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
- Ratings: up to 759 VAC[1], 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)
- Design according to EN/IEC60947-4-2 , EN/IEC60947-4-3, EN/IEC62314, UL508, CSA22-2 No.14-13
- Conformance to Railway standards
- 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
- Option

Ordering Key

1 Phase SSR with heatsink	Rated voltage	Control voltage	Rated current[2], I²t	Connection control	Connection power	Connection configuration	Option
RGH1A: ZC	60: 600 VAC +10% - 15%, 1600 Vp	D: 4-32 VDC	15: 23 AAC, 6600 A²s	K: Screw	K: Screw	E: Contactor	X20: Bulk packaging of 20 pcs.[3]
		A: 20-275 VAC, 24-190 VDC	31: 30 AAC, 6600 A²s	M: Pluggable spring-loaded	G: Box clamp	U: SSR	
			41: 40 AAC, 6600 A²s				
	69: 690 VAC +10% -15%, 1600 Vp		60: 60 AAC, 6600 A²s				

ZC = zero cross switching
2: Refer to Current Derating curves
3: Applicable only to RGH..15 models

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, low depth	30 AAC (6600 A²s) 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

				40 AAC (6600 A²s) 35 mm	60 AAC (6600 A²s) 70 mm
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[4], +10% -15% on maximum
Blocking voltage	1600 Vp	1600 Vp
Internal varistor	680 V	-

4: 690 VAC refers to the line to line voltage

General Specifications

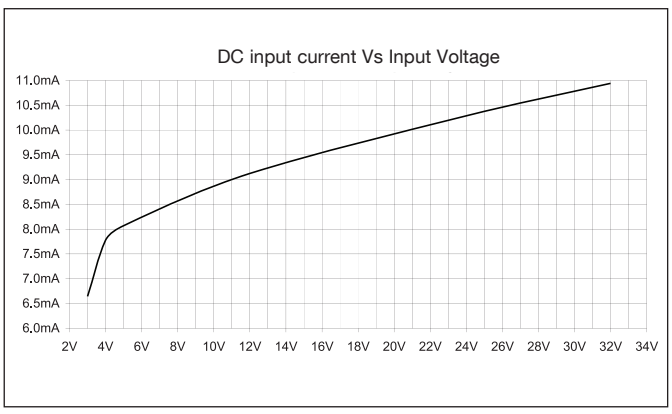
Latching voltage (across L1-T1)	≤20 V
Operational frequency range	45 to 65 Hz
Power factor	> 0.5 @ Vrated
Touch Protection	IP20
Control input status	continuously ON Green LED, when control input is applied

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

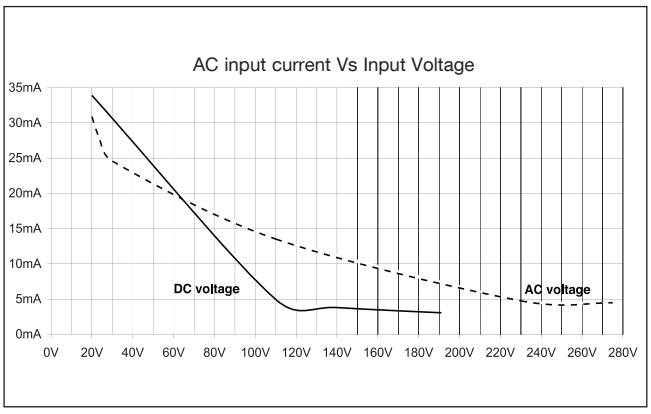
Input Specifications

	RGH..D..	RGH..A..
Control voltage range[5]	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..



