RGCM3

45 mm, 3-phase with integrated heatsink



Description

This product is intended to replace mechanical contactors especially when switching is frequent. The product width is 45 mm and the heatsink is enclosed to provide a look alike to its mechanical counterpart. The enclosed heatsink eliminates the need for protective earth connection.

The RGCM switches ON when the voltage crosses zero and switches OFF when the current crosses zero. Apart for resistive and slightly inductive loads, the RGCM is certified for motor switching with associated motor ratings. Varistors are integrated for overvoltage protection. A green LED gives indication of control voltage presence.

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

Benefits

- **Long lifetime.** A fully solid state contactor that can replace mechanical contactors in the same 45mm footprint, ensuring a longer lifetime.
- **Less maintenance costs.** Wire bonding technology reduces thermal and mechanical stresses of the output chips resulting in a larger number of operational cycles compared to other assembly technologies.
- **Low machine downtime.** Integrated overvoltage protection prevents the solid state relay from breaking down due to uncontrolled transients that may occur on the lines.
- **Touch safe.** The heatsink is completely covered. This eliminates the need to connect potential live parts (such as an exposed heatsink) to Protective Earth.
- **Certification ready for motor use.** The RGCM3 is certified as a motor switch device with applicable HP ratings.

Applications

Plastic injection machines, extrusion machines, blow moulding machines, thermoformers, dryers, electrical ovens, fryers, shrink tunnels, air handling units, sterilisation equipment, climatic chambers, ovens and furnaces, ambient heating.

Main features

- 3-pole switching, AC solid state contactors
- Ratings up to 600 VAC, 15.5 A for resistive use
- Certified motor ratings: 2.2 kW @ 400 VAC, 3 HP @ 480 VAC
- DC control voltage range: 5-32 VDC
- Integrated over voltage protection on output

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Order code

RGCM3A60D15GKE

Code	Option	Description	Comments
RGCM	-	Solid state contactor, 45 mm	
3	-	3-pole switching	
A	-	Zero cross switching (ZC)	
60	-	Rated voltage: 42-660 VAC	
D	-	Control voltage: 5 - 32 VDC	
15	-	Rated current: 15.5 AAC	
G	-	Pluggable box clamp for control terminals	
K	-	Screw connection for power terminals	
E	-	Contactor configuration	

Carlo Gavazzi compatible components

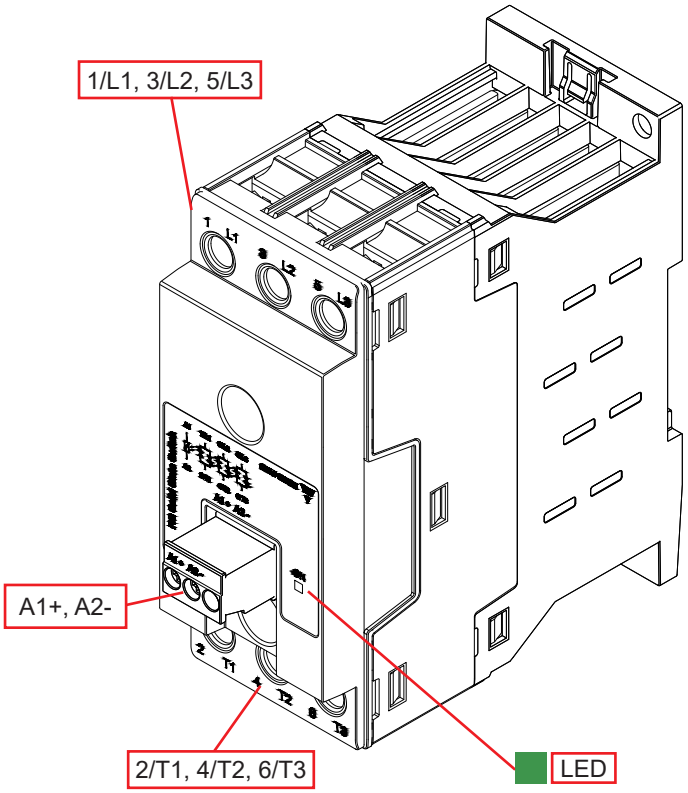
Description	Component code	Notes
Control plugs	RG3G25	Pack of 10 box clamp control plugs
Motor overload relay adaptor	REC3ADAPTOR	Plastic adaptor that can be fitted to the RGCM to facilitate mounting of overload protection relays

