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[1]
- Rated operational current: up to 60 AAC @ 40°C
- Up to 6600 A²s for I²t and 1600 Vp blocking voltage
- Control voltages: 4-32 VDC, 20-275 VAC (24-190 VDC)
- IP20 protection
- Design according to EN/IEC60947-4-2 , EN/IEC60947-4-3, EN/IEC62314, UL508, CSA22-2 No.14-10
- 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 I²t 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

- 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

Ordering Key

1 Phase SSR with heatsink	Rated voltage	Control voltage	Rated current[2], I²t	Connection control	Connection power	Connection configuration
RGH1A: ZC	60: 600 VAC +10% - 15%, 1600 Vp	D: 4-32 VDC	15: 23 AAC, 6600 A²s	K: Screw	K: Screw	E: Contactor
		A: 20-275 VAC, 24-190 VDC	20: 23 AAC, 1800 A²s	M: Pluggable spring-loaded	G: Box Clamp	U: SSR
	69: 690 VAC +10% -15%, 1600 Vp		21: 23 AAC, 6600 A²s			
			31: 30 AAC, 6600 A²s			
			40: 40 AAC, 1800 A²s			
			41: 40 AAC, 6600 A²s			
			60: 60 AAC, 6600 A²s			

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 (I²t value) Product width			
				23 AAC (6600 A²s) 17.5 mm short	23 AAC (1800 A²s) 17.5 mm	23 AAC (6600 A²s) 17.5 mm	30 AAC (6600 A²s) 22.5 mm
600 VAC, 1600 Vp	4-32 VDC	E-type	Screw / Screw	RGH1A60D15KKE	RGH1A60D20KKE	RGH1A60D21KKE	RGH1A60D31KKE
		E-type	Spring / Screw	RGH1A60D15MKE	RGH1A60D20MKE	RGH1A60D21MKE	RGH1A60D31MKE
	20-275 VAC, 24-190 VDC	E-type	Screw / Screw	RGH1A60A15KKE	RGH1A60A20KKE	RGH1A60A21KKE	RGH1A60A31KKE
		E-type	Spring / Screw	RGH1A60A15MKE	RGH1A60A20MKE	RGH1A60A21MKE	RGH1A60A31MKE
				40 AAC (1800 A²s) 35 mm	40 AAC (6600 A²s) 35 mm	60 AAC (6600 A²s) 70 mm	
600 VAC, 1600 Vp	4-32 VDC	E-type	Screw / Box clamp	RGH1A60D40KGE	RGH1A60D41KGE	RGH1A60D60KGE	
		E-type	Spring / Box clamp	-	RGH1A60D41MGE	RGH1A60D60MGE	
		U-type	Screw / Box clamp	-	RGH1A60D41KGU	RGH1A60D60KGU	
	20-275 VAC, 24-190 VDC	E-type	Screw / Box clamp	RGH1A60A40KGE	RGH1A60A41KGE	RGH1A60A60KGE	
		E-type	Spring / Box clamp	-	RGH1A60A41MGE	RGH1A60A60MGE	
		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[3], +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

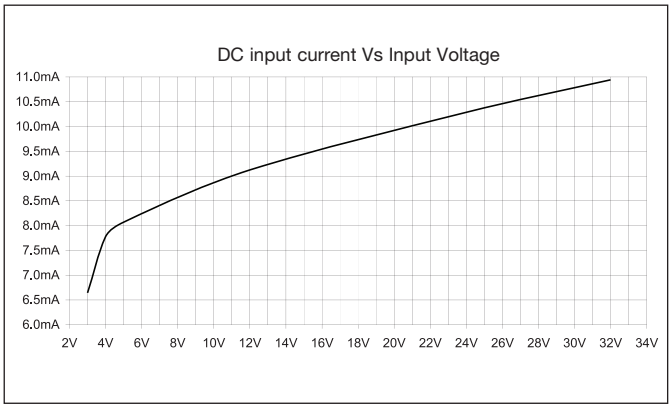
Latching voltage (across L1-T1)	≤20 V
Operational frequency range	45 to 65 Hz
Power factor	> 0.5 @ Vrated
Touch Protection	IP20
Control input status	continuously ON Green LED, when control input is applied

Pollution degree	2 (non-conductive pollution with possibilities of condensation)
Rated impulse withstand voltage, Uimp	6 kV (1.2/50 µs) for Overvoltage Category III (fixed installations)
Isolation Input to Output Input & Output to Case	 4000 Vrms 4000 Vrms

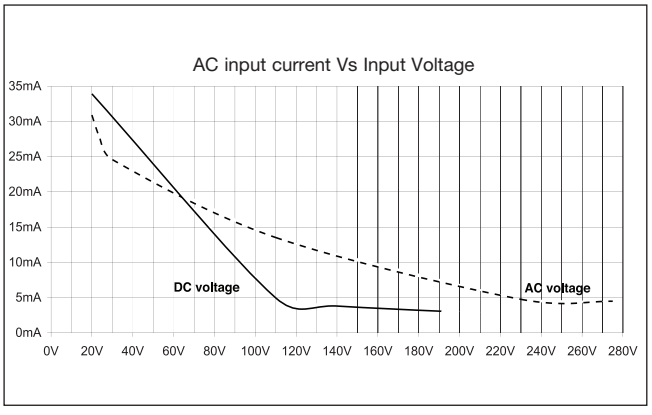
Input Specifications

	RGH..D..	RGH..A..
Control voltage range[4]	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

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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..20/21	1/2HP / 0.18kW	1 1/2HP / 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..40	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