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

Output Specifications

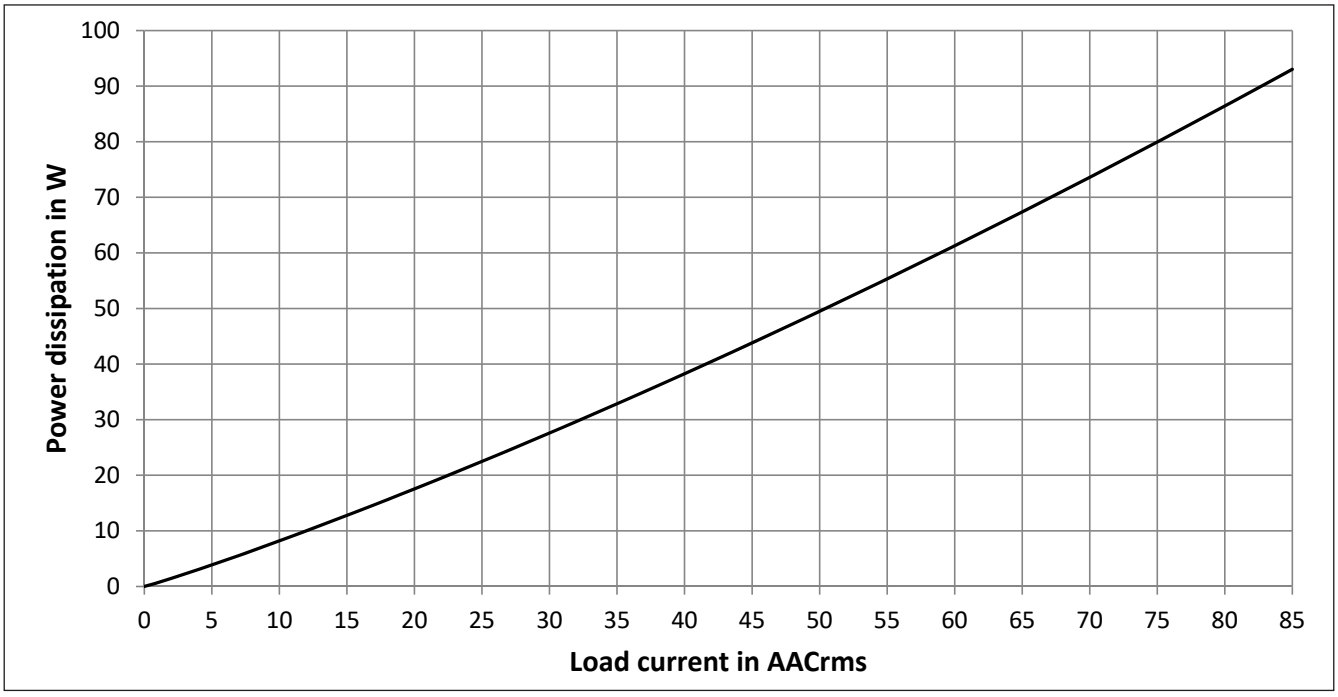
	RGH..15	RGH..31	RGH..41	RGH..60
Rated operational current[6] AC-51 rating @ Ta=25°C	23 AAC	30 AAC	49 AAC	75 AAC
AC-51 rating @ Ta=40°C	23 AAC	30 AAC	40 AAC	60 AAC
AC-53a rating @ Ta=40°C	5 AAC	10 AAC	13 AAC	18 AAC
Number of motor starts per hour (x:6, Tx:6s, F:50%) at 40°C[7]	30	30	30	30
Min. operational current	400 mAAC	400 mAAC	400 mAAC	400 mAAC
Rep. overload current - (Motor Rating) PF = 0.4 - 0.5 UL508: T_{AMB}=40°C, t_{ON}=1s, t_{OFF}=9s, 50cycles	51 AAC	84 AAC	126 AAC	144 AAC
Maximum transient surge current (I_{TSM}), 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^2t for fusing (t=10ms), minimum	6600 A^2s	6600A^2s	6600A^2s	6600A^2s
Crititcal dv/dt (@ Tj init = 40°C)	1000 V/µs	1000 V/µs	1000 V/µs	1000 V/µs

6: Refer to Current Derating curves
7: Overload profile for AC-53a;
Ie: AC-53a: xIe-Tx: F-S, where Ie = nominal current (AC-53a AAC), xIe = 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%

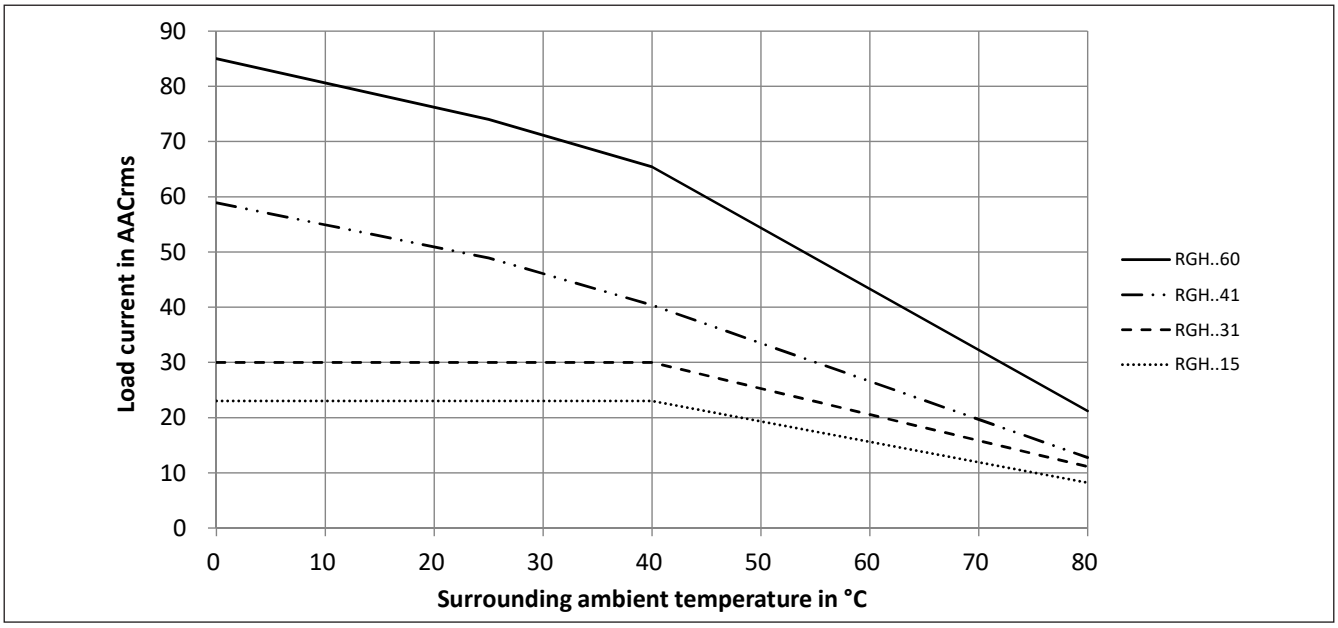
Motor Ratings: HP (UL508) / kW (EN/IEC60947-4-2) @ 40°C

