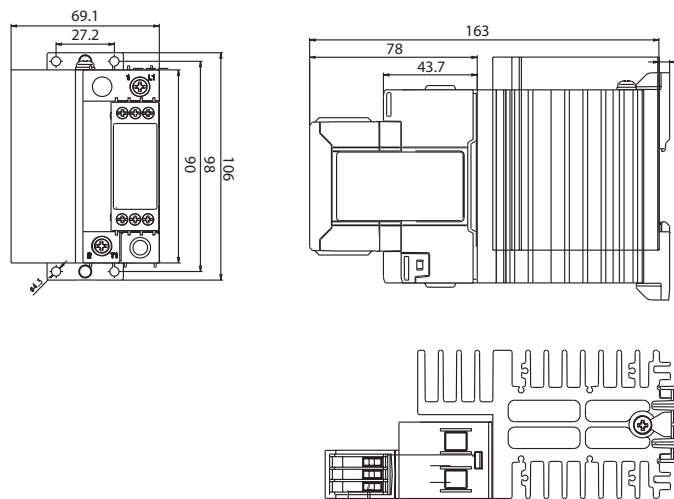
All dimensions in mm

Dimensions

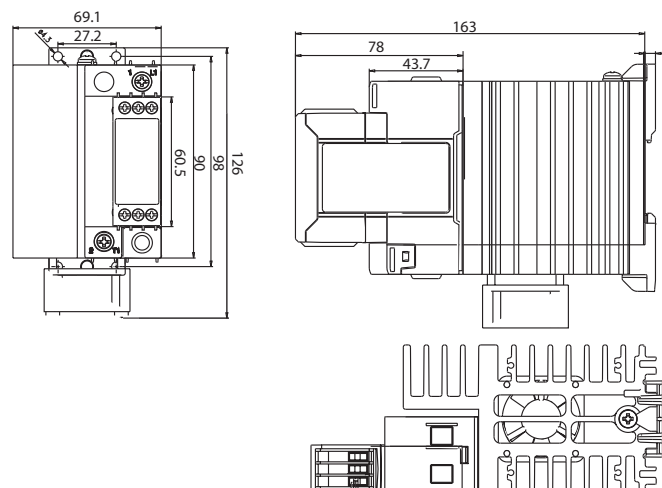
RGC1S60D41GGEP
RGS1S60D41GGEP (without heatsink)



RGC1S60D61GGEP
RGS1S60D61GGEP (without heatsink)



RGC1S60D90GGEP
(fan to be supplied externally - no terminations provided on the RG module)