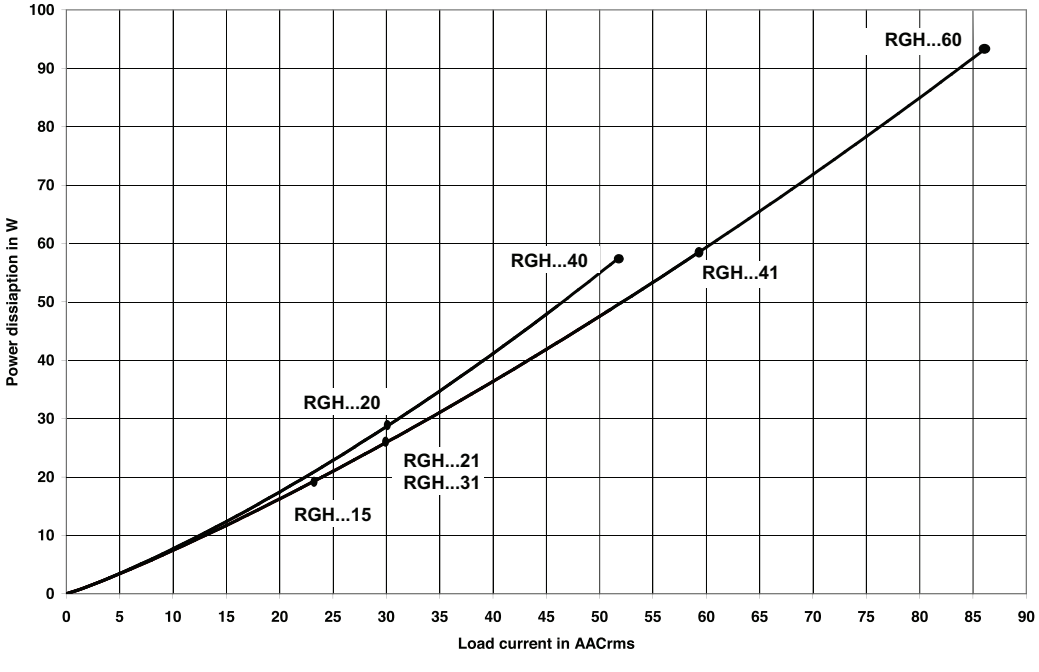
Output Specifications

	RGH..15	RGH..20	RGH..21	RGH..31	RGH..40	RGH..41	RGH..60
Rated operational current[5] AC-51 rating @ Ta=25°C	23 AAC	25.5 AAC	25.5 AAC	30 AAC	43.7 AAC	49 AAC	75 AAC
AC-51 rating @ Ta=40°C	23 AAC	23 AAC	23 AAC	30 AAC	40 AAC	40 AAC	60 AAC
AC-53a rating @ Ta=40°C	5 AAC	5 AAC	5 AAC	10 AAC	10 AAC	13 AAC	18 AAC
Number of motor starts (x:6, Tx:6s, F:50%) at 40°C [6]	30	30	30	30	30	30	30
Min. operational current	400 mAAC	250 mAAC	400 mAAC	400 mAAC	250 mAAC	400 mAAC	400 mAAC
Rep. overload current - (Motor Rating) PF = 0.4 - 0.5 UL508: T_{AMB}=40°C, t_{ON}=1s, t_{OFF}=9s, 50cycles	51 AAC	60 AAC	60 AAC	84 AAC	84 AAC	126 AAC	144 AAC
Maximum transient surge current (I_{TSM}), t=10ms	1150 Ap	600 Ap	1150 Ap	1150 Ap	600 Ap	1150 Ap	1150 Ap
Maximum off-state leakage current at rated voltage	3 mA	3 mA	3 mA	3 mA	3 mA	3 mA	3 mA
I^2t for fusing (t=10ms) Min.	6600 A^2s	1800 A^2s	6600A^2s	6600A^2s	1800A^2s	6600A^2s	6600A^2s
Crititcal dv/dt (@ Tj init = 40°C)	1000 V/us	1000 V/us	1000 V/us	1000 V/us	1000 V/us	1000 V/us	1000 V/us

5: Refer to Current Derating curves

6: Overload current profle definition, x: multiple of AC53a rating, Tx: duration of current surge, F: duty cycle

Output Power Dissipation



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 (2011/65/EU)	Compliant
Impact resistance (EN 50155, EN 61373)	15/11 g/ms
Vibration resistance (2-100Hz, IEC60068-2-6, EN50155, EN61373)	2g per axis
Relative humidity	95% non-condensing @ 40°C
UL flammability rating (housing)	UL 94 V0

GWIT & GWFI	conforms to EN 60335-1 requirements
Weight	
RGH..15	approx. 260 g
RGH..20, 21	approx. 315 g
RGH..31	approx. 375 g
RGH..40, 41	approx. 515 g
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	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[7]	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
3V/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 0.5/1cycle	Performance Criteria 2
40% for 10 cycles	Performance Criteria 2
70% for 250 cycles	Performance Criteria 2
Voltage Interruptions Immunity	IEC/EN 61000-4-11
0% for 5000ms	Performance Criteria 2

EMC Emission	EN/IEC 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)

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

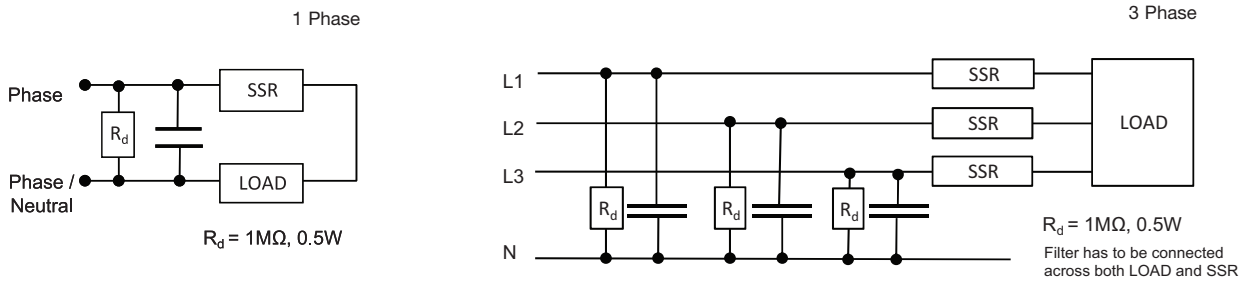
Filtering - EN / IEC 55011 Class A compliance (for class B compliance contact us)

