

# Solid State Relays 1-Phase with Integrated Heatsink Zero Cross Switching, 1600 Vp Blocking Voltage Types RGH



- Product width ranging from 17.5mm to 70mm
- Rated operational voltage: up to 759 VAC<sup>1</sup>
- Rated operational current: up to 60 AAC @ 40°C
- Up to 6600 A<sup>2</sup>s for I<sup>2</sup>t and 1600 Vp blocking voltage
- Control voltages: 4-32 VDC, 20-275 VAC (24-190 VDC)
- Design according to EN/IEC60947-4-2, EN/IEC60947-4-3, EN/IEC62314, UL508, CSA22-2 No.14-13
- Integrated overvoltage protection with varistor
- 100kA short circuit current rating according to UL508



1: 690V AC version is CE marked only and does not have an integrated varistor

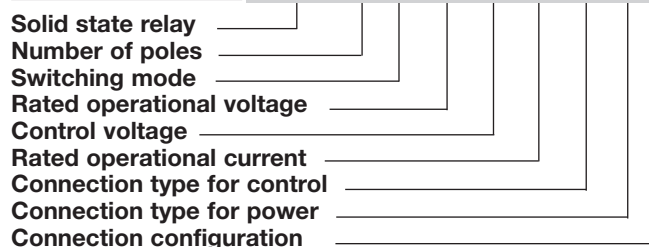
## Product Description

This range of Solid State Contactors offers the possibility of 1600Vp blocking voltage as well as the use of Miniature Circuit Breakers for short circuit protection due to the use of power chips with high I<sup>2</sup>t ratings.

The product dimensions can go as narrow as 17.5mm for 23 AAC at 40°C.

Specifications are stated at 25°C unless otherwise stated.

## Ordering Key **RGH 1 A 60 A 31 K K E**



## Ordering Key

1 Phase SSR with heatsink	Rated voltage	Control voltage	Rated current <sup>2</sup> , I <sup>2</sup> t	Connection control	Connection power	Connection configuration
RGH1A: ZC	60: 600 VAC +10% - 15%, 1600 Vp	D: 4-32 VDC A: 20-275 VAC, 24-190 VDC	15: 23 AAC, 6600 A <sup>2</sup> s 31: 30 AAC, 6600 A <sup>2</sup> s 41: 40 AAC, 6600 A <sup>2</sup> s 60: 60 AAC, 6600 A <sup>2</sup> s	K: Screw M: Pluggable spring-loaded	K: Screw G: Box clamp	E: Contactor U: SSR
	69: 690 VAC +10% -15%, 1600 Vp					

ZC = zero cross switching  
2: Refer to Current Derating curves

## Selection Guide

Rated output voltage, Blocking voltage	Control voltage	Connection type	Connection control / power	Rated operational current @ 40°C (I <sup>2</sup> t value) Product width	
				23 AAC (6600 A <sup>2</sup> s) 17.5 mm, low depth	30 AAC (6600 A <sup>2</sup> s) 22.5 mm
600 VAC, 1600 Vp	4-32 VDC	E-type	Screw / Screw	RGH1A60D15KKE	RGH1A60D31KKE
		E-type	Spring / Screw	RGH1A60D15MKE	RGH1A60D31MKE
	20-275 VAC, 24-190 VDC	E-type	Screw / Screw	RGH1A60A15KKE	RGH1A60A31KKE
		E-type	Spring / Screw	RGH1A60A15MKE	RGH1A60A31MKE
600 VAC, 1600 Vp	4-32 VDC	E-type	Screw / Box clamp	RGH1A60D41KGE	RGH1A60D60KGE
		E-type	Spring / Box clamp	RGH1A60D41MGE	-
		U-type	Screw / Box clamp	RGH1A60D41KGU	RGH1A60D60KGU
	20-275 VAC, 24-190 VDC	E-type	Screw / Box clamp	RGH1A60A41KGE	RGH1A60A60KGE
		E-type	Spring / Box clamp	RGH1A60A41MGE	-
		U-type	Screw / Box clamp	RGH1A60A41KGU	RGH1A60A60KGU
690 VAC, 1600 Vp	4-32 VDC	E-type	Screw / Box clamp	RGH1A69D41KGE	RGH1A69D60KGE
	20-275 VAC, 24-190 VDC	E-type	Screw / Box clamp	RGH1A69A41KGE	RGH1A69A60KGE

## Output Voltage Specifications

	RGH1A60...	RGH1A69...
Operational voltage range	42-600 VAC, +10% -15% on maximum	42-690 VAC <sup>3</sup> , +10% -15% on maximum
Blocking voltage	1600 Vp	1600 Vp
Internal varistor	680 V	-

3: 690 VAC refers to the line to line voltage

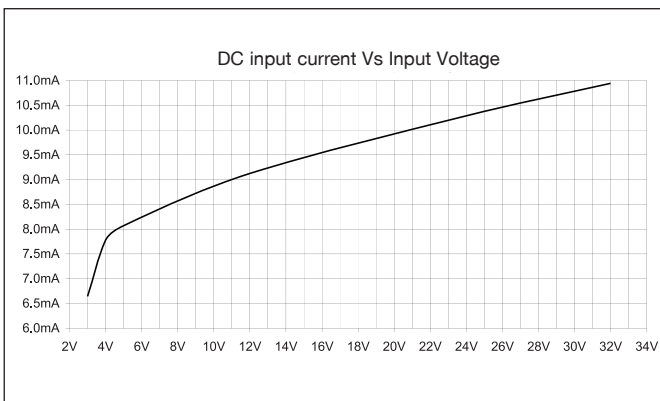
## General Specifications

Latching voltage (across L1-T1)	≤20 V	Pollution degree	2 (non-conductive pollution with possibilities of condensation)
Operational frequency range	45 to 65 Hz	Rated impulse withstand voltage, Uimp	6 kV (1.2/50 μs) for Overvoltage Category III (fixed installations)
Power factor	> 0.5 @ Vrated	Isolation	
Touch Protection	IP20	Input to Output	4000 Vrms
Control input status	continuously ON Green LED, when control input is applied	Input & Output to Case	4000 Vrms

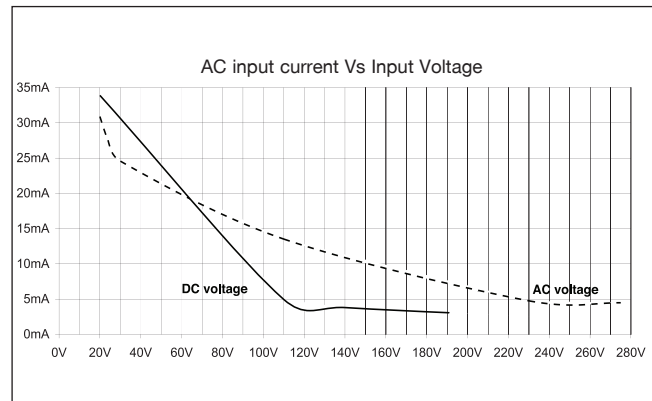
## Input Specifications

	RGH..D..	RGH..A..
Control voltage range <sup>4</sup>	4 - 32 VDC	20 - 275 VAC, 24 (-10%) - 190 VDC
Pick-up voltage	3.8 VDC	20 VAC/DC
Drop-out voltage	1 VDC	5 VAC/DC
Maximum Reverse voltage	32 VDC	-
Response time pick-up	0.5 cycle + 500 μs @ 24 VDC	2 cycles @ 230 VAC/110 VDC
Response time drop-out	0.5 cycle + 500 μs @ 24 VDC	0.5 cycle + 40 ms @ 230VAC/ 110 VDC
Input current @ 40°C	See diagrams below	See diagrams below