Carlo Gavazzi further reading

Information	Where to find it	Notes
Datasheet	https://www.gavazziautomation.com/images/PIM/DATASHEET/ENG/SSR_Accessories.pdf	Accessories datasheet

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Structure



Element	Component	Function
1/L1, 3/L2, 5/L3	Power connection	Mains connection
2/T1, 4/T2, 6/T3	Power connection	Load connection
A1+, A2-	Control connection	Terminals for control voltage
LED	ON indicator	Indicates presence of control voltage

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Features

General data

Material	PA66 or PA6 (UL94 V0), RAL7035 Glow wire ignition temperature and Glow wire flammability index conform to EN 60335-1 requirements
Mounting	DIN rail (panel mount also possible)
Control input status	Continuously ON green LED, when control input is applied
Touch protection	IP20
Overvoltage category	III
Isolation	Input and Output to Case: 4000 Vrms Input to Output: 4000 Vrms
Weight	approx. 390 g

Performance

Output specifications

Operational voltage range	42-600 VAC, +10% -15% on max.
Blocking voltage	1200 Vp
Max. operational current[1]: AC-51 @ Ta=25°C	18 AAC
Max. operational current[1]: AC-51 @ Ta=40°C	15.5 AAC
Max. operational current[2]: AC-53a @ Ta=40°C	5.8 AAC
Operational frequency range	45 to 65 Hz
Output protection	Integrated varistor
Minimum operational current	250 mAAC
Repetitive overload current (Motor rating) UL508: Ta=40°C, t_{ON}=1 s, t_{OFF}=9 s, 50 cycles	40 AAC
Non-repetitive surge current (I_{TSM}), t=10 ms	600 Ap
I^2t for fusing (t=10 ms), minimum	1800 A^2s
No. of motor starts per hour @ 40°C[2] (I_n/I_e=6, T_n=6, $T_{ON}/T_{ON} + T_x$ = 50%)	30
Power factor	>0.5 at rated voltage
Critical dV/dt (@Tj init = 40°C)	1000 V/µs

1. Refer to Current derating curves
2. Overload cycle definition: I_n/I_e = overload current factor, T_n = time during inrush current, $T_{ON}/T_{ON} + T_x$ = duty cycle. Refer to Characteristic curves and operating cycles section for other parameters

Motor ratings: HP (UL508) / kW (EN/IEC 60947-4-2) @ 40°C

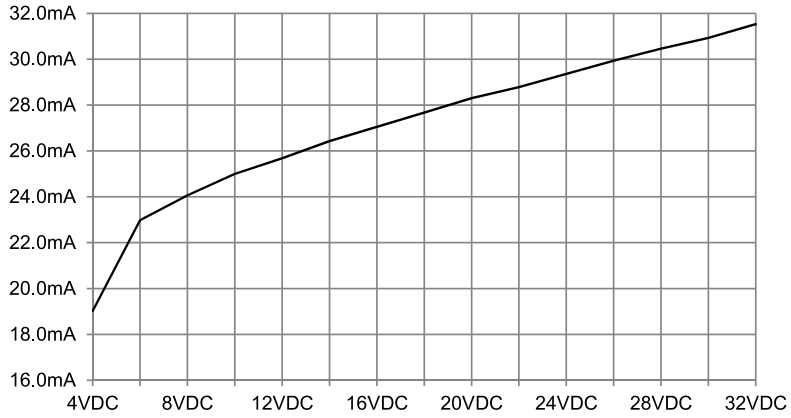
	115 VAC	230 VAC	400 VAC	480 VAC	600 VAC
RGCM3..15	½ HP / 0.37 kW	1 HP / 1.1 kW	2 HP / 2.2 kW	3 HP / 3 kW	3 HP / 4 kW