Part Number	Suggested filter for compliance	Maximum Heater current
RGH1A60..15	220 nF / 760 V / X1	20A
RGH1A60..20	150 nF / 760 V / X1	20A
RGH1A60..21	220 nF / 760 V / X1	20A
RGH1A60..31	220 nF / 760 V / X1	30A
RGH1A60..40/41	330 nF / 760 V / X1	40A
RGH1A60..60	330 nF / 760 V / X1 470 nF / 760 V / X1	40A 65A

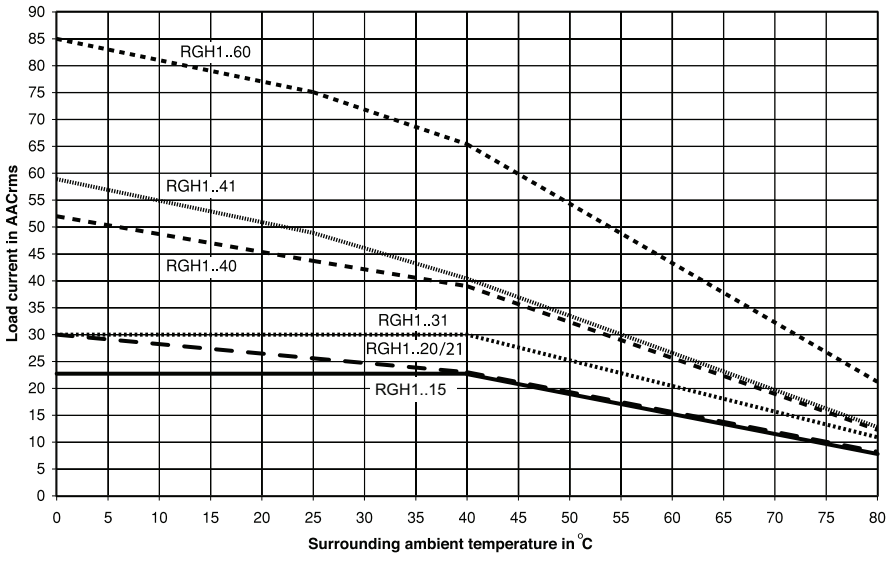
Note:

- 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.
- 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

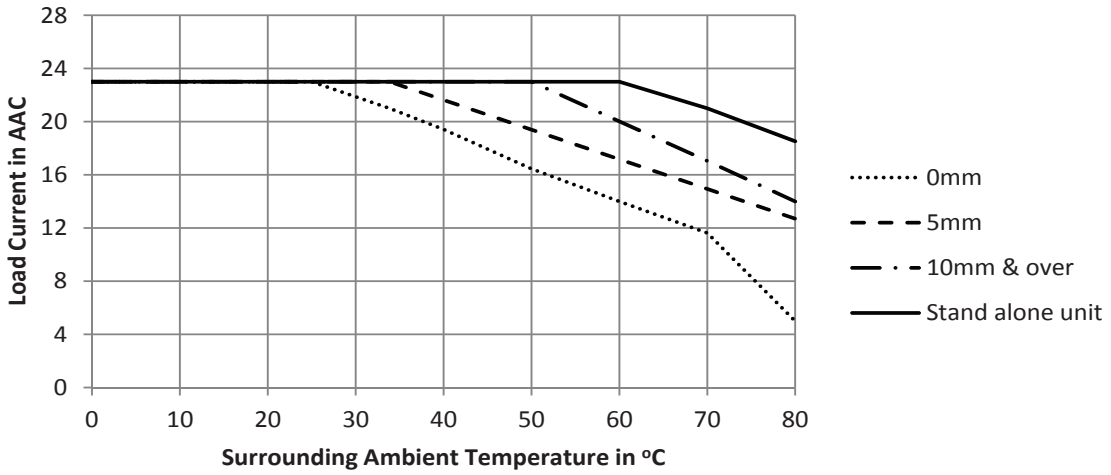


Current Derating (UL 508)