### RG..D..



### RG..A..



4: DC control to be supplied by a Class 2 power source according to UL1310

**Motor Ratings: HP (UL508) / kW (EN/IEC60947-4-2) @ 40°C**

	115 VAC	230 VAC	400 VAC	480 VAC	600 VAC	690 VAC
RGH..15	1/3HP / 0.18kW	1HP / 0.37kW	2HP / 0.75kW	3HP / 1.1kW	3HP / 1.5kW	- / 1.5kW
RGH..31	3/4HP / 0.37kW	2HP / 1.1kW	3HP / 1.5kW	5HP / 2.2kW	5HP / 3.7kW	- / 3.7kW
RGH..41	1 1/2HP / 0.56kW	3HP / 1.5kW	5HP / 2.2kW	7 1/2HP / 3.7kW	10HP / 4kW	- / 4kW
RGH..60	2HP / 0.75kW	3HP / 1.5kW	5HP / 4kW	7 1/2HP / 4kW	10HP / 5.5kW	- / 5.5kW

**Output Specifications**

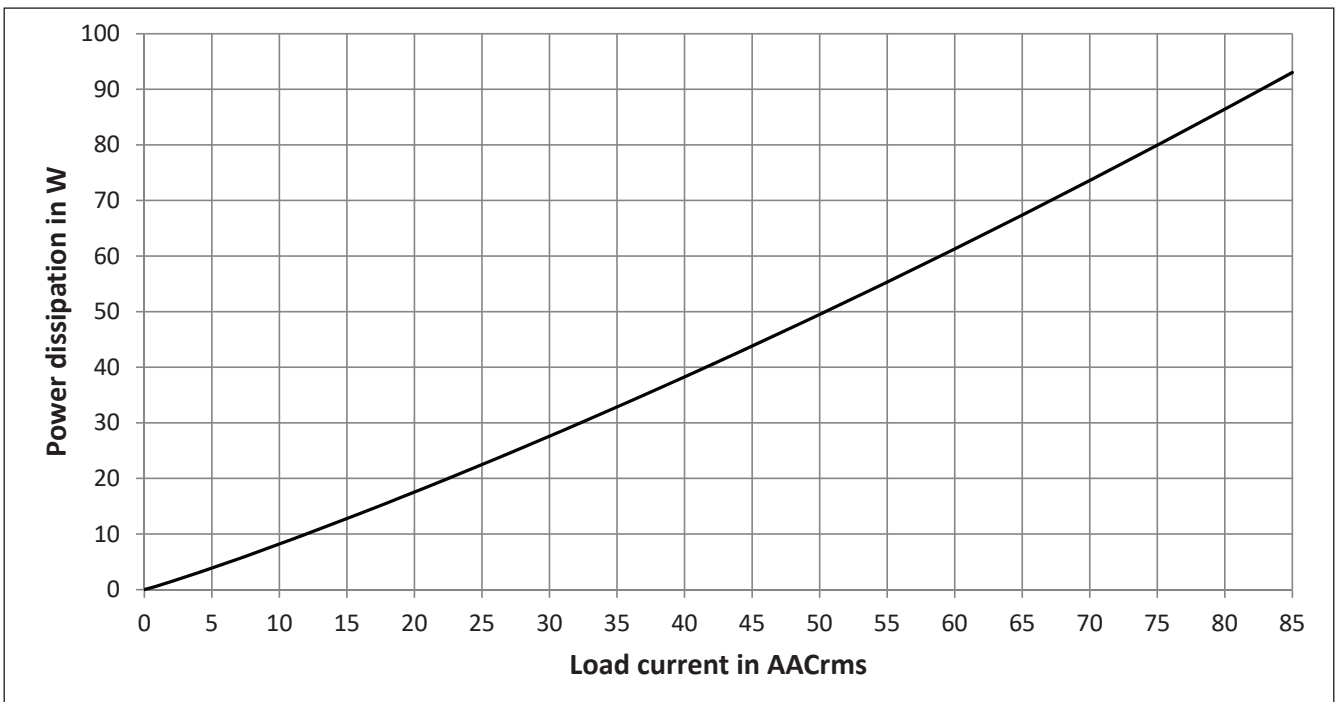
	RGH..15	RGH..31	RGH..41	RGH..60
Rated operational current <sup>5</sup> AC-51 rating @ Ta=25°C	23 AAC	30 AAC	49 AAC	75 AAC
AC-51 rating @ Ta=40°C	23 AAC	30 AAC	40 AAC	60 AAC
AC-53a rating @ Ta=40°C	5 AAC	10 AAC	13 AAC	18 AAC
Number of motor starts per hour (x:6, Tx:6s, F:50%) at 40°C <sup>6</sup>	30	30	30	30
Min. operational current	400 mAAC	400 mAAC	400 mAAC	400 mAAC
Rep. overload current - (Motor Rating) PF = 0.4 - 0.5 UL508: T <sub>AMB</sub> =40°C, t <sub>ON</sub> =1s, t <sub>OFF</sub> =9s, 50cycles	51 AAC	84 AAC	126 AAC	144 AAC
Maximum transient surge current (I <sub>TSM</sub> ), t=10ms	1150 Ap	1150 Ap	1150 Ap	1150 Ap
Maximum off-state leakage current at rated voltage	3 mA	3 mA	3 mA	3 mA
I <sup>2</sup> t for fusing (t=10ms), minimum	6600 A <sup>2</sup> s	6600A <sup>2</sup> s	6600A <sup>2</sup> s	6600A <sup>2</sup> s
Critical dv/dt (@ Tj init = 40°C)	1000 V/μs	1000 V/μs	1000 V/μs	1000 V/μs

5: Refer to Current Derating curves

6: Overload profile for AC-53a;

le: AC-53a: xle-Tx: F-S, where le = nominal current (AC-53a AAC), xle = overload current factor, Tx = duration of overload current (s), F = duty cycle (%), S = number of starts per hour. Example; 5A: AC-53a: 6 - 6 : 50 - 30 = max. 30 starts for the RGH..15 with an overload profile of 30A for 6 seconds with a duty cycle of 50%