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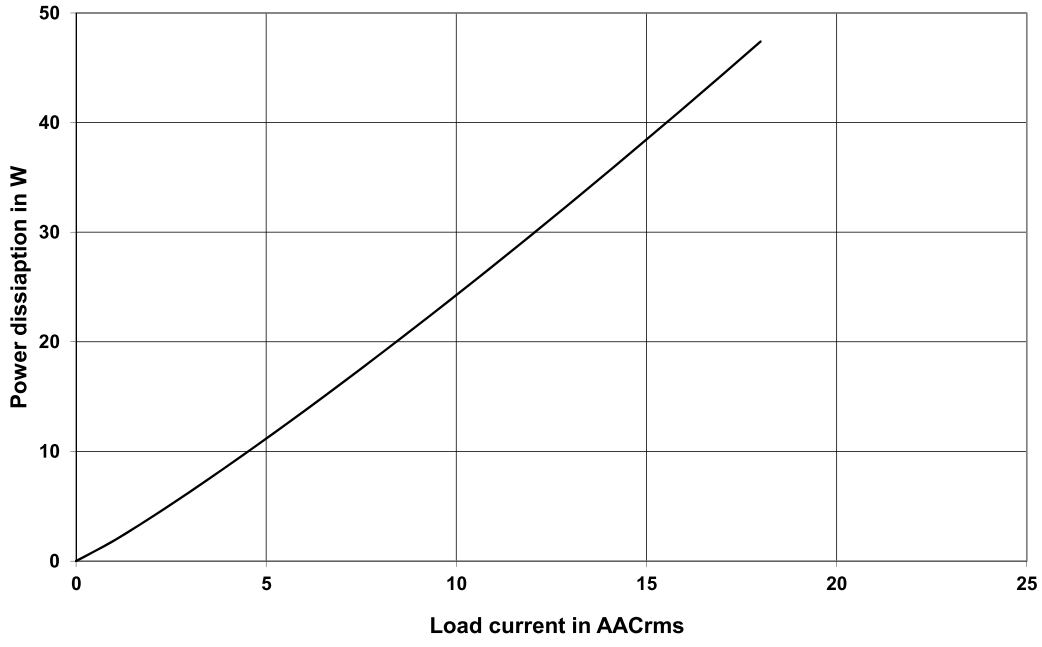
Input specifications

Control voltage range	5 - 32 VDC
Pick-up voltage	4.8 VDC
Drop-out voltage	1.0 VDC
Maximum reverse voltage	32 VDC
Maximum response time	0.5 cycle + 500 µs @ 24 VDC
Input current @ 40°C	See diagram below