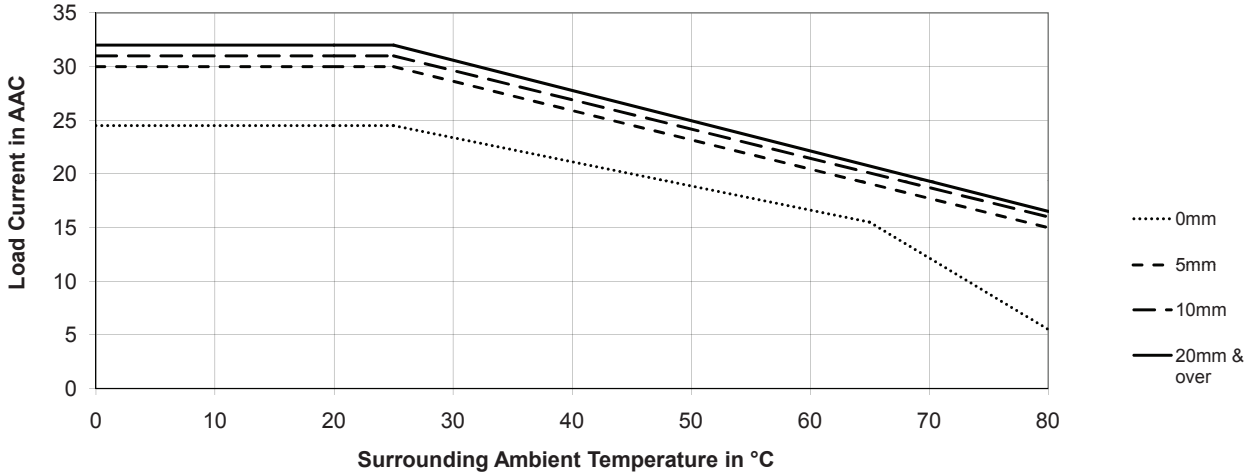


Derating vs. Spacing Curves

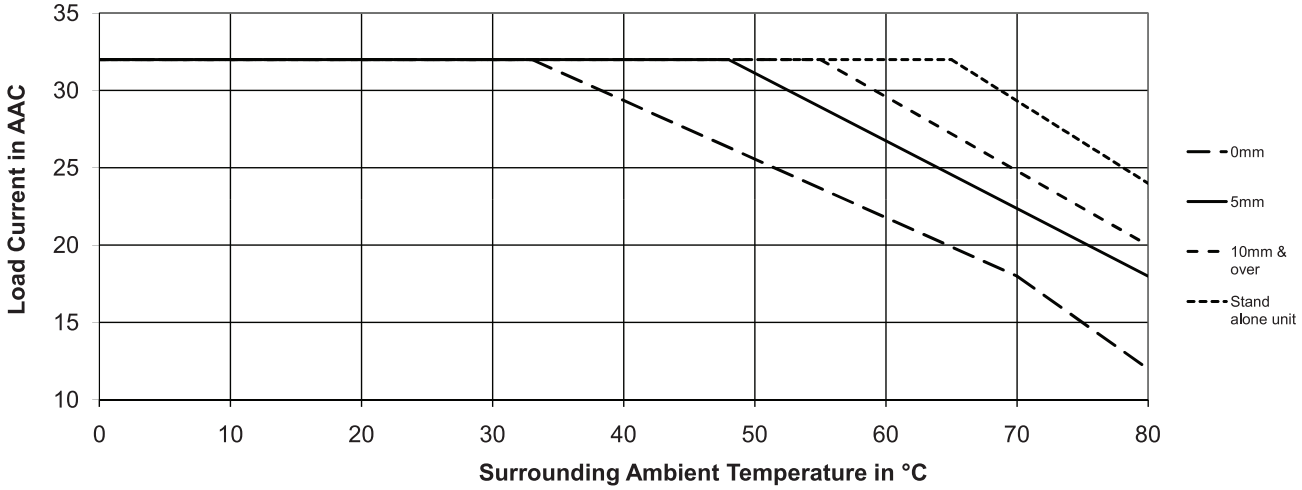
RGH.. 15..



RGH.. 20.., RGH..21..

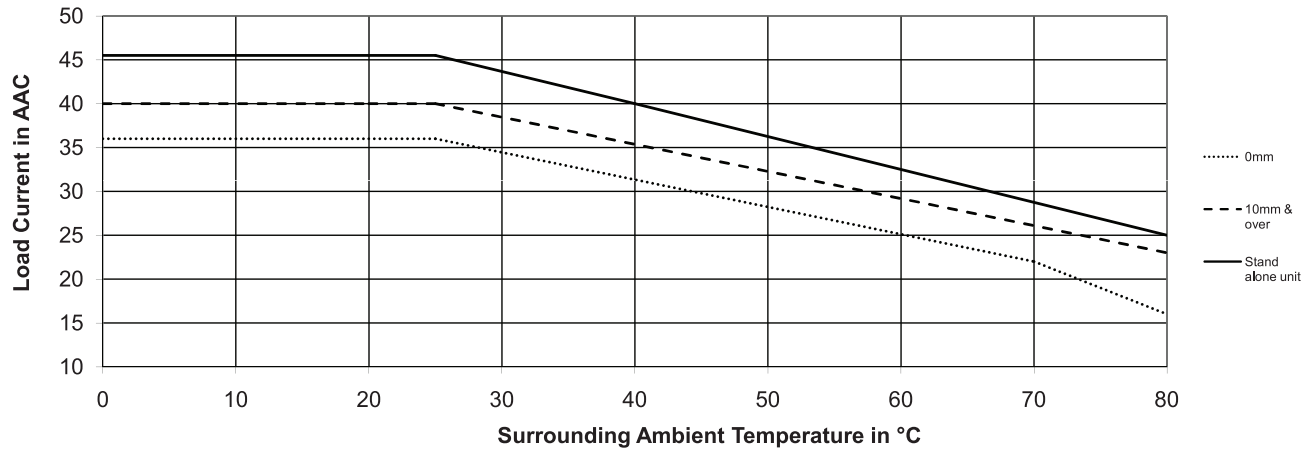


RGH.. 31..