**Output Power Dissipation**



## Environmental Specifications

Operating Temperature	-40°C to 80°C (-40°F to +176°F)	UL flammability rating (housing)	UL 94 V0 Glow wire ignition temperature and Glow wire flammability index conform to EN 60335-1 requirements
Storage Temperature	-40°C to 100°C (-40°F to +212°F)		
EU RoHS compliant	Yes		
China RoHS compliant	Refer to Environmental Information (page 15)		
Impact resistance (EN 50155, EN 61373)	15/11 g/ms	Weight	
Vibration resistance (2-100Hz, IEC60068-2-6, EN50155, EN61373)	2g per axis	RGH..15	approx. 260 g
		RGH..31	approx. 375 g
		RGH..41	approx. 515 g
Relative humidity	95% non-condensing @ 40°C	RGH..60	approx. 972 g

## Agency Approvals and Conformances

Conformance	IEC/EN 62314 IEC/EN 60947-4-2 IEC/EN 60947-4-3	Agency Approvals	UL508 Listed (E172877) cUL Listed (E172877) VDE 0660-109
		Short Circuit Current Rating	100kA, UL508



## Electromagnetic Compatibility

EMC Immunity	EN 60947-4-3	Radiated Radio Frequency Immunity	IEC/EN 61000-4-3
Electrostatic Discharge (ESD)		10V/m, 80 - 1000 MHz	Performance Criteria 1
Immunity	IEC/EN 61000-4-2	10V/m, 1.4 - 2.0GHz	Performance Criteria 1
Air discharge, 8kV	Performance Criteria 1	3V/m, 2.0 - 2.7GHz	Performance Criteria 1
Contact, 4kV	Performance Criteria 1	Conducted Radio Frequency Immunity	IEC/EN 61000-4-6
Electrical Fast Transient (Burst) Immunity	IEC/EN 61000-4-4	10V/m, 0.15 - 80 MHz	Performance Criteria 1
Output: 2kV, 5kHz	Performance Criteria 1	Voltage Dips Immunity	IEC/EN 61000-4-11
Input: 1kV, 5kHz	Performance Criteria 1	0% for 0.5, 1 cycle	Performance Criteria 2
Electrical Surge Immunity <sup>7</sup>	IEC/EN 61000-4-5	40% for 10 cycles	Performance Criteria 2
Output, line to line, 1kV	Performance Criteria 1	70% for 25 cycles	Performance Criteria 2
Output, line to earth, 2kV	Performance Criteria 1	80% for 250 cycles	Performance Criteria 2
Input, line to line, 1kV	Performance Criteria 2	Voltage Interruptions Immunity	IEC/EN 61000-4-11
Input, line to earth, 2kV	Performance Criteria 2	0% for 5000ms	Performance Criteria 2
EMC Emission	EN 60947-4-3	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		

7: An external varistor, S20K750, needs to be connected across the mains supply for the RGH1A69.. models

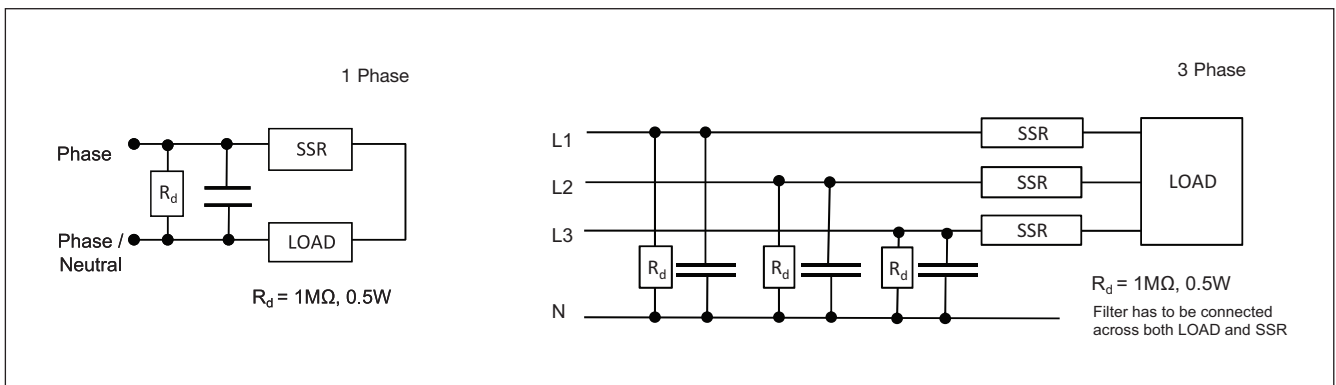
## Filtering - EN / IEC 55011 Class A compliance (for class B compliance contact us)

Part Number	Suggested filter for compliance	Maximum Heater current
RGH1A60..15	220 nF / 760 V / X1	20A
RGH1A60..31	220 nF / 760 V / X1	30A
RGH1A60..41	330 nF / 760 V / X1	40A
RGH1A60..60	330 nF / 760 V / X1 680 nF / 760 V / X1	40A 65A

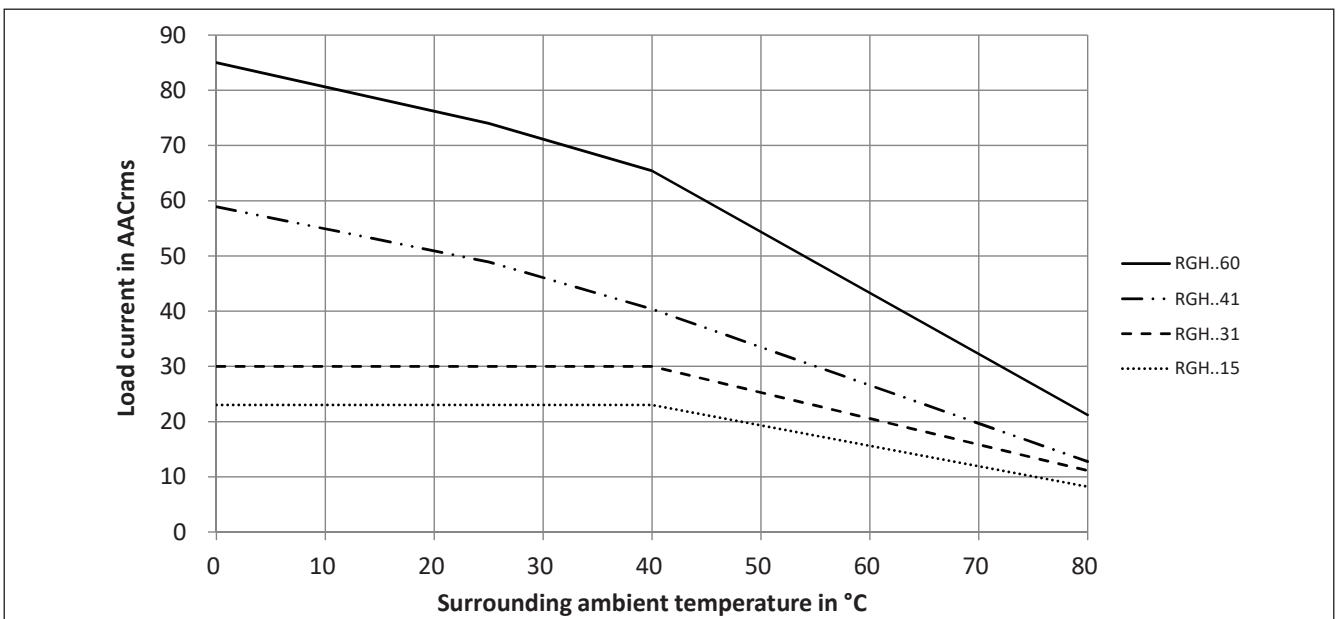
Note:

- 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.