Input current vs. input voltage

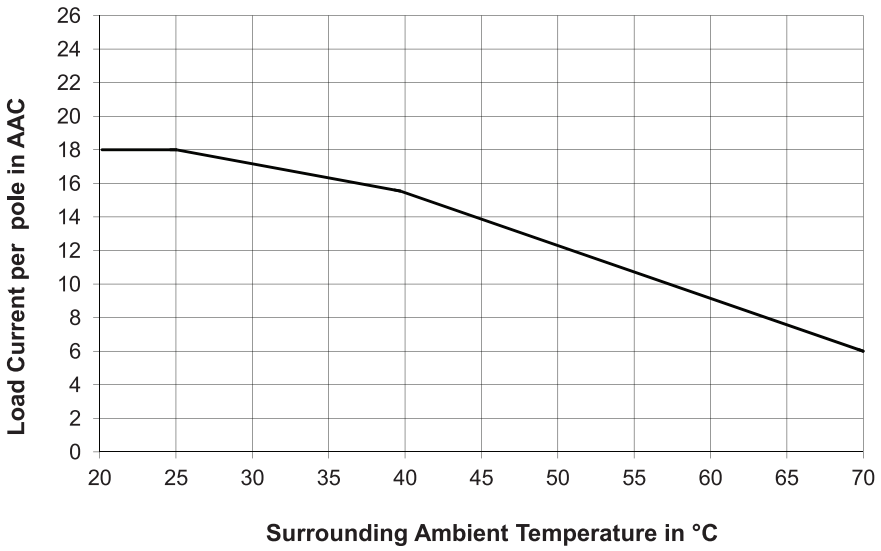


Output power dissipation

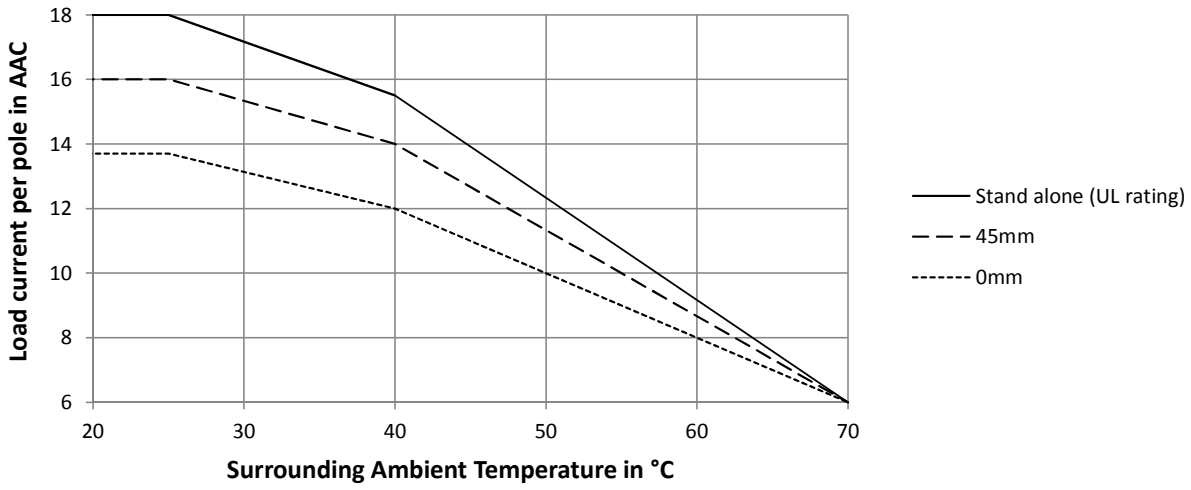


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Current derating



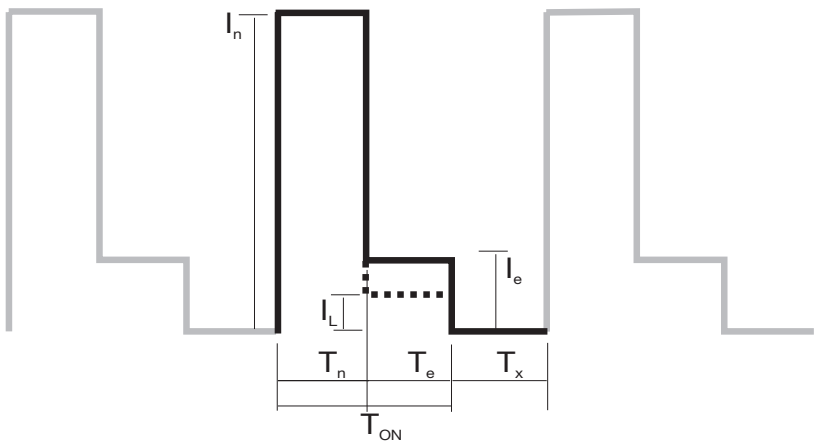
Derating vs. Spacing curves



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Characteristic curves and operating cycles