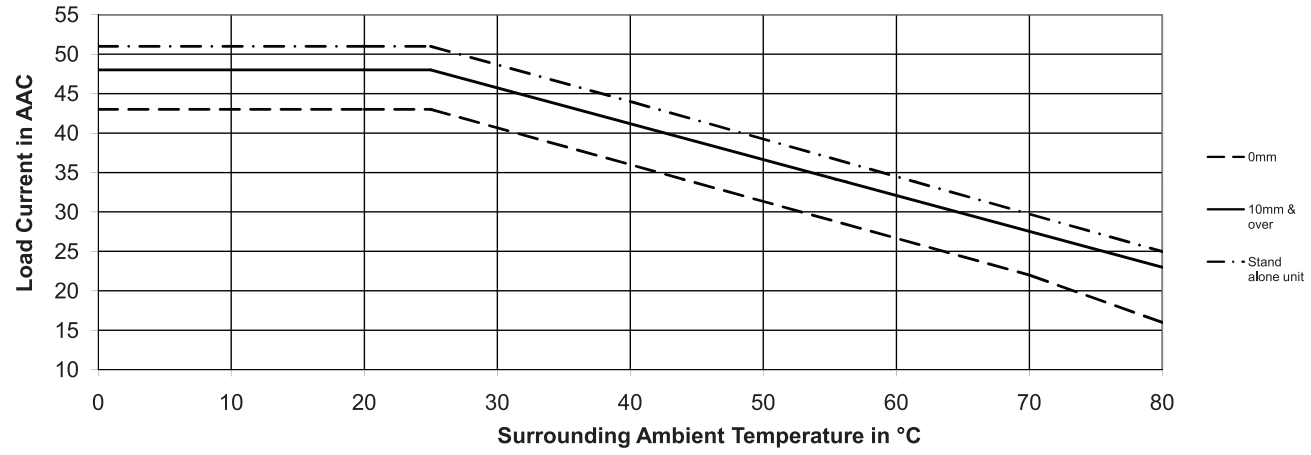


Derating vs. Spacing Curves (cont.)

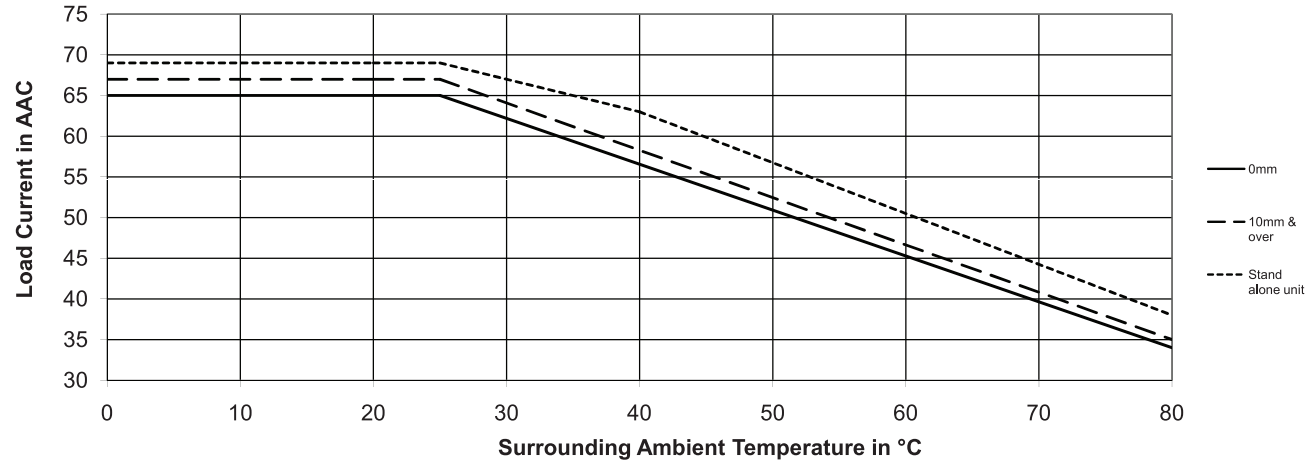
RGH.. 40..



RGH.. 41..

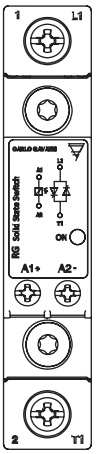


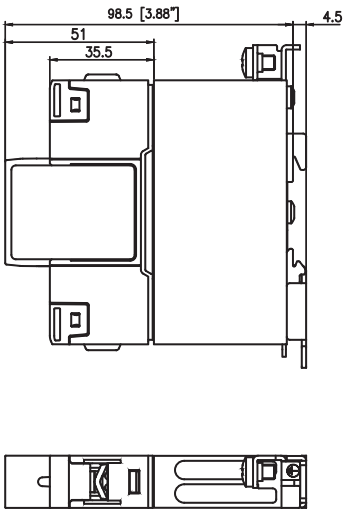
RGH.. 60..

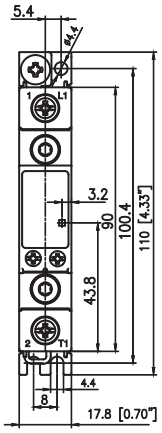


Terminal Layout and Dimensions

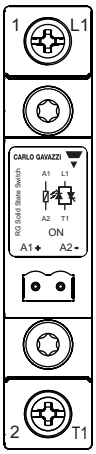
RGH1A...15KKE

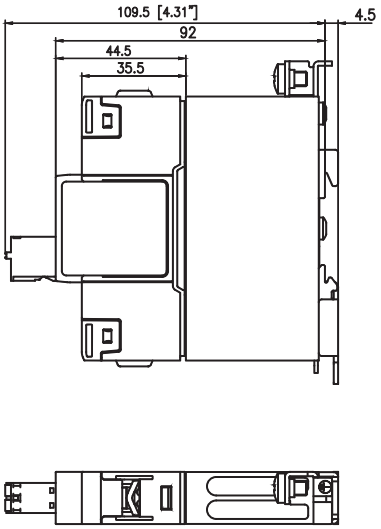


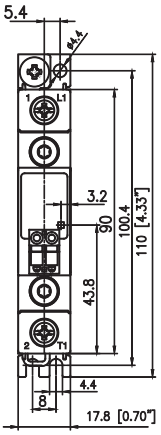




RGH1A...15MKE







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.

