Solid State Relays
SOLITRON MIDI - With Integrated Heatsink
Types RJ1A, RJ1B

- **AC semiconductor contactor**
- **Zero switching (RJ1A) or instant-on switching (RJ1B)**
- **Direct copper bonding (DCB) technology**
- **LED-indication**
- **Cage clamp output terminals**
- **2 input ranges: 4-32 VDC and 24-275 VAC/24-48VDC**
- **Operational ratings up to 75 AACrms and 600 VAC[1]**
- **Blocking voltage: Up to 1200 Vp**
- **Opto-isolation > 4000 VACrms**
- **Over-temperature safety option[2]**
- **Integrated fan option**
- **Option for UL508 listing[5]**

Product Description

The *SOLITRON* Midi is a single-phase Solid State Contactor designed to replace electro-mechanical contactors in industrial heating and motor applications, especially when switching is frequent. The product is ready to mount on DIN-rail or chassis and comes with integral heatsink. For current rating of 75AACrms (AC51) convection cooling is used. The standard housing dimensions enable straightforward replacement of alternative products and the terminal layout allows both contactor (E) and SSR (U) type connection. Cage clamp terminals are used to ensure secure load connection with cable up to 25mm^2.
An LED indicates the status of the control input. The superior heat-transfer efficiency combined with a robust power management system make this a high reliability product that can meet the most stringent functional requirements.

Ordering Key

RJ 1 A 60 D 50 E P V M

- **Solid State Relay**
- **Number of poles**
- **Switching mode**
- **Rated operational voltage**
- **Control voltage**
- **Rated operational current**
- **Terminal layout**
- **Overtemp. protection**
- **Varistor**
- **UL listed option**

Type Selection

Switching mode	Rated operational voltage[1]	Control voltage	Rated operational current	Terminal layout	Options
A: Zero switching B: Instant-on switching[3]	23: 230 VACrms 60: 600 VACrms	D: 4-32 VDC A: 24-275 VAC/ 24-48 VDC	40: 40 AACrms 45: 45 AACrms 50: 50 AACrms 75: 75 AACrms[4]	U: SSR E: Contactor	P: Over-temp. protection[2] V: Integrated Varistor M: UL Listed

Selection Guide

Rated operational voltage	Blocking voltage	Control voltage	Rated operational current 40A	45 A	50 A	75 A (FAN+OTP)[2]
230 VACrms	650 V_p	4 - 32VDC	**RJ1A23D40E** **RJ1A23D40U**	**RJ1A23D45E** **RJ1A23D45U**	**RJ1A23D50E** **RJ1A23D50U**	**RJ1A23D75EP**
		24 - 275VAC/ 24 - 48VDC	**RJ1A23A40E** **RJ1A23A40U**	**RJ1A23A45E** **RJ1A23A45U**	**RJ1A23A50E** **RJ1A23A50U**	**RJ1A23A75EP**
600 VACrms	1200 V_p	4 - 32VDC	**RJ1A60D40E** **RJ1A60D40U**	**RJ1A60D45E** **RJ1A60D45U**	**RJ1A60D50E** **RJ1A60D50U**	**RJ1A60D75EP**
		24 - 275VAC/ 24 - 48VDC	**RJ1A60A40E** **RJ1A60A40U**	**RJ1A60A45E** **RJ1A60A45U**	**RJ1A60A50E** **RJ1A60A50U**	**RJ1A60A75EP**

Notes

1 690 VACrms rated operational voltage available on request. Example: RJ1A69D45U

2 "P" suffix: Over-temperature protection (OTP), available with type "E" terminals only

3 Instant-on versions not available with AC control voltage

4 With integrated fan and over-temperature protection - fan will automatically switch on when necessary

5 "M" suffix available only on request. Product ending with"M" is UL listed with NMFT/ NMFT7 requirements for motor loads.

Motor ratings (UL508)

Part number	110-120VAC HP	110-120VAC FLA	220-240VAC HP	220-240VAC FLA	440-480VAC HP	440-480VAC FLA	550-660VAC HP	550-660VAC FLA
RJ1.23..40..M	1/2	9.8A	2	12.0A	-	-	-	-
RJ1.60..40..M	1/2	9.8A	2	12.0A	3	8.5A	5	11.2A
RJ1.23..45..M	1	16A	2	12.0A	-	-	-	-
RJ1.60..45..M	1	16A	2	12.0A	5	14.0A	7 1/2	16.0A
RJ1.23..50..M	1	16A	2	12.0A	-	-	-	-
RJ1.60..50..M	1	16A	2	12.0A	5	14.0A	7 1/2	16.0A
RJ1.23..75..M	1 1/2	20A	3	17.0A	-	-	-	-
RJ1.60..75..M	1 1/2	20A	3	17.0A	5	14.0A	10	20.0A

Note: surrounding ambient temperature is 40°C for motor rating application.