Maximum allowable number of starts depending on the T_n and T_{ON}



I_n: Inrush current for direct on line starting
I_e: Rated full load current
I_L: Load current
T_n: Time during inrush current I_n
T_e: Time during full load current I_e or I_L
T_x: Off time
$T_{ON} = T_n + T_e$

Curves: No. of switching cycles per hour versus T_{ON}

Chart No. 1

$\frac{I_n}{I_e} = 7.2, \frac{I_L}{I_e} = 1$

t_{ON} (s)	Number of Switches per Hour						
	T_n = 0.05s	T_n = 0.1s	T_n = 0.2s	T_n = 0.4s	T_n = 0.8s	T_n = 1.6s	T_n = 3.2s
0.1	1800	910	-	-	-	-	-
1	1500	800	420	220	102	-	-
10	280	300	25	160	90	40	15
100	38	38	38	35	35	25	6
1000	-	-	-	-	-	-	-

Chart No. 2

$\frac{I_n}{I_e} = 7.2, \frac{I_L}{I_e} = 0.6$

t_{ON} (s)	Number of Switches per Hour						
	T_n = 0.05s	T_n = 0.1s	T_n = 0.2s	T_n = 0.4s	T_n = 0.8s	T_n = 1.6s	T_n = 3.2s
0.1	1900	900	-	-	-	-	-
1	1800	850	440	120	110	-	-
10	390	390	350	190	100	50	25
100	38	38	38	38	25	25	20
1000	-	-	-	-	-	-	-

Chart No. 3

$\frac{I_n}{I_e} = 4, \frac{I_L}{I_e} = 1$

t_{ON} (s)	Number of Switches per Hour						
	T_n = 0.05s	T_n = 0.1s	T_n = 0.2s	T_n = 0.4s	T_n = 0.8s	T_n = 1.6s	T_n = 3.2s
0.1	5100	2800	-	-	-	-	-
1	2700	1900	1100	650	350	-	-
10	250	250	250	290	200	140	75
100	36	36	36	36	36	36	30
1000	-	-	-	-	-	-	-

Chart No. 4

$\frac{I_n}{I_e} = 4, \frac{I_L}{I_e} = 0.6$

t_{ON} (s)	Number of Switches per Hour						
	T_n = 0.05s	T_n = 0.1s	T_n = 0.2s	T_n = 0.4s	T_n = 0.8s	T_n = 1.6s	T_n = 3.2s
0.1	5500	2900	-	-	-	-	-
1	3400	2300	1400	700	350	-	-
10	350	350	350	350	280	170	80
100	36	36	36	36	36	36	36
1000	-	-	-	-	-	-	-

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Compatibility and conformance

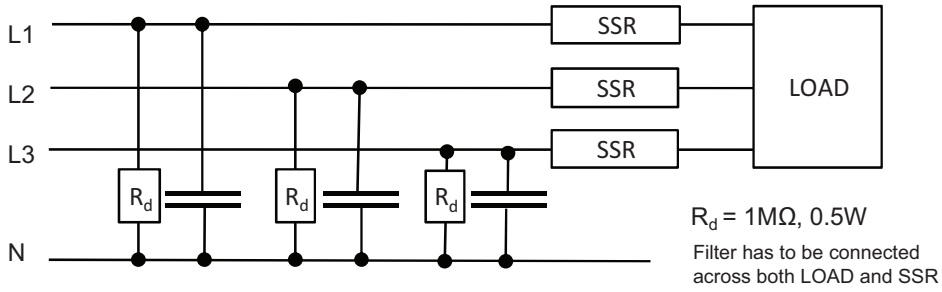
Approvals	
Standards compliance	LVD: EN 60947-4-2, EN 60947-4-3 EMCD: EN 60947-4-3 EE: EN 60947-4-2, EN 60947-4-3 EMC: EN 60947-4-3 UL: UL508 (E172877), NMFT cUL: C22.2 No. 14 (E172877), NMFT7
UL short circuit current rating	5k Arms