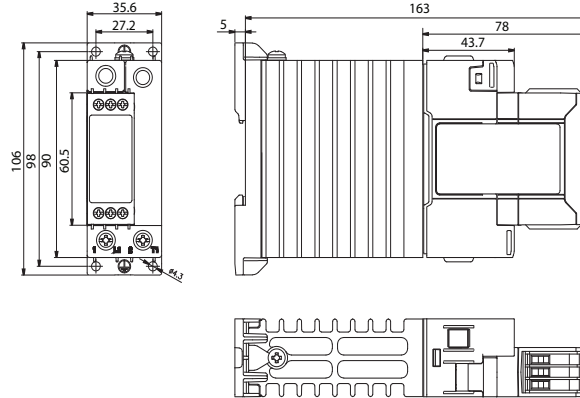


* Housing width tolerance +0.5mm, -0mm...as per DIN43880

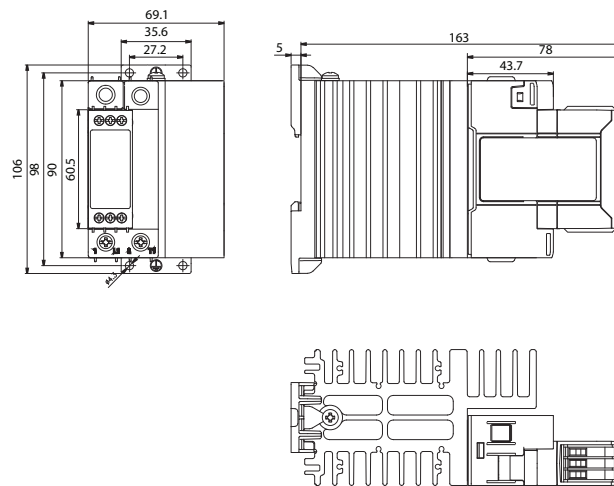
All dimensions in mm

Dimensions

RGC1S60D41GGUP



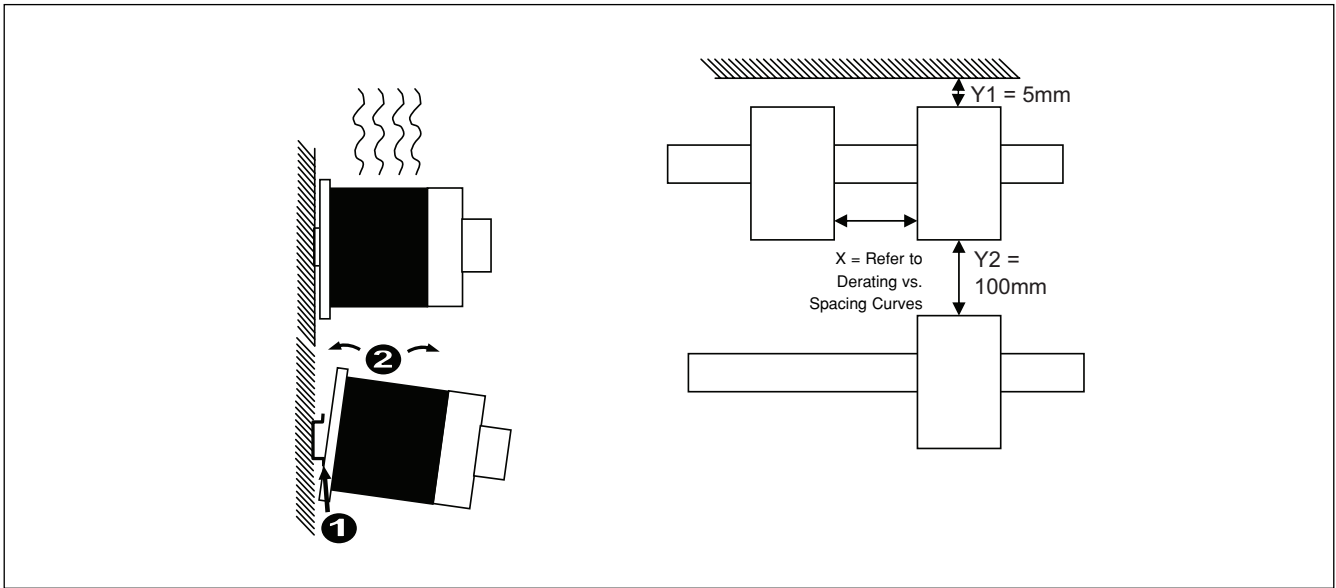
RGC1S60D61GGUP
RGS1S60D61GGUP (without heatsink)