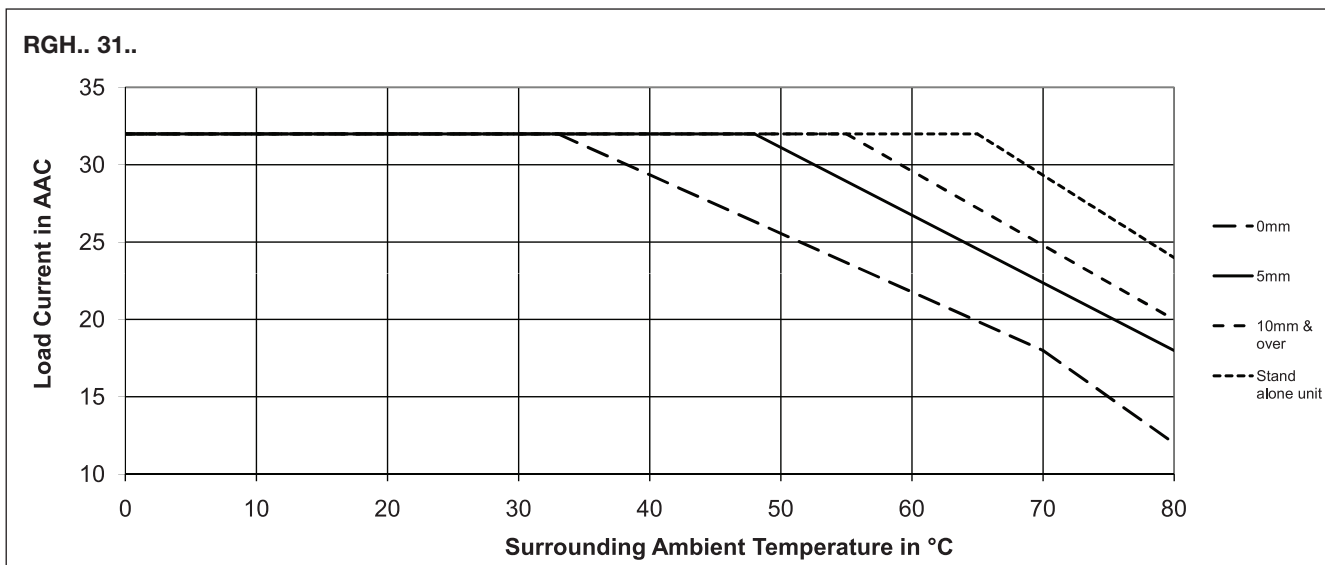
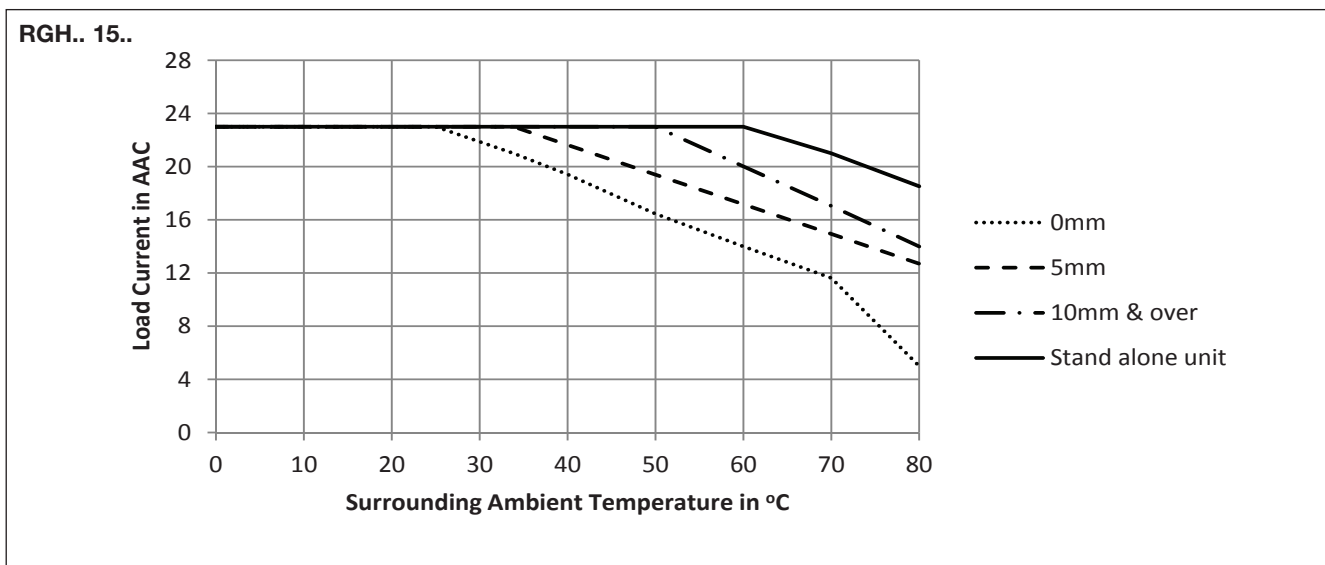
## Filter Connection Diagrams