Electromagnetic compatibility (EMC) - Immunity	
Electrostatic discharge (ESD)	EN/IEC 61000-4-2 8 kV air discharge, 4 kV contact (PC2)
Radiated radio frequency	EN/IEC 61000-4-3 10 V/m, from 80 MHz to 1 GHz (PC1) 10 V/m, from 1.4 to 2 GHz (PC1) 3 V/m, from 2 to 2.7 GHz (PC1)
Electrical fast transient (burst)	EN/IEC 61000-4-4 Output: 2 kV, 5 kHz (PC1) Input: 1 kV, 5 kHz (PC1)
Conducted radio frequency	EN/IEC 61000-4-6 10 V/m, from 0.15 to 80 MHz (PC1)
Electrical surge	EN/IEC 61000-4-5 Output, line to line: 1 kV (PC1) Output, line to earth: 2 kV (PC1) Input, line to line: 1 kV (PC2) Input, line to earth: 2 kV (PC2)
Voltage dips	EN/IEC 61000-4-11 0% for 0.5, 1 cycle (PC2) 40% for 10 cycles (PC2) 70% for 25 cycles (PC2) 80% for 250 cycles (PC2)
Voltage interruptions	EN/IEC 61000-4-11 0% for 5000 ms (PC2)

Electromagnetic compatibility (EMC) - Emissions	
Radio interference field emission (radiated)	EN/IEC 55011 Class A: from 30 to 1000 MHz
Radio interference voltage emissions (conducted)	EN/IEC 55011 Class A: from 0.15 to 30 MHz (External filter may be required - refer to Filtering section)

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Filter connection diagram



Filtering

Part number	Suggested filter for EN 55011 Class A compliance	Maximum heater current
RGCM3..15	220 nF / 760 V / X1	20 AAC

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.
- This product has been designed for Class A equipment. Use of this product in domestic environments may cause radio interference, in which case the user may be required to employ additional mitigation methods.

- Performance Criteria 1 (PC1): No degradation of performance or loss of function is allowed when the product is operated as intended.

- Performance Criteria 2 (PC2): 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 (PC3): Temporary loss of function is allowed, provided the function can be restored by manual operation of the controls.

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Environmental specifications

Operating temperature	-40°C to +70°C (-40°F to +158°F)
Storage temperature	-40°C to +100°C (-40°F to +212°F)
Relative humidity	95% non-condensing @ 40°C
Pollution degree	2
Installation altitude	0-1000 m. Above 1000 m derate linearly by 1% of FLC per 100 m up to a maximum of 2000 m
Vibration resistance	2g / axis (2-100Hz, IEC 60068-2-6, EN 50155, EN 61373)
Impact resistance	15/11 g/ms (EN50155, EN61373)
EU RoHS compliant	Yes
China RoHS	

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.

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。

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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 capacble of delivering not more than 5,000 Arms Symettrical Amperes, 600 Volts maximum when protected by fuses. Tests at 5,000 A were performed with Class RK5 fuses; please refer to table below for maximum allowed ampere rating of the fuse. Use fuses only.

Tests with Class RK5 fuses are representative of Class CC fuses.

Protection co-ordination Type 1 according to UL 508				
Part No.	**Prospective short circuit current [kArms]**	**Max fuse size [A]**	**Class**	**Voltage [VAC]**
RGCM3...15	5	25	RK5 or CC	Max. 600