	115 VAC	230 VAC	400 VAC	480 VAC	600 VAC	690 VAC
RGH..15	½HP / 0.18kW	1HP / 0.37kW	2HP / 0.75kW	3HP / 1.1kW	3HP / 1.5kW	- / 1.5kW
RGH..31	¾HP / 0.37kW	2HP / 1.1kW	3HP / 1.5kW	5HP / 2.2kW	5HP / 3.7kW	- / 3.7kW
RGH..41	1½HP / 0.56kW	3HP / 1.5kW	5HP / 2.2kW	7½HP / 3.7kW	10HP / 4kW	- / 4kW
RGH..60	2HP / 0.75kW	3HP / 1.5kW	5HP / 4kW	7½HP / 4kW	10HP / 5.5kW	- / 5.5kW

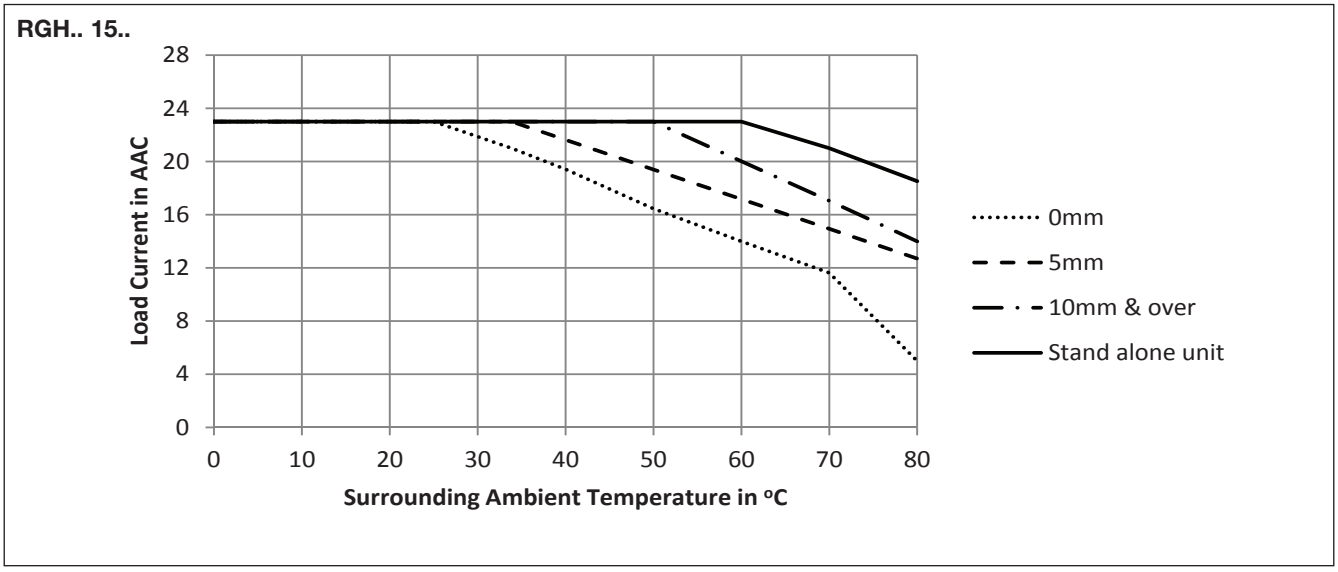
Output Power Dissipation



Current Derating (UL 508)