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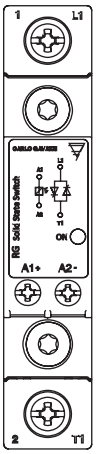
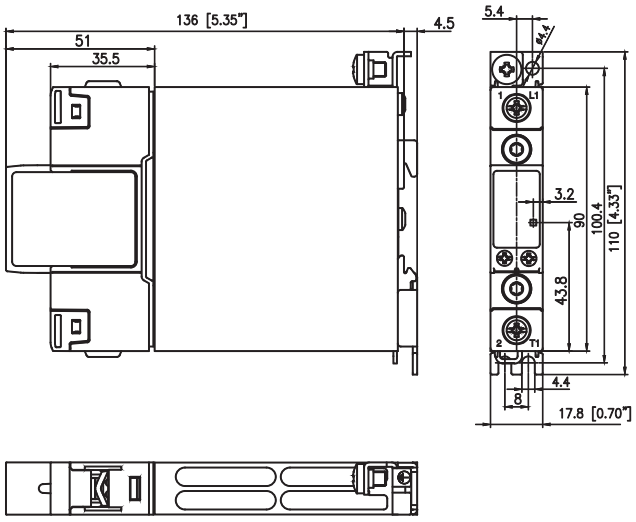
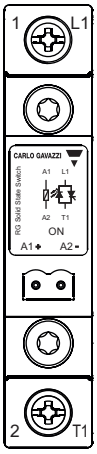
Terminal Layout and Dimensions (cont.)

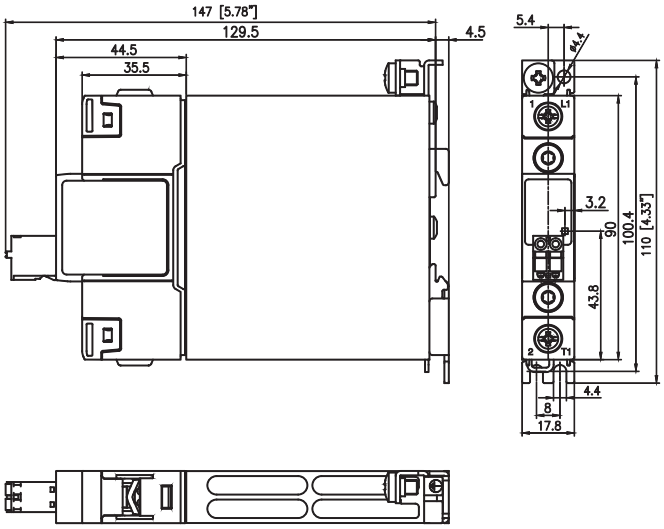
RGH1A...20KKE, RGH1A...21KKE



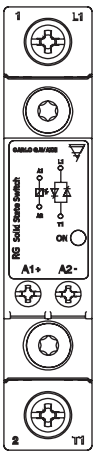


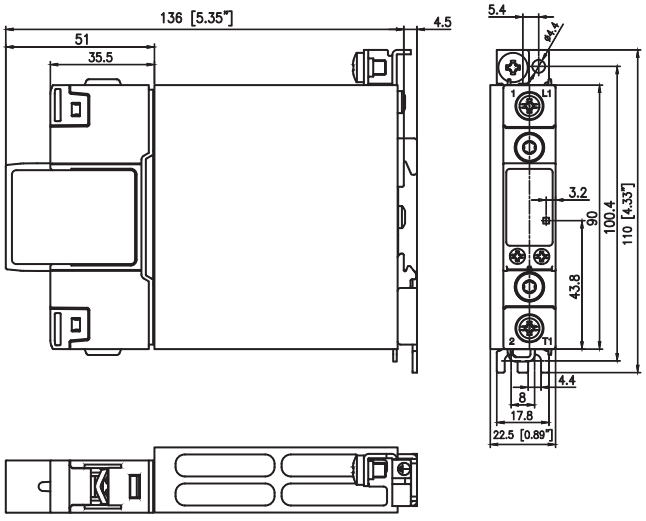
RGH1A...20MKE, RGH1A...21MKE





RGH1A...31KKE





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

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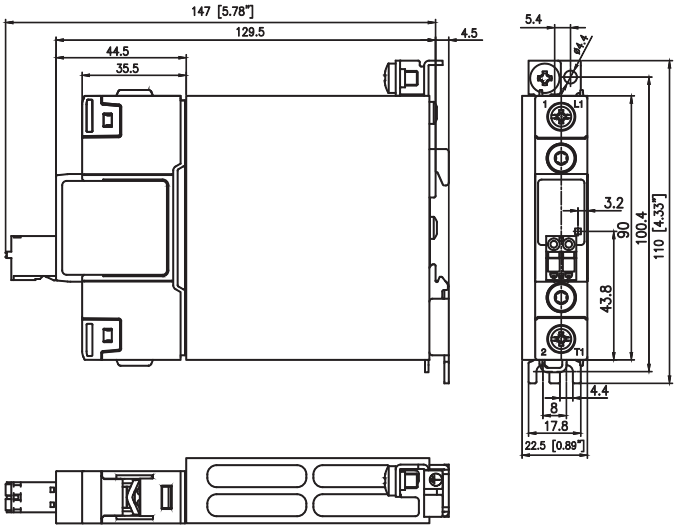
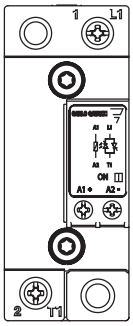
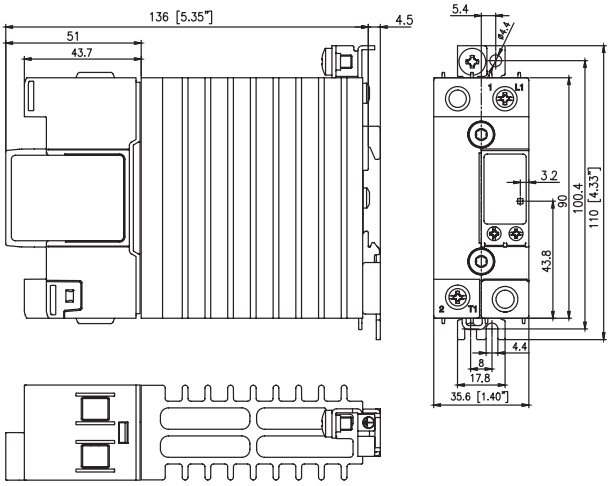
Terminal Layout and Dimensions (cont.)