Protection co-ordination Type 2 (IEC/EN 60947-4-2/ -4-3)				
Part No.	**Prospective short circuit current [kArms]**	**Ferraz Shawmut (Mersen)**		**Voltage [VAC]**
		Max fuse size [A]	**Part number**	
RGCM3...15	5	25	6.9xx CP gRC 14x51/25	Max. 600

xx = 00, without fuse trip indication,
xx= 21, with fuse trip indication

Protection co-ordination Type 2 with Minature 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][3]**
RGCM3..15	S203 - Z10 (10A)	S203-B4 (4A)	1.0 1.5 2.5	7.6 11.4 19.0
	S203 - Z16 (16A)	S203-B6 (6A)	1.0 1.5 2.5 4.0	5.2 7.8 13.0 20.8
	S203 - Z20 (20A)	S203-B10 (10A)	1.5 2.5	12.6 21.0
	S203 - Z25 (25A)	S203-B13 (13A)	2.5 4.0	25.0 40.0

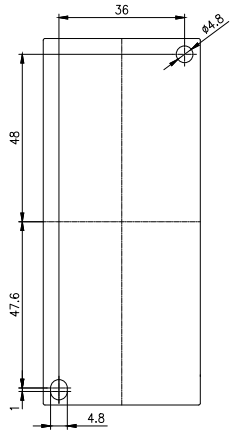
3. Between MCB and Load (including return path which goes back to the mains)

Note: A prospective current of 6 kA and a 230 / 400 V power supply 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.

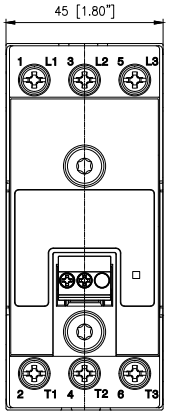
S201 models refer to 1-pole M.C.B., S202 models refer to 2-poles M.C.B.

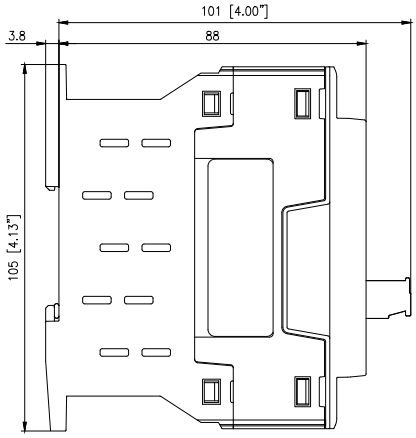
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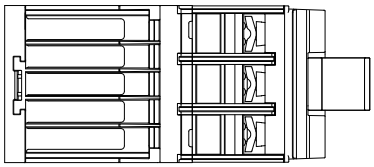
Dimensions



Panel Mounting
Hole Positions

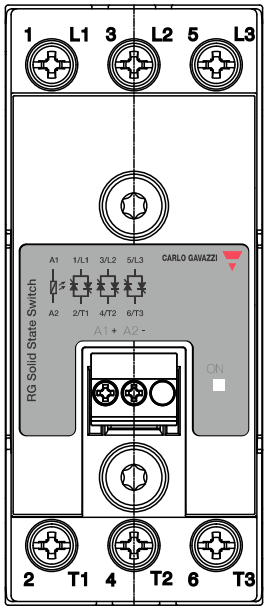






Dimensions in mm. Tolerances +/- 0.5mm.