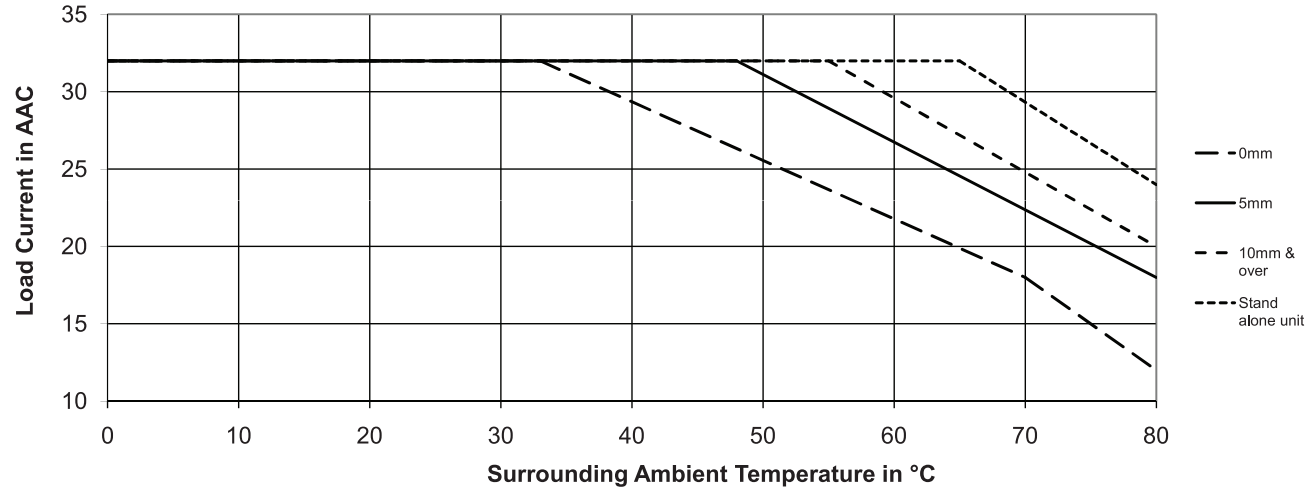


Derating vs. Spacing Curves

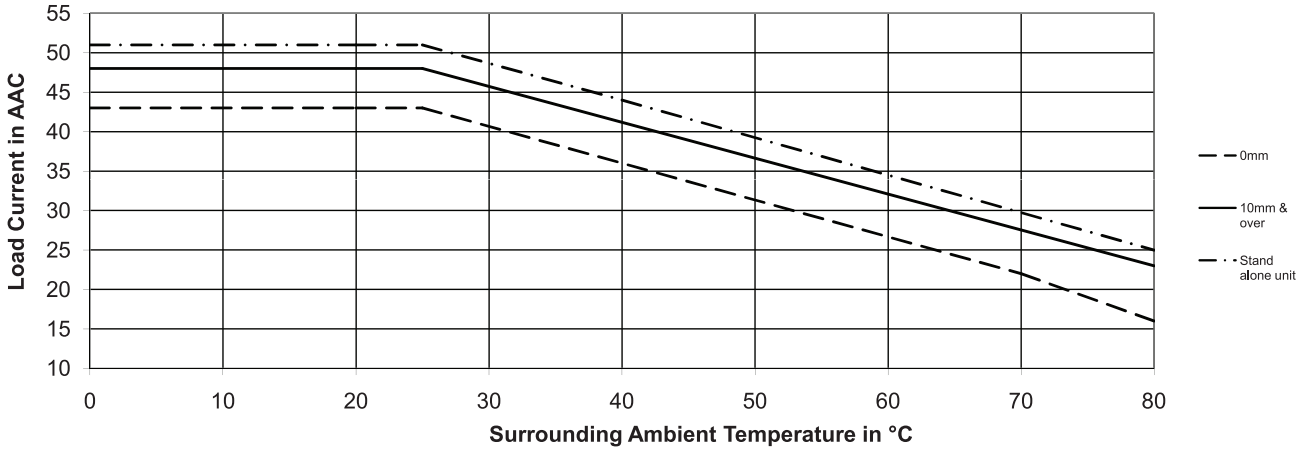


Derating vs. Spacing Curves (cont.)

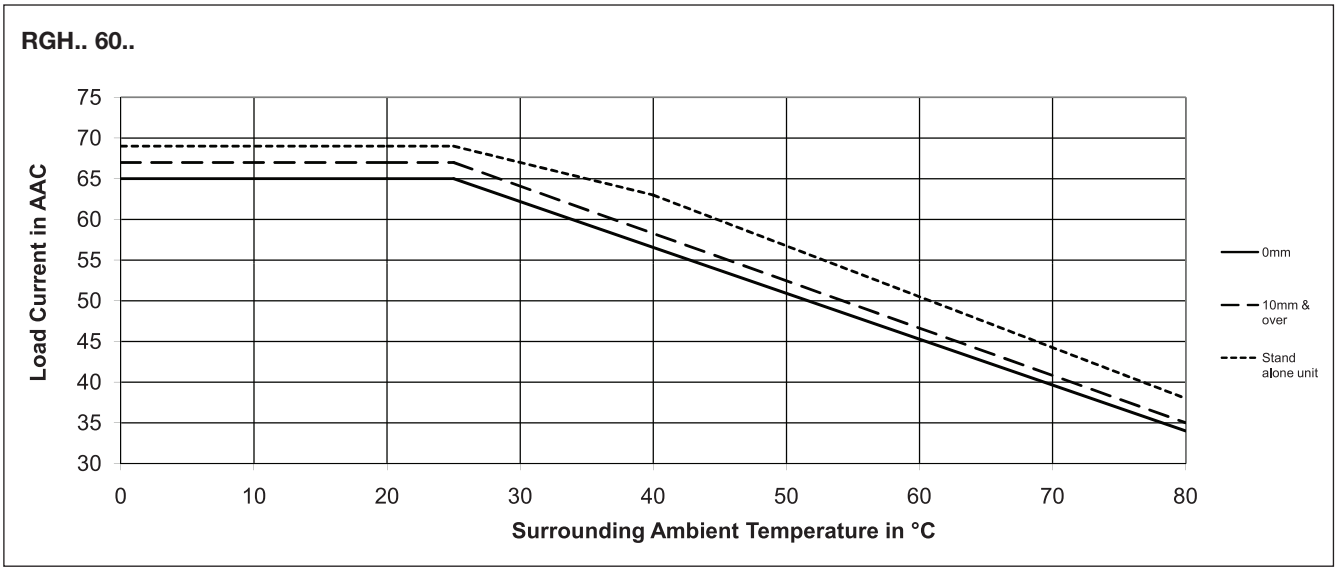
RGH.. 31..



RGH.. 41..



Derating vs. Spacing Curves (cont.)