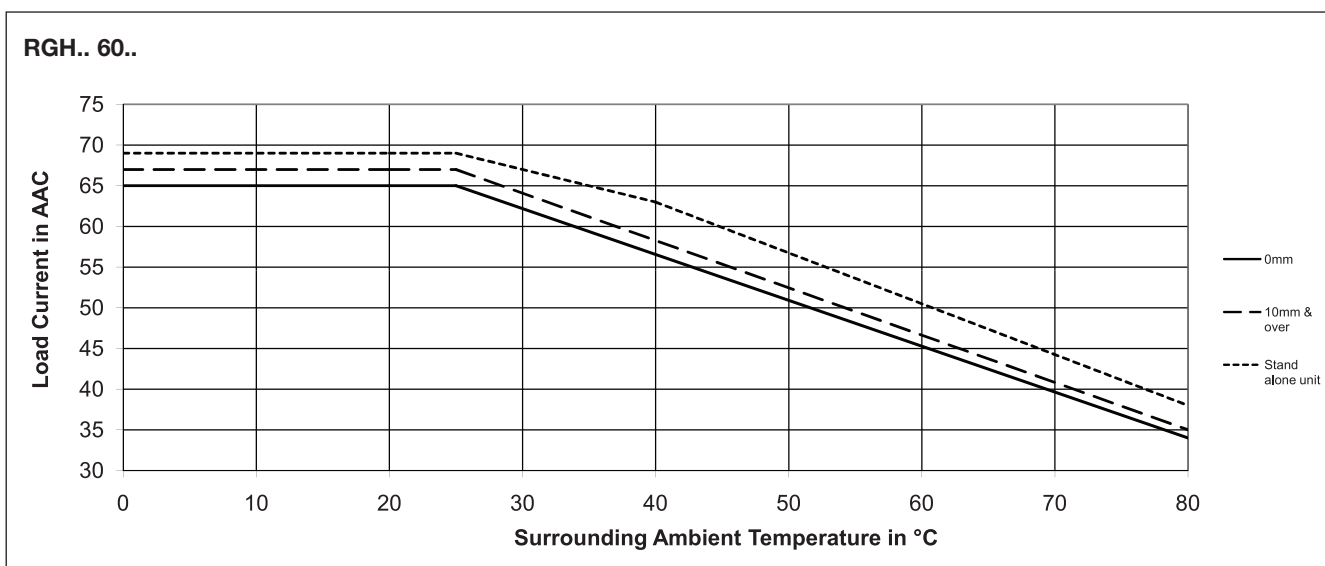
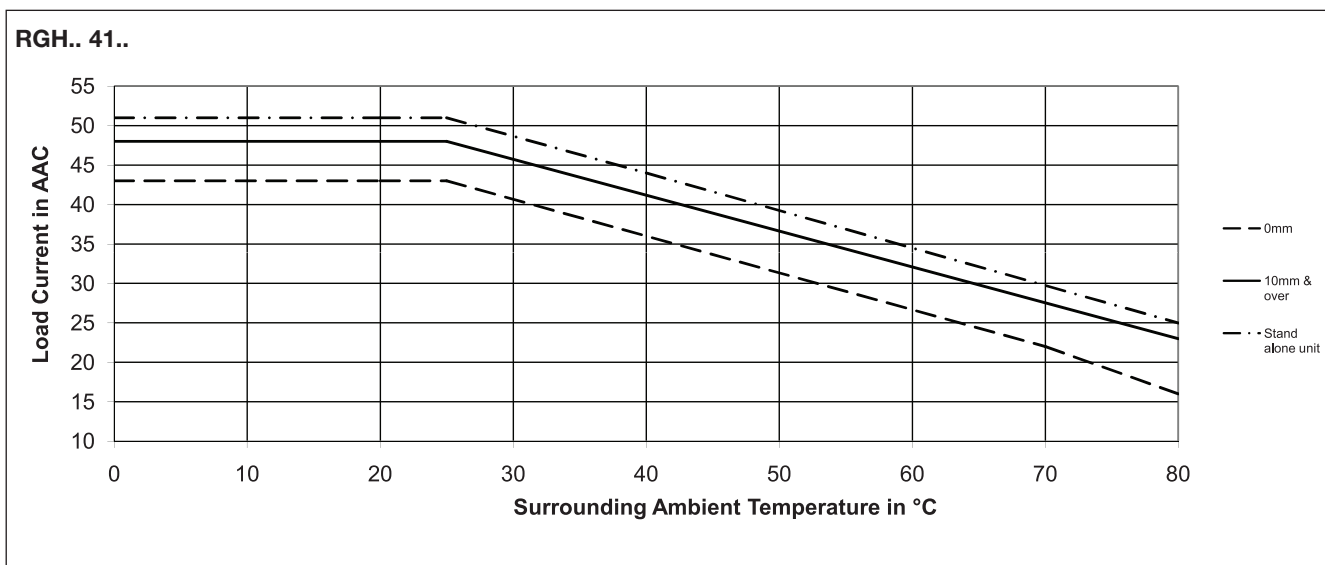
## Current Derating (UL 508)



## Derating vs. Spacing Curves

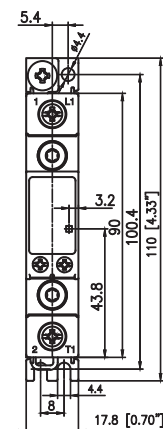
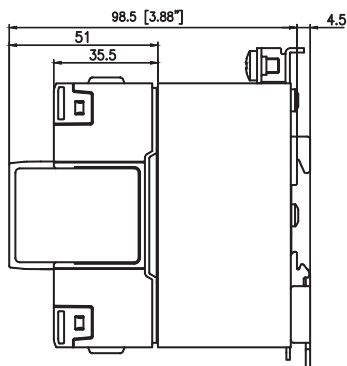
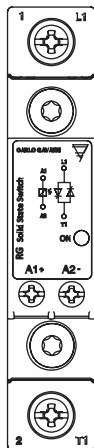


## Derating vs. Spacing Curves (cont.)

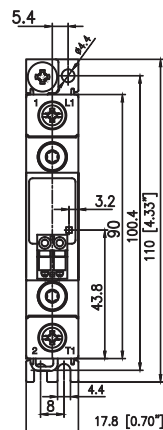
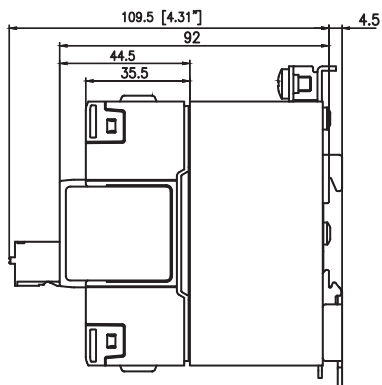
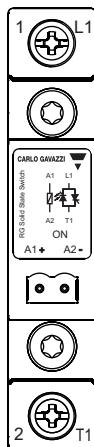


# Terminal Layout and Dimensions

RGH1A...15KKE



RGH1A...15MKE



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

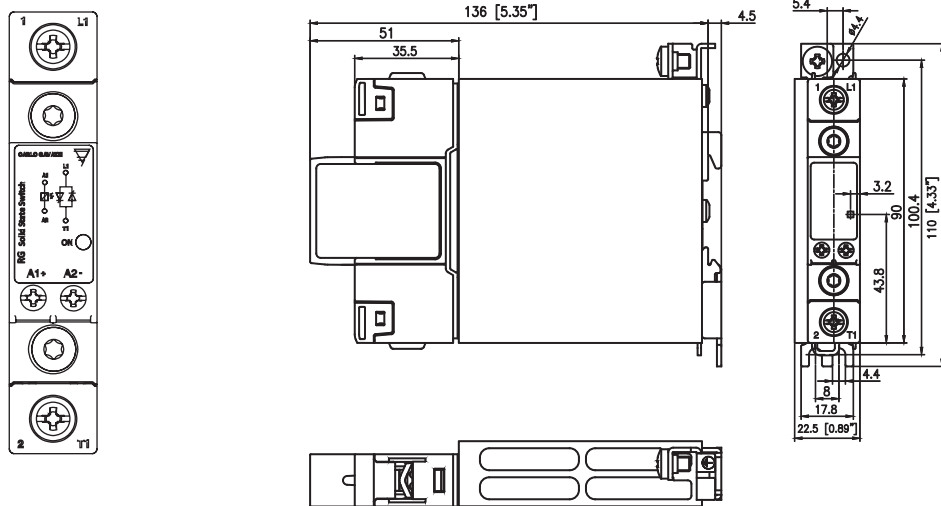
Housing width tolerance +0.5mm, -0mm...as per DIN43880.