General Specifications

	RJ1.23..	RJ1.60..
Operational voltage range	24 to 265 VAC	42 to 660 VAC
Blocking voltage	650 V_p	1200 V_p
Operational frequency range	45 to 65 Hz	45 to 65 Hz
Power factor	≥ 0.5 @ 230 VACrms	≥ 0.5 @ 600 VACrms
Integrated Varistor (RJ1.....V)	275V	680V
Over-temperature alarm		
I_{max}	50mADC	50mADC
U_{max}	50VDC	50VDC
CE-marking	Yes	
Pollution degree	2	
RoHS compliance	Yes	

Input Specifications

	RJ1A...D	RJ1B..D	RJ1A...A
Control voltage range	4 - 32 VDC	4.5 - 32 VDC	24-275 VAC/24 - 48 VDC
Pick-up voltage	3.8 VDC	4.25 VDC	22 VAC/DC
Reverse voltage	32 VDC	32 VDC	n/a
Drop-out voltage	1.2 VDC	1.0 VDC	6 VAC/DC
Maximum input current	12 mA	15 mA	17 mA
Response time pick-up	1/2 cycle	1 ms	1 cycle
Response time drop-out	1/2 cycle	1 cycle	1 cycle

Isolation

Rated isolation voltage	
Input to output	≥ 4000 VACrms
Output to case	≥ 4000 VACrms

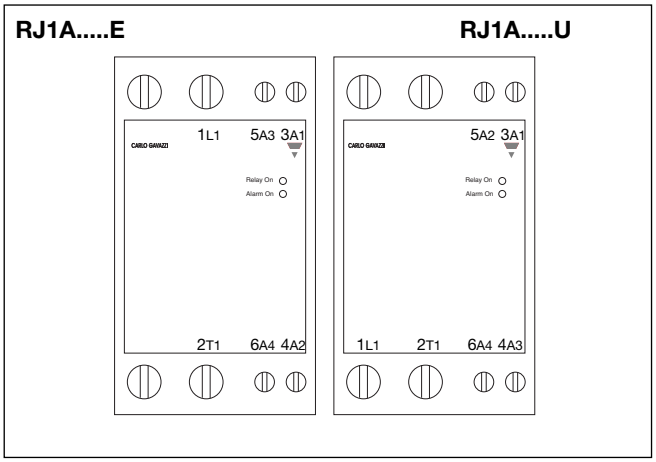
Output Specifications

	RJ..40	RJ..45	RJ..50	RJ..75 (With integrated fan)
Rated operational current AC51 @Ta=25°C AC53a @Ta=25°C	 40 AACrms 15 AACrms	 45 AACrms 20 AACrms	 50 AACrms 30 AACrms	 75 AACrms 30 AACrms
Min. operational current	250 mAACrms	400 mAACrms	500mAACrms	500mAACrms
Rep. overload current t = 1s	< 125 AACrms	< 150 AACrms	<200 AACrms	<200 AACrms
Non rep. surge current Tj(init.) = 25°C and t = 10 ms	600 A_p	1150 A_p	1900 A_p	1900 A_p
Off-state leakage current @ rated voltage and frequency	< 3 mArms	< 3 mArms	< 3 mArms	< 3 mArms
I^2t for fusing t = 10 ms	1800 A^2s	6600 A^2s	18000 A^2s	18000 A^2s
On-state voltage drop @ rated current	1,6 Vrms	1,6 Vrms	1,6 Vrms	1,6 Vrms
Critical dV/dt off-state	500 V/µs	500 V/µs	500 V/µs	500 V/µs

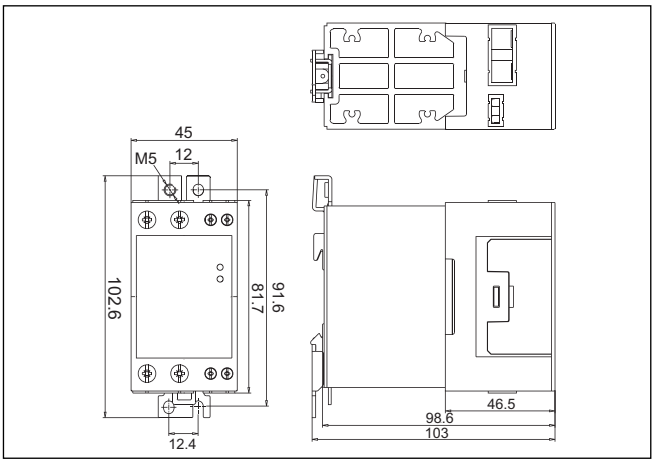
Thermal Specifications

	RJ...D	RJ...A
Operating temperature	-30 to +70°C (-22 to +158°F)	-30 to +70°C (-22 to +158°F)
Storage temperature	-40 to +100°C (-40 to +176°F)	-40 to +100°C (-40 to +176°F)

Terminal Layout



Dimensions



All dimensions in mm