Terminal layout



1/L1, 3/L2, 5/L3:
Line connections

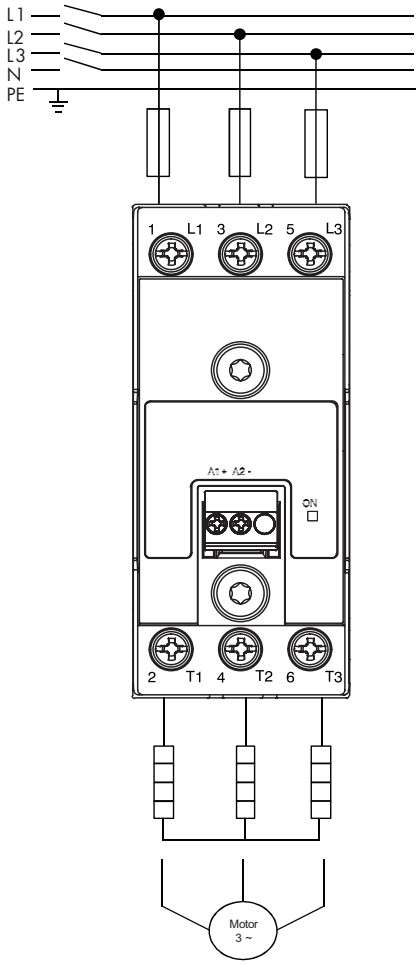
2/T1, 4/T2, 6/T3:
Load connections

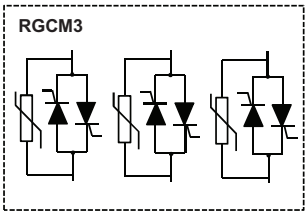
A1(+):
Positive control signal

A2(-):
Control ground

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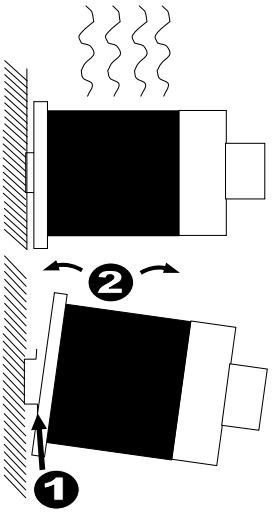
Connection diagram

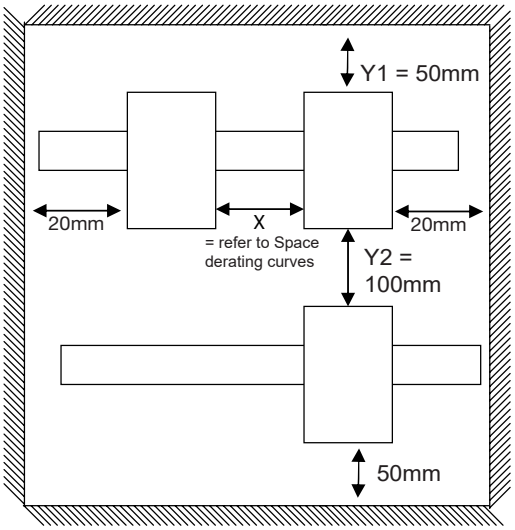




A1, A2: 5-32 VDC

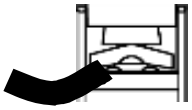
Installation

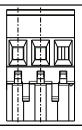




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Connection specifications

Power connections		
Terminals	1/L1, 3/L2, 5/L3, 2/T1, 4/T2, 6/T3	
Conductors	Use 75°C copper (Cu) conductors	
		
Connection type	M4 screw with captivated washer	
Stripping length	10 mm	
Rigid (solid & stranded) UL/cUL rated data	2 x 1.5 – 2.5mm² 2 x 2.5 – 6.0 mm² 2 x 16 – 14 AWG 2 x 14 – 10 AWG	1x 1.5 – 6.0 mm² 1x 16 – 10 AWG
Flexible with end sleeve	2x 1.0 – 2.5 mm² 2x 2.5 – 6.0 mm² 2x 16 – 14 AWG 2x 14 – 10 AWG	1x 1.5 – 6.0 mm² 1x 16 – 10 AWG
Flexible without end sleeve	2x 1.5 – 2.5 mm² 2x 2.5 – 6.0 mm² 2x 16 – 14 AWG 2x 14 – 10 AWG	1x 1.5 – 6.0mm² 1x 16 – 10 AWG
Torque specifications	Pozidrive 2 2.0 Nm (17.7 lb-in)	
Aperture for termination lug	11 mm	

Control connections	
Terminals	A1+, A2-
Conductors	Use 60/75°C copper (Cu) conductors
	
Connection type	Pluggable box clamp
Stripping length	6 - 7.5 mm
Rigid (solid & stranded) UL/cUL rated data	1 x 0.2 - 2.5 mm² 1 x 24 - 12 AWG
Torque specification	M3, Philips 0.8 Nm (7.0 lb-in)

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