All other tolerances ± 0.5mm.

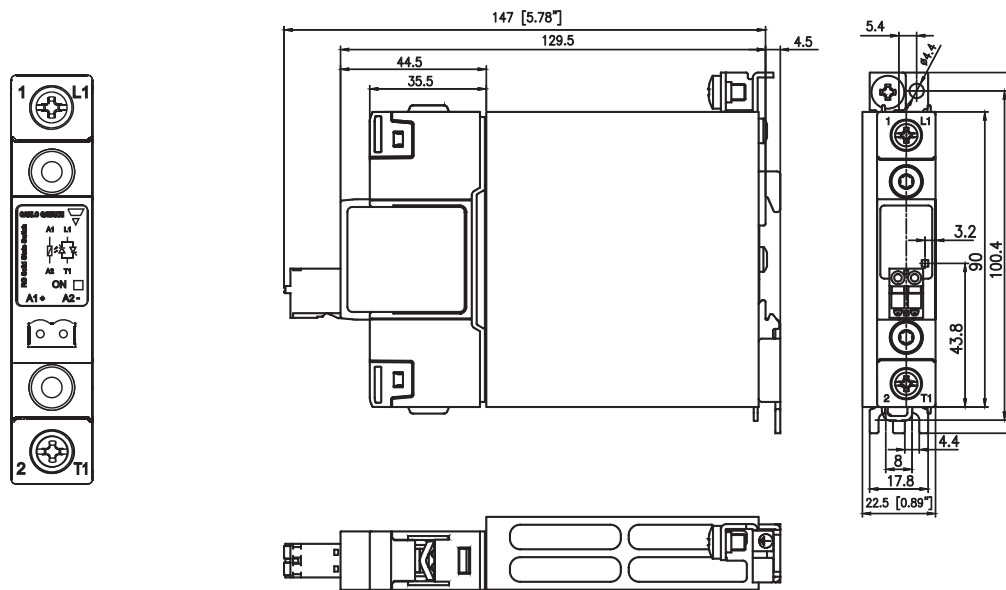
All dimensions in mm.

## Terminal Layout and Dimensions (cont.)

### RGH1A...31KKE



### RGH1A...31MKE

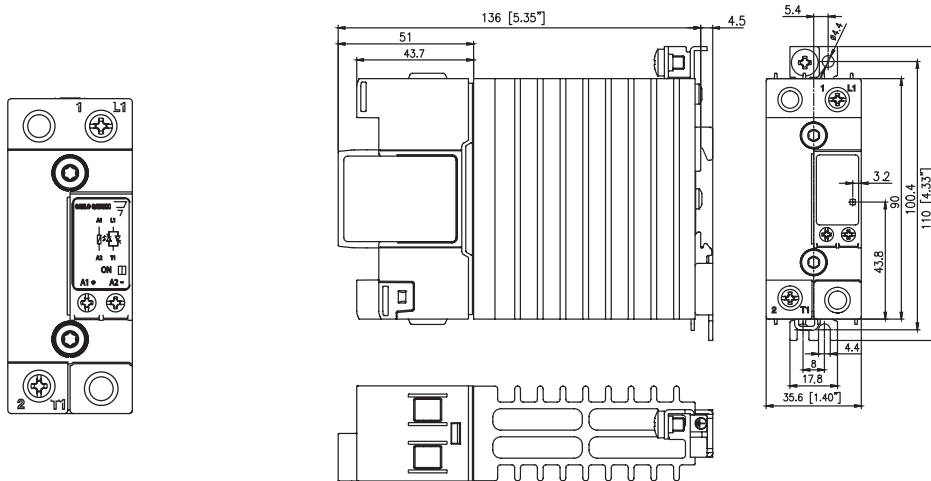


- 1/L1: Supply connection
- 2/T1: Load connection
- A1(+): Positive control signal
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- ⊕ : Protective Earth

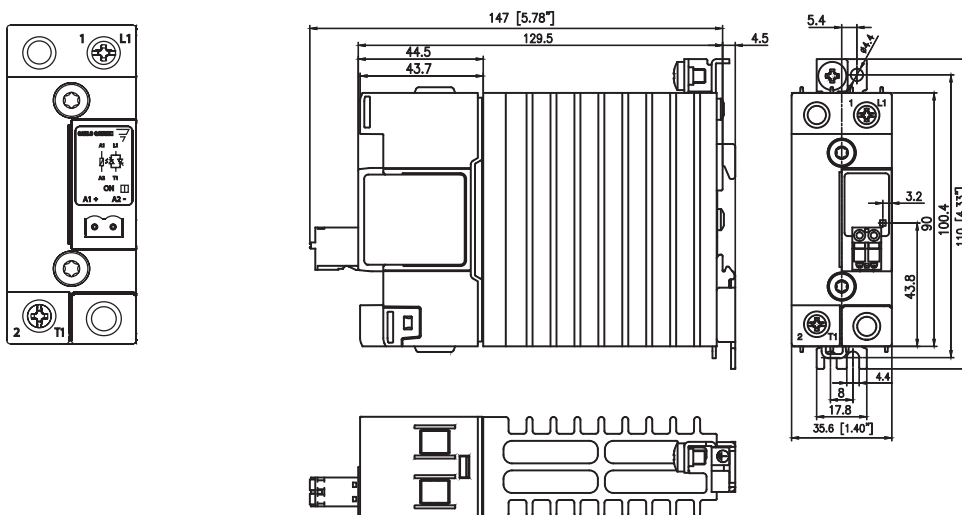
Housing width tolerance +0.5mm, -0mm...as per DIN43880.  
All other tolerances ± 0.5mm. All dimensions in mm.