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)
EU RoHS compliant	Yes
China RoHS compliant	Refer to Environmental Information (page 15)
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 Glow wire ignition temperature and Glow wire flammability index conform to EN 60335-1 requirements
Installation altitude	0 - 1000m. Above 1000m derate linearly by 1% of FLC per 100m up to maximum of 2000m
Weight	
RGH..15	approx. 260 g
RGH..31	approx. 375 g
RGH..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

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Electromagnetic Compatibility

EMC Immunity	EN 60947-4-3
Electrostatic Discharge (ESD)	
Immunity	IEC/EN 61000-4-2
Air discharge, 8 kV	Performance Criteria 1
Contact, 4 kV	Performance Criteria 1
Electrical Fast Transient	
(Burst) Immunity	IEC/EN 61000-4-4
Output: 2 kV, 5 kHz	Performance Criteria 1
Input: 1 kV, 5 kHz	Performance Criteria 1
Electrical Surge Immunity[8]	IEC/EN 61000-4-5
Output, line to line, 1 kV	Performance Criteria 1
Output, line to earth, 2 kV	Performance Criteria 1
Input, line to line, 1 kV	Performance Criteria 2
Input, line to earth, 2 kV	Performance Criteria 2

EMC Emission	EN 60947-4-3
Radio Interference	
Voltage Emission (Conducted)	IEC/EN 55011
0.15 - 30 MHz	Class A (industrial) with filters - see filter information

Radiated Radio Frequency Immunity	IEC/EN 61000-4-3
10 V/m, 80 - 1000 MHz	Performance Criteria 1
10 V/m, 1.4 - 2.0 GHz	Performance Criteria 1
3 V/m, 2.0 - 2.7 GHz	Performance Criteria 1
Conducted Radio Frequency Immunity	IEC/EN 61000-4-6
10 V/m, 0.15 - 80 MHz	Performance Criteria 1
Voltage Dips Immunity	IEC/EN 61000-4-11
0% for 0.5, 1 cycle	Performance Criteria 2
40% for 10 cycles	Performance Criteria 2
70% for 25 cycles	Performance Criteria 2
80% for 250 cycles	Performance Criteria 2
Voltage Interruptions Immunity	IEC/EN 61000-4-11
0% for 5000 ms	Performance Criteria 2

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

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

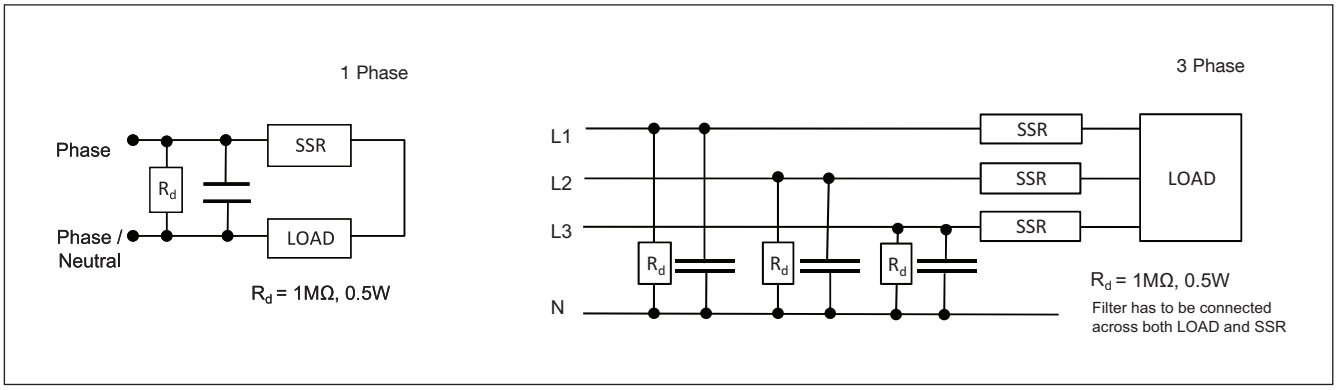
Note:

- 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.

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

Filter Connection Diagrams

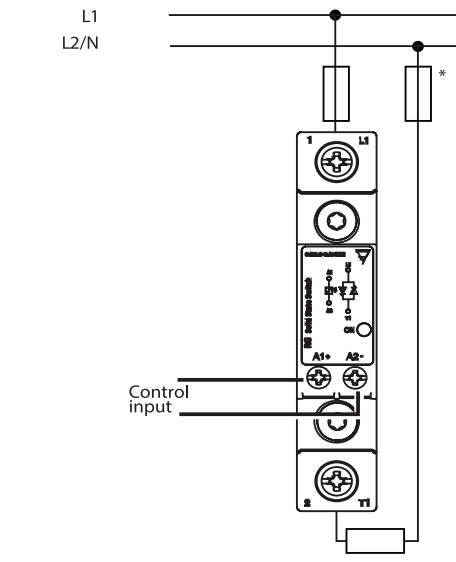


Additional Conformance to Railway standards

Applicable to variants:	RGH
Additional conformance specific to Railway applications	EN 50155 EN 45545-2 EN 50121-3-2
Hazardous level conformance according to EN 45545-2	HL1, HL2 for requirement R23 HL1 for requirement R22
Operating temperature class according to EN 50155	OT3 (-25 °C to +70 °C)
Vibration and shock	EN 61373 Category 1, Class B

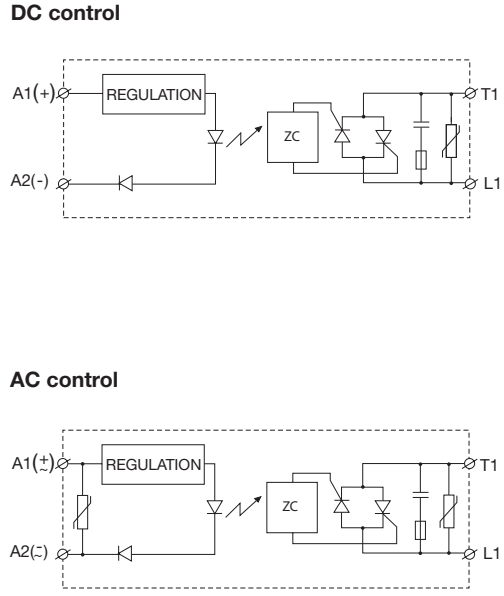
Additional EMC conformance	accoding to EN 50121-3-2
Radiated radio frequnecy Immunity	IEC/EN 61000-4-3
20V/m, 80 MHz - 1 GHz	Performance Criteria 1
10V/m, 1.4 - 2 GHz	Performance Criteria 1
5V/m, 2 - 2.7 GHz	Performance Criteria 1
3V/m, 5.1 - 6 GHz	Performance Criteria 1
Power Quality Measurement	IEC/EN 61000-4-30
50 Hz - 2 kHz, <8% THD	Pass