* Housing width tolerance +0.5mm, -0mm...as per DIN43880

All dimensions in mm

Installation Instructions



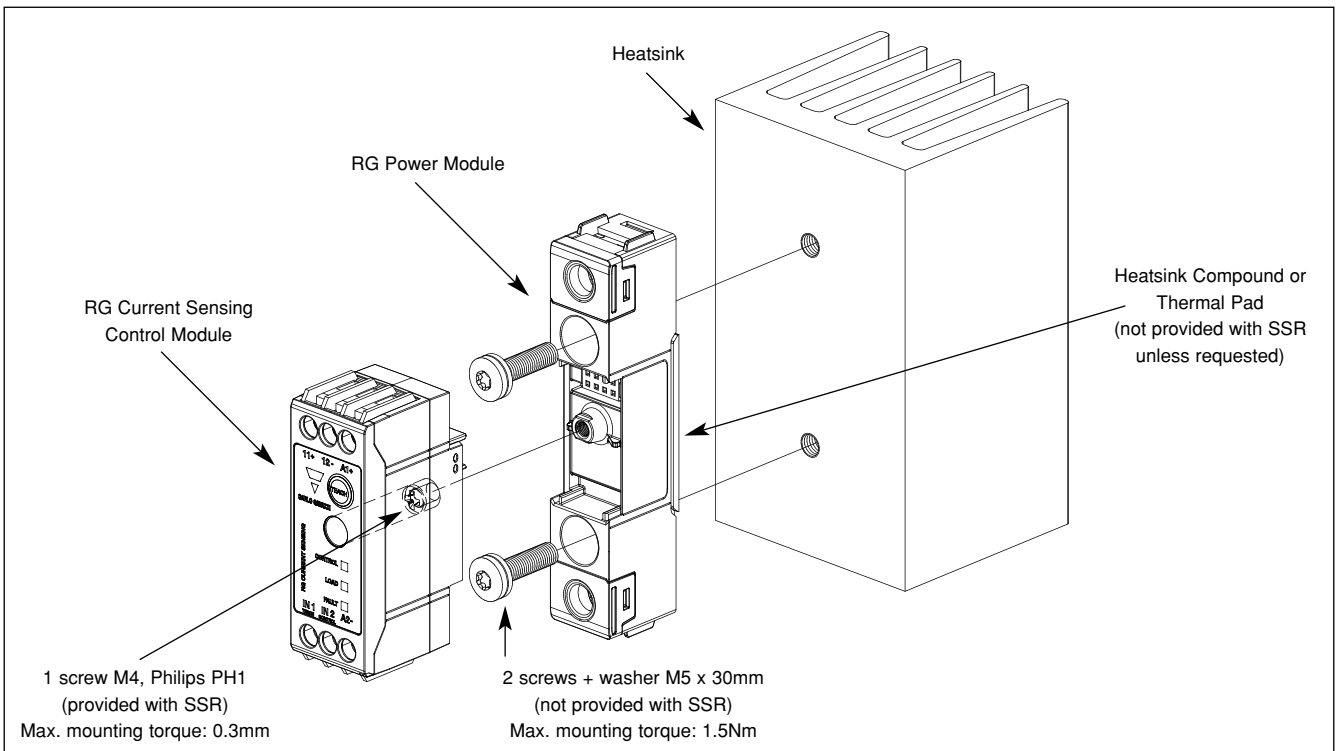
Mounting Instructions for RGS1S

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 small amount of thermally conductive silicone paste must be applied to the back of the SSR. The RG Power Module should be first mounted on the heatsink with two M5 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 RG Power Module is gradually tightened (alternating between the 2 screws) to a maximum torque of 1.5Nm.

Once the power module is tightened to heatsink, the control module can be mounted on top of the power module and screwed with a torque of 0.3Nm to ensure good contact between the 2 units.



Short Circuit Protection

Protection Co-ordination, Type 1 vs Type 2:

Type 1 protection implies that after a short circuit, the device under test will no longer be in a functioning state. In type 2 co-ordination the device under test will still be functional after the short circuit. In both cases, however the short circuit has to be interrupted. The fuse between enclosure and supply shall not open. The door or cover of the enclosure shall not be blown open. There shall be no damage to conductors or terminals and the conductors shall not separate from terminals. There shall be no breakage or cracking of insulating bases to the extent that the integrity of the mounting of live parts is impaired.

Discharge of parts or any risk of fire shall not occur.

The product variants listed in the table hereunder are suitable for use on a circuit capable of delivering not more than 100,000A rms Symmetrical Amperes, 600 Volts maximum when protected by fuses. Tests at 100,000A were performed with Class J fuses, fast acting; please refer to the table below for maximum allowed ampere rating of the fuse. Use fuses only.