## Terminal Layout and Dimensions (cont.)

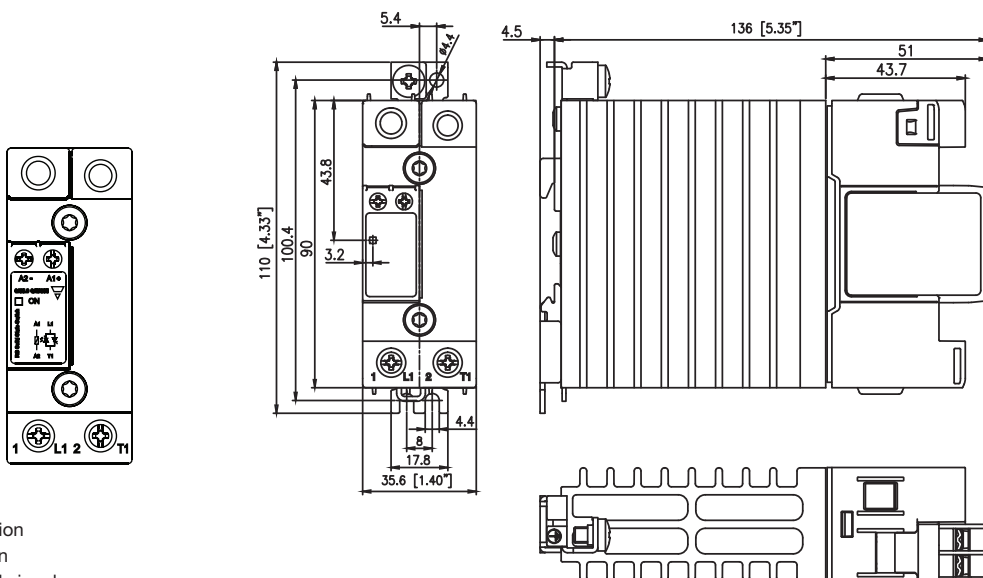
RGH1A...41KGE



RGH1A...41MGE



RGH1A...41KGU

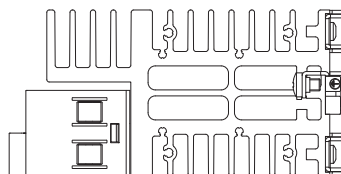
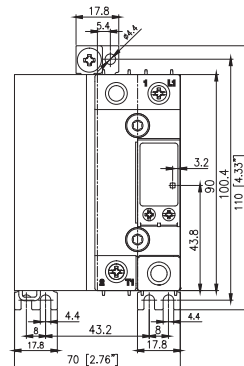
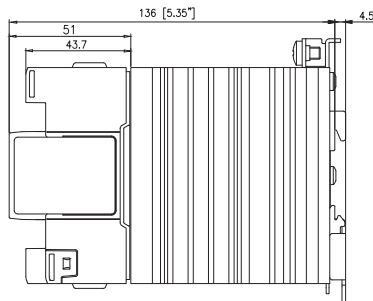
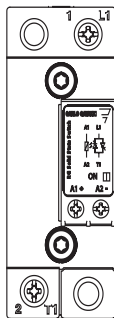


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- ⊕ : Protective Earth

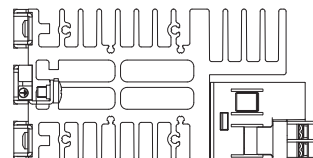
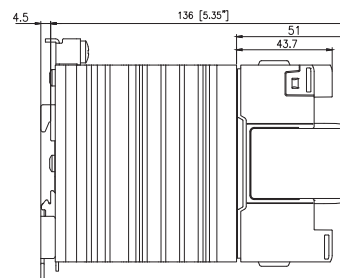
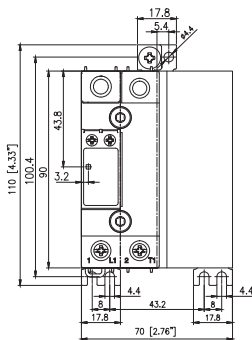
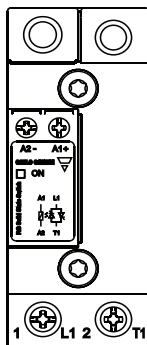
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All other tolerances ± 0.5mm. All dimensions in mm.

### Terminal Layout and Dimensions (cont.)

RGH1A...60KGE



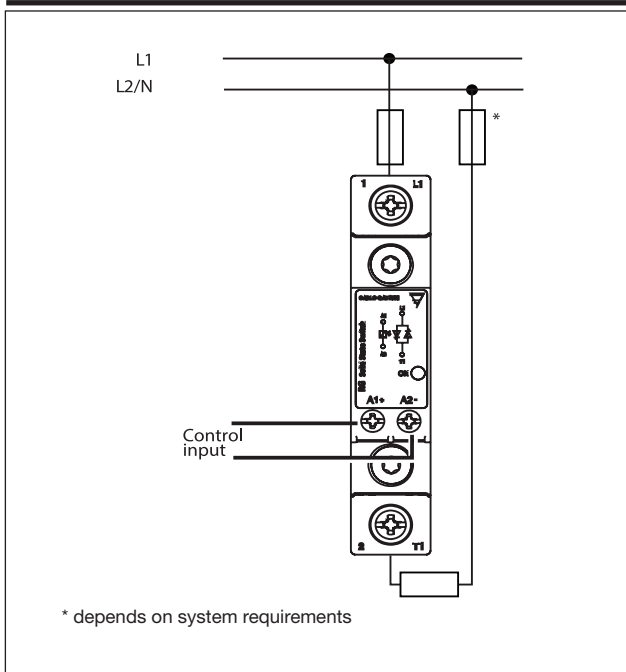
RGH1A...60KGU



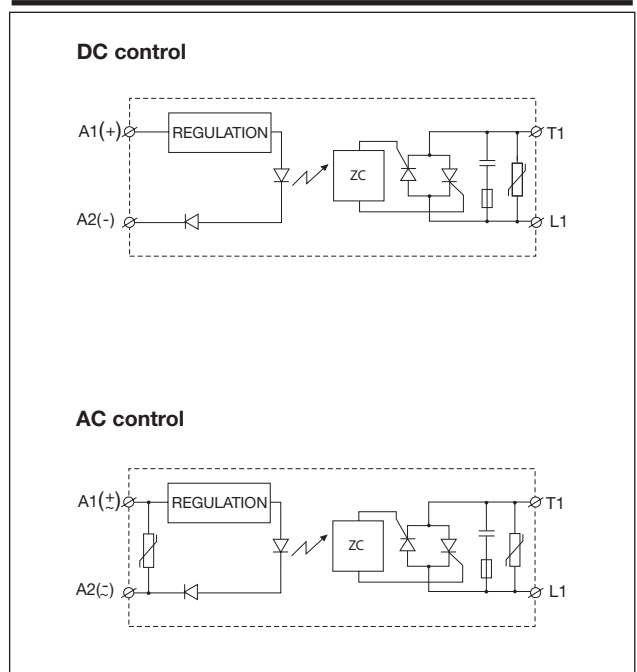
- 1/L1: Supply connection
- 2/T1: Load connection
- A1(+): Positive control signal
- A2(-): Control ground
- ⊕ : Protective Earth

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

## Connection Diagram



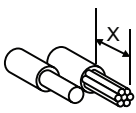





## Functional Diagram



Note: Varistor on output is not included in the RGH1A69...models

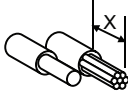


## Connection Specifications

**POWER CONNECTIONS: 1/L1, 2 /T1**  
Use 75°C copper (Cu) conductors

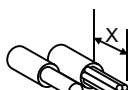
	RG..KKE RG..MKE	RG..KGE ; RG..KGU RG..MGE	
Stripping Length (X)	12mm	11mm	
Connection type	M4 screw with captivated washer	M5 screw with box clamp	
Rigid (Solid & Stranded) UL/ cUL rated data			
	2x 2.5..6 mm <sup>2</sup> 2x 14.. 10 AWG	1x 2.5..6 mm <sup>2</sup> 1x 14.. 10 AWG	1x 2.5..25mm <sup>2</sup> 1x 14.. 3 AWG
Flexible with end sleeve			
	2x 1.0..2.5mm <sup>2</sup> 2x 2.5..4mm <sup>2</sup> 2x 18..14AWG 2x 14..12 AWG	1x 1.0..4mm <sup>2</sup> 1x 18.. 12 AWG	1x 2.5..16mm <sup>2</sup> 1x 14.. 6 AWG
Flexible without end sleeve			
	2x 1.0..2.5 mm <sup>2</sup> 2x 2.5...6 mm <sup>2</sup> 2x 18..14 AWG 2x 14...10 AWG	1x 1.0..6 mm <sup>2</sup> 1x 18.. 10 AWG	1x 4..25 mm <sup>2</sup> 1x 12.. 3 AWG
Torque specifications	Pozidriv 2 UL: 2.0Nm (17.7lb-in) IEC: 1.5 - 2.0Nm (13.3 - 17.7lb-in)	Pozidriv 2 UL: 2.0Nm (17.7lb-in) IEC: 2.0 - 2.5Nm (13.3 - 17.7lb-in)	
Aperture for termination lug	12.3mm	-	
Protective Earth (PE) Connection	 M5, 1.5Nm (13.3 lb-in)		

Note: 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.