Connection Diagram



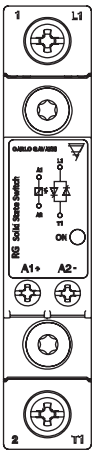
Note: Varistor on output is not included in the RGH1A69...models

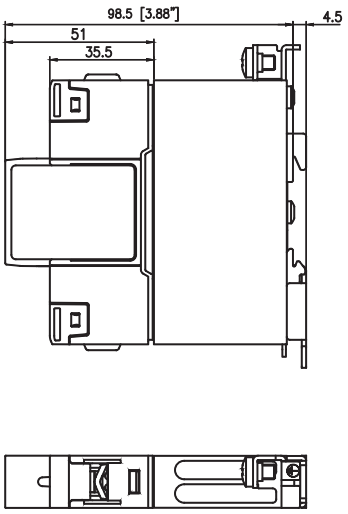
Functional Diagram

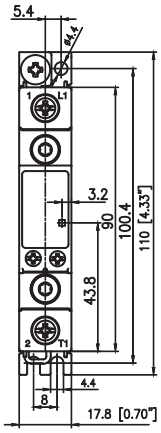


Terminal Layout and Dimensions

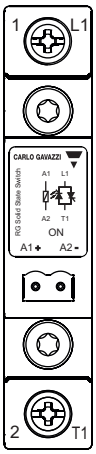
RGH1A...15KKE

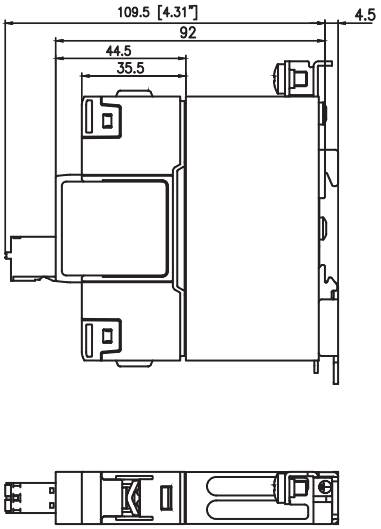


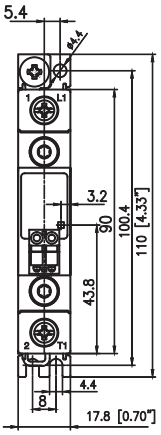




RGH1A...15MKE





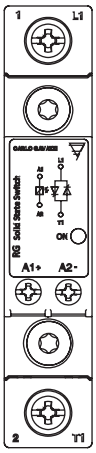


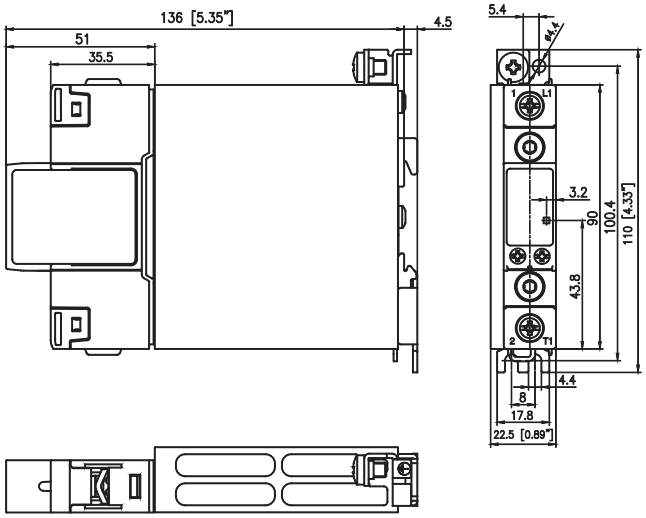
1/L1: Supply connection
2/T1: Load connection
A1(+): Positive control signal
A2(-): Control ground
⏚ : Protective Earth

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

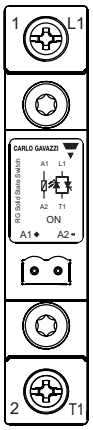
Terminal Layout and Dimensions (cont.)