RGH1A...31MKE

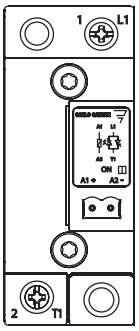


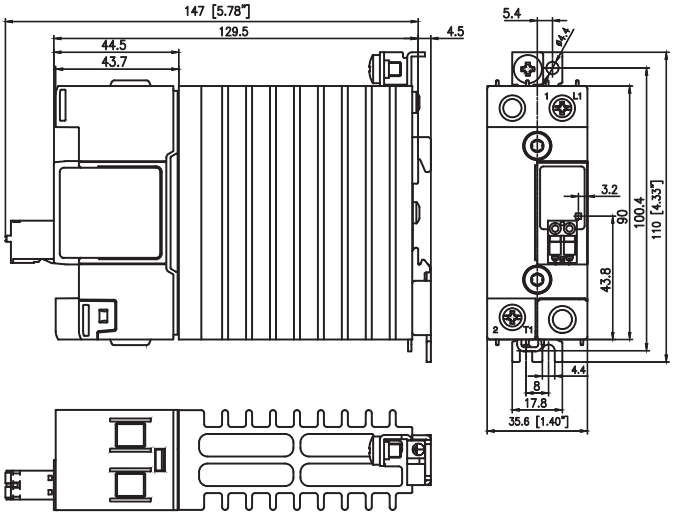
RGH1A...40KGE, RGH1A...41KGE





RGH1A...41MGE





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⏚ : Protective Earth

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

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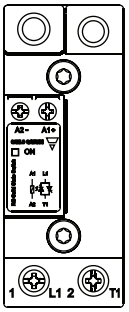
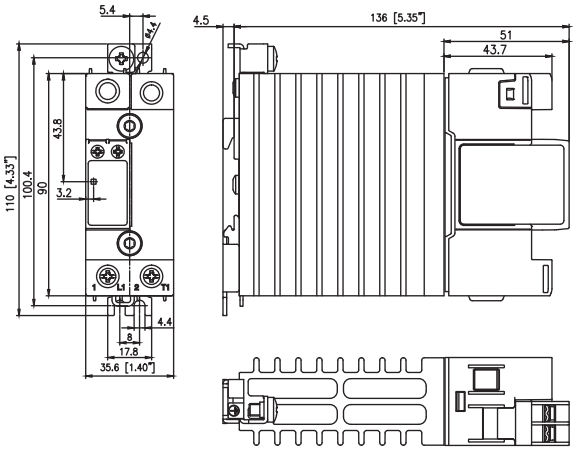
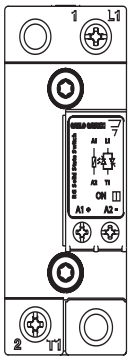
Terminal Layout and Dimensions (cont.)