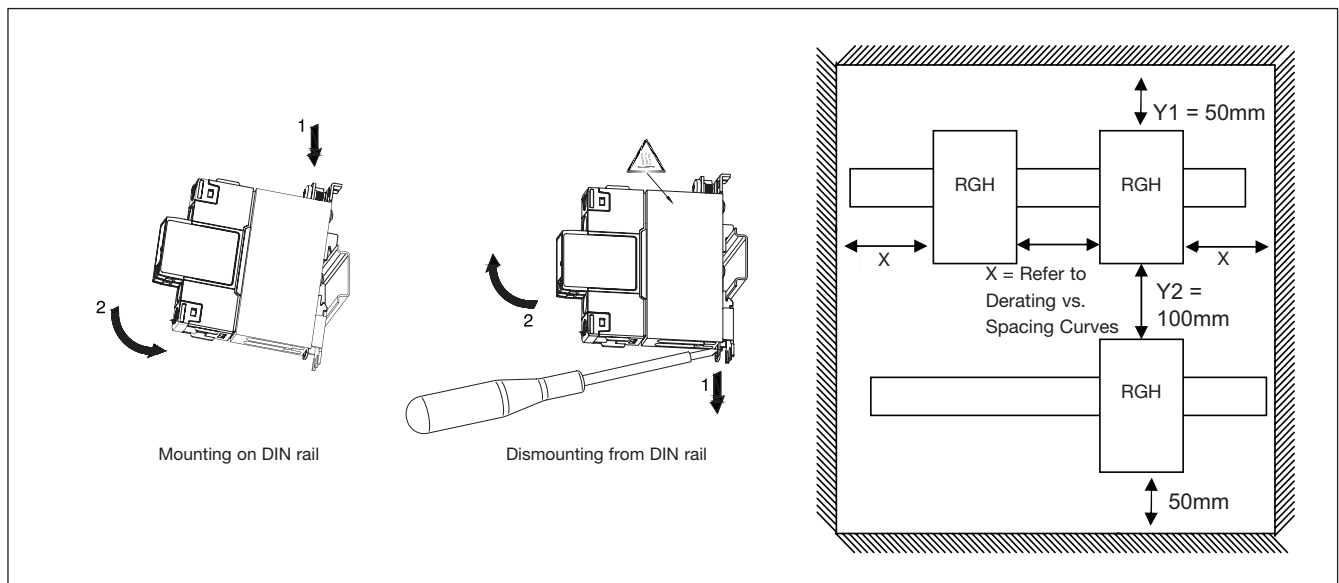
**CONTROL CONNECTIONS: A1(+), A2(-)**  
Use 60 / 75°C copper (Cu) conductors

	RG.KKE, RG..KGE, RG..KGU	
Torque specifications	M3, Pozidriv 1 UL: 0.5Nm (4.4lb-in) IEC: 0.4 - 0.5Nm (3.5 - 4.4lb in)	
Stripping Length (X)	8mm	
Rigid (Solid & Stranded) UL/ cUL rated data		
	2x 0.5..2.5 mm <sup>2</sup> 2x 18..12 AWG	1x 0.5..2.5 mm <sup>2</sup> 1x 18..12 AWG
Flexible with end sleeve		
	2x 0.5..2.5 mm <sup>2</sup> 2x 18..12 AWG	1x 0.5..2.5 mm <sup>2</sup> 1x 18..12 AWG

**CONTROL CONNECTIONS: A1(+), A2(-)**  
Use 60/75°C copper (Cu) conductors

	RG..MKE, RG..MGE
Stripping Length (X)	12 - 13mm
Rigid (Stranded) UL/ cUL rated data	
	1x 0.2...2.5 mm <sup>2</sup> 1x 24...12 AWG

## 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 100,000 A rms Symmetrical Amperes, 600 Volts maximum when protected by fuses. Tests at 100,000 A 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. fuse size [A]	Class	Current [kA]	Voltage [VAC]
RGH..15	30	J or CC	100	Max. 600
RGH..31	30	J or CC	100	Max. 600
RGH..41	40	J	100	Max. 600
RGH..60	40	J	100	Max. 600

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

Part No.	Ferraz Shawmut (Mersen)		Siba		Current [kA]	Voltage [VAC]
	Max fuse size [A]	Part number	Max fuse size [A]	Part number		
RGH1A60..15	100	A70QS100-4	100	50 194 20.100	100	Max. 660
RGH1A60..31	100	A70QS100-4	100	50 194 20.100	100	Max. 660
RGH1A60..41	100	A70QS100-4	100	50 194 20.100	100	Max. 660
RGH1A60..60	100	A70QS100-4	100	50 194 20.100	100	Max. 660
RGH1A69..41	100	A100P50-4	100	50 197 20.100	100	Max. 759
RGH1A69..60	-	-	100	50 197 20.100	100	Max. 759

## 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 <sup>2</sup> ]	Minimum length of Cu wire conductor [m] <sup>8</sup>
<b>RGH..15</b>	<b>1 pole</b>			
<b>RGH..31</b>	S201 - Z20 (20A)	S201-B10 (10A)	1.5	4.2
<b>RGH..41</b>			2.5	7.0
<b>RGH..60</b> (6600 A <sup>2</sup> s)			4.0	11.2
	S201 - Z32 (32A)	S201-B16 (16A)	2.5	13.0
			4.0	20.8
			6.0	31.2
	<b>2 pole</b>			
	S202 - Z20 (20A)	S202-B10 (10A)	1.5	1.8
			2.5	3.0
			4.0	4.8
	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

8. 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.

## Environmental Information

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	○	○	○	○	○
<p>O: Indicates that said hazardous substance contained in homogeneous materials fot this part are below the limit requirement of GB/T 26572.</p> <p>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.</p>						

## 环境特性

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	○	○	○	○	○
<p>O: 此零件所有材料中含有的该有害物低于GB/T 26572的限定。</p> <p>X: 此零件某种材料中含有的该有害物高于GB/T 26572的限定。</p>						



## Accessories

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### Control Plugs



### Ordering Key

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Pack of 10 spring  
loaded control plugs

**RGM25**

\* Refer to 'Connection Specifications' section for further details.