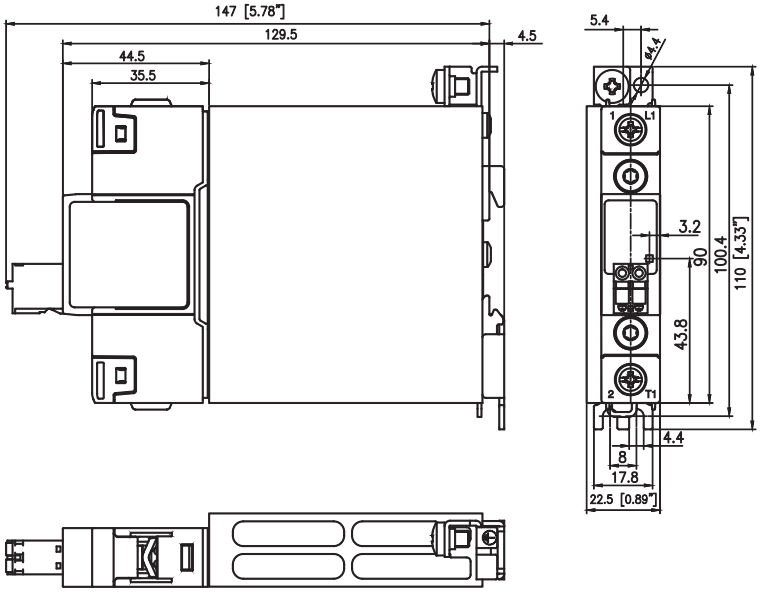
RGH1A...31KKE





RGH1A...31MKE





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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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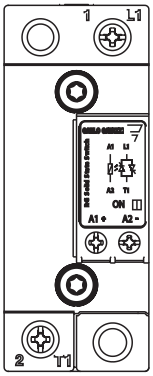
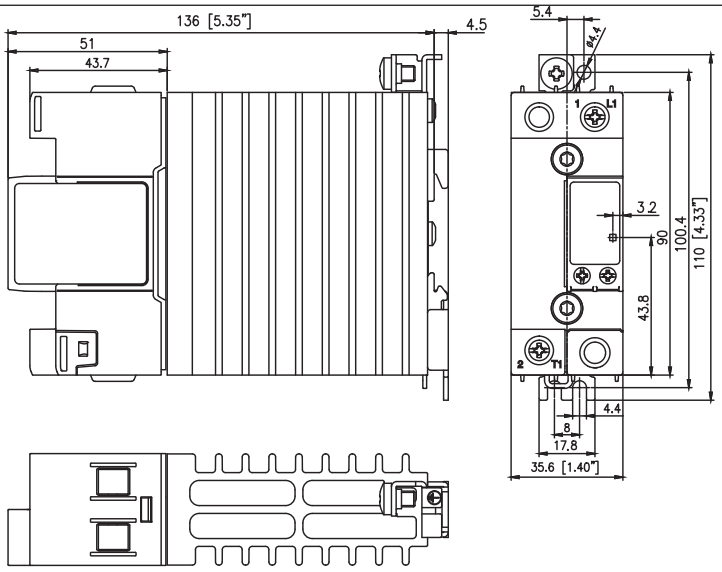
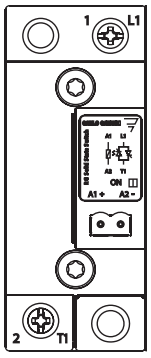
Terminal Layout and Dimensions (cont.)

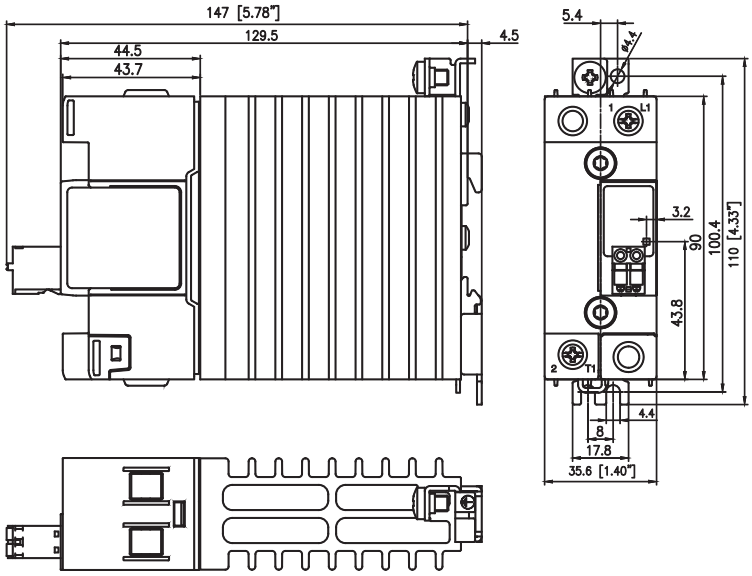
RGH1A...41KGE



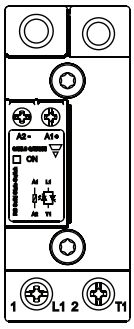


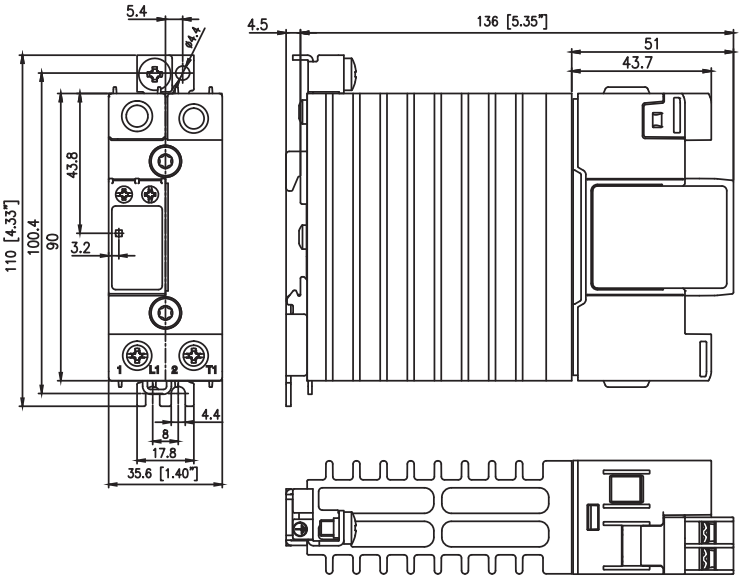
RGH1A...41MGE





RGH1A...41KGU





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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.