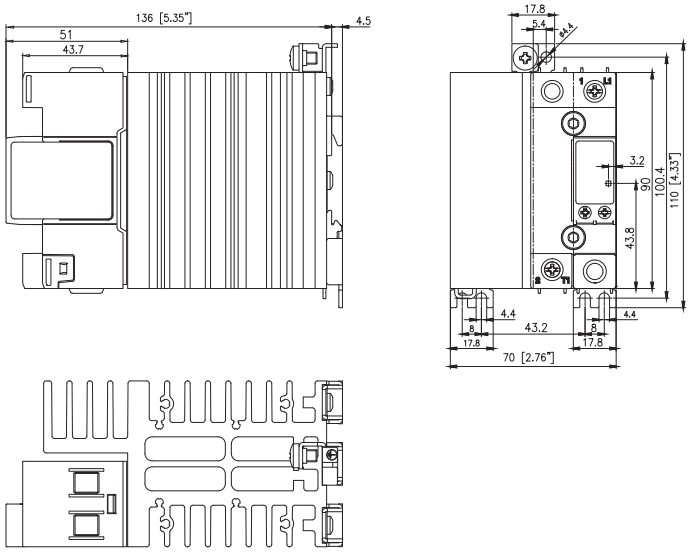
RGH1A...41KGU



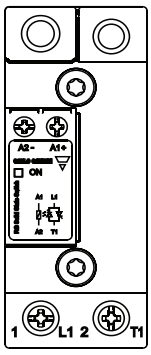


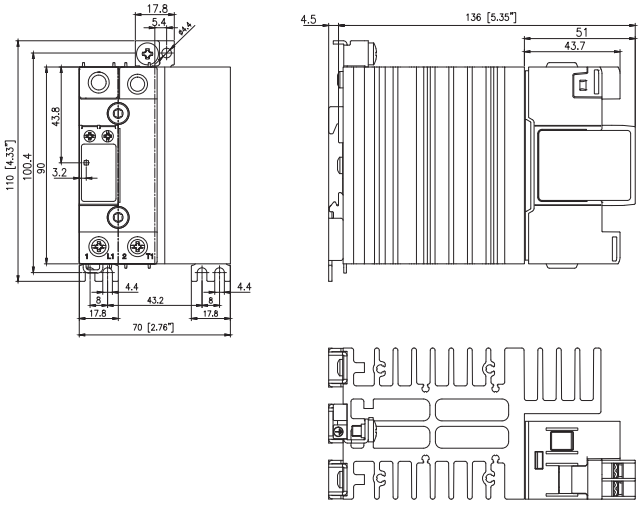
RGH1A...60KGE





RGH1A...60KGU

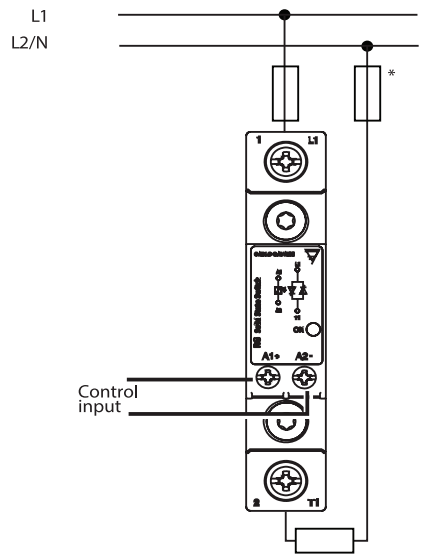




1/L1: Supply connection
2/T1: Load connection
A1(+): Positive control signal
A2(-): Control ground
⏚ : Protective Earth

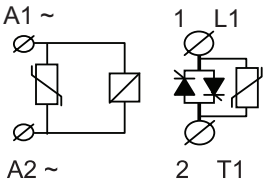
Housing width tolerance +0.5mm, -0mm…as per DIN43880.
All other tolerances ± 0.5mm. All dimensions in mm.

Connection Diagram



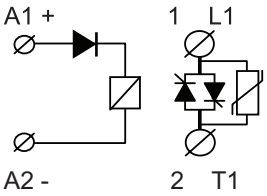
* depends on system requirements

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.

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 mm² 2x 14.. 10 AWG	1x 2.5..6 mm² 1x 14.. 10 AWG	1x 2.5..25mm² 1x 14.. 3 AWG
Flexible with end sleeve	2x 1.0...2.5mm² 2x 2.5...4mm² 2x 18...14AWG 2x 14...12 AWG	1x 1.0..4mm² 1x 18.. 12 AWG	1x 2.5..16mm² 1x 14.. 6 AWG
Flexible without end sleeve	2x 1.0...2.5 mm² 2x 2.5...6 mm² 2x 18...14 AWG 2x 14...10 AWG	1x 1.0..6 mm² 1x 18.. 10 AWG	1x 4..25 mm² 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 mm² 2x 18..12 AWG	1x 0.5..2.5 mm² 1x 18..12 AWG
Flexible with end sleeve	2x 0.5..2.5 mm² 2x 18..12 AWG	1x 0.5..2.5 mm² 1x 18..12 AWG

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 mm² 1x 24...12 AWG

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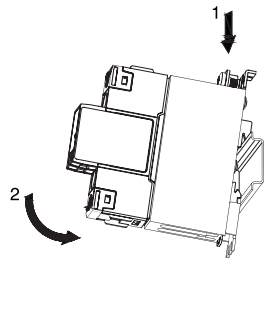
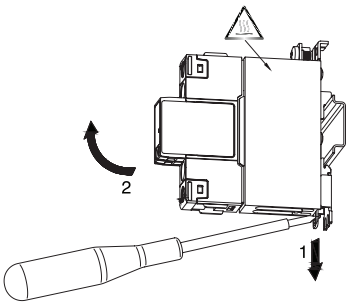
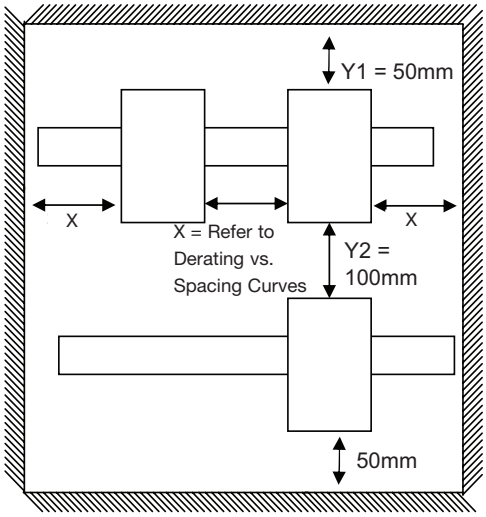
Installation Instructions



Mounting on DIN rail



Dismounting from DIN rail



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 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 100,000 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..20	30	J or CC	100	Max. 600
RGH..21	30	J or CC	100	Max. 600
RGH..31	30	J or CC	100	Max. 600
RGH..40	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...20	50	A70QS50-4	-	-	100	Max. 660
RGH1A60...21	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...40	50	A70QS50-4	-	-	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

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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 [mm²]	Minimum length of Cu wire conductor [m][8]
RGH..20, RGH..40	**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
RGH..15	**1 pole**			
RGH..21	S201 - Z20 (20A)	S201-B10 (10A)	1.5	4.2
RGH..31			2.5	7.0
RGH..41			4.0	11.2
RGH..60				
	S201 - Z32 (32A)	S201-B16 (16A)	2.5	13.0
			4.0	20.8
			6.0	31.2
	2 pole			
	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.

Accessories

Control Plugs

Ordering Key

Pack of 10 spring loaded control plugs	**RGM25**

* Refer to ‘Connection Specifications’ section for further details.