Co-ordination type 1 (UL508)

| Part No. | Max. size [A] | Class | Current [kA] | Voltage [VAC] |
|----------------|---------------|-------|--------------|---------------|
| RG.1S60D20GKEP | 30 | J | 100 | Max. 600 |
| RG.1S60D30GKEP | 30 | J | 100 | Max. 600 |
| RG.1S60D31GKEP | 40 | J | 100 | Max. 600 |
| RGC1S60D41GG.P | 40 | J | 100 | Max. 600 |
| RG.1S60D61GG.P | 40 | J | 100 | Max. 600 |
| RGC1S60D90GGEP | 40 | J | 100 | Max. 600 |

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

| Part No. | Ferraz Shawmut | | Siba | | Current [kA] | Voltage [VAC] |
|----------------|----------------|--|--------------|---------------|--------------|---------------|
| | Max size [A] | Part number | Max size [A] | Part number | | |
| RG.1S60D20GKEP | 32 | 6.9xx CP URD 22x58/32 (xx = 00 or 21) | 32 | 50 142 06.32 | 100 | Max. 600 |
| RG.1S60D30GKEP | 40 | A70QS40-4 | 32 | 50 142 06.32 | 100 | Max. 600 |
| RG.1S60D31GKEP | 40 | A70QS40-4 | 40 | 50 194 20.40 | 100 | Max. 600 |
| RGC1S60D41GG.P | 60 | A70QS60-4 | 63 | 50 194 20.63 | 100 | Max. 600 |
| RG.1S60D61GG.P | 90 | A70QS90-4 | 100 | 50 194 20.100 | 100 | Max. 600 |
| RGC1S60D90GGEP | 100 | A70QS100-4 | 100 | 50 194 20.100 | 100 | Max. 600 |



Protection with Miniature Circuit Breakers

| Solid State Relay type | Model no. for Z - type M. C. B. (rated current) | Model no. for B - type M. C. B. (rated current) | Wire cross sectional area [mm ²] | Minimum length of Cu wire conductor [m] ⁹ | |
|------------------------|---|---|--|--|-----|
| RG..20 | S201 - Z4 (4A) S201 - Z6 UC (6A) | S201 - B2 (2A) S201 - B2 (2A) | 1.0 | 21.0 | |
| | | | 1.0 | 21.0 | |
| | | | 1.5 | 31.5 | |
| RG..30 | 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 | |
| | S202 - Z25 (25A) | S202-B13 (13A) | 2.5 | 19.0 | |
| | | | 4.0 | 30.4 | |
| | RG ... 31, 41, 61, 90 | S201 - Z20 (20A) | S201-B10 (10A) | 1.5 | 4.2 |
| | | | | 2.5 | 7.0 |
| 4.0 | | | | 11.2 | |
| S202 - Z20 (20A) | | S202-B10 (10A) | 1.5 | 1.8 | |
| | | | 2.5 | 3.0 | |
| | | | 4.0 | 4.8 | |
| S201 - Z32 (32A) | | S201-B16 (16A) | 2.5 | 13.0 | |
| | | | 4.0 | 20.8 | |
| | | | 6.0 | 31.2 | |
| S202 - Z32 (32A) | | S202-B16 (16A) | 2.5 | 5.0 | |
| | | | 4.0 | 8.0 | |
| | | | 6.0 | 12.0 | |
| | | | 10.0 | 20.0 | |
| S202 - Z50 (50A) | | S202-B25 (25A) | 4.0 | 14.8 | |
| | | | 6.0 | 22.2 | |
| | | | 10.0 | 37.0 | |

9. Between MCB and SSR Relay (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

Thermal Pads



Ordering Key

Thermal pad
mounted on RGS

RGS...HT

Pack of 10 thermal pads
size 34.6 x 14mm

RGHT