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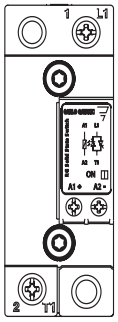
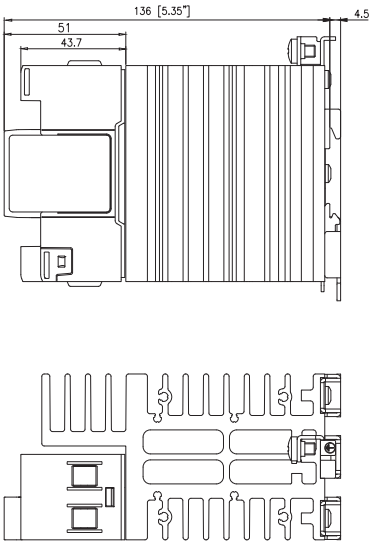
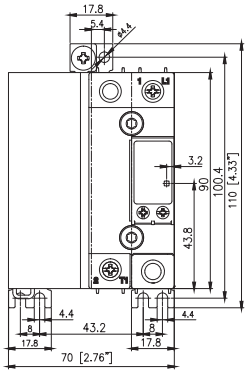
Terminal Layout and Dimensions (cont.)

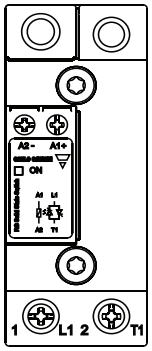
RGH1A...60KGE

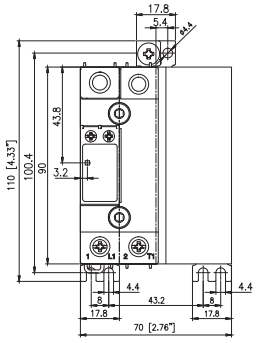


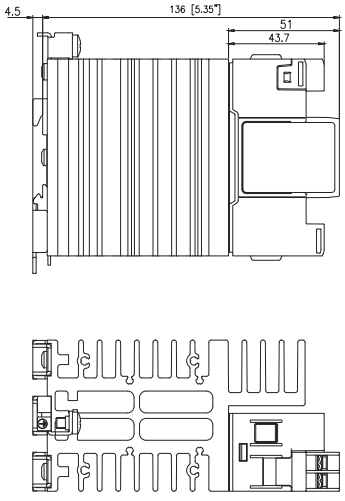




RGH1A...60KGU







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 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.

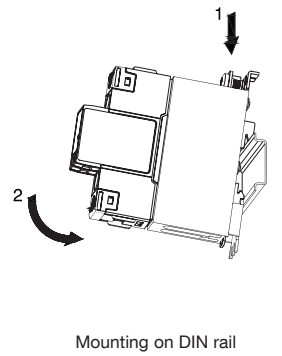
CONTROL CONNECTIONS: A1(+), A2(-)
Use 60 / 75°C copper (Cu) conductors

	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

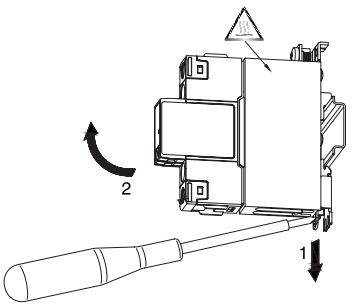
CONTROL CONNECTIONS: A1(+), A2(-)
Use 60/75°C copper (Cu) conductors

	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

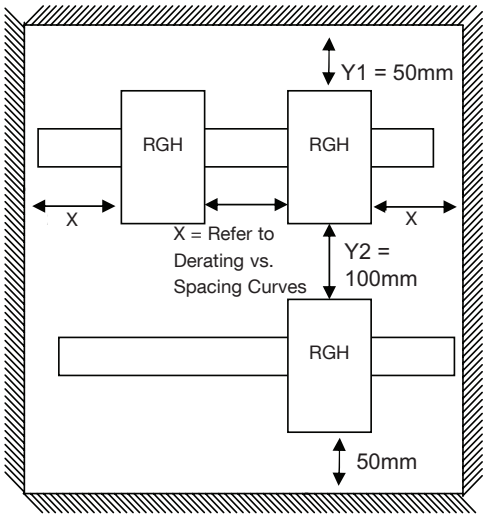
Installation Instructions



Mounting on DIN rail



Dismounting from DIN rail



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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..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^2]	Minimum length of Cu wire conductor [m][9]
RGH..15	**1 pole**			
RGH..31	S201 - Z20 (20A)	S201-B10 (10A)	1.5	4.2
RGH..41			2.5	7.0
RGH..60			4.0	11.2
(6600 A^{2}s)				
	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

9. 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	O	O	O	O	O
O: Indicates that said hazardous substance contained in homogeneous materials fot this part are below the limit requirement of GB/T 26572. X: Indicates that said hazardous substance contained in one of the homogeneous materials used for this part is above the limit requirement of GB/T 26572.						

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

Accessories

Control Plugs

Ordering Key

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

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

Packaging

Ordering Key

Bulk packaging of 20 pcs.	**RGH..X20**

Applicable only to RGH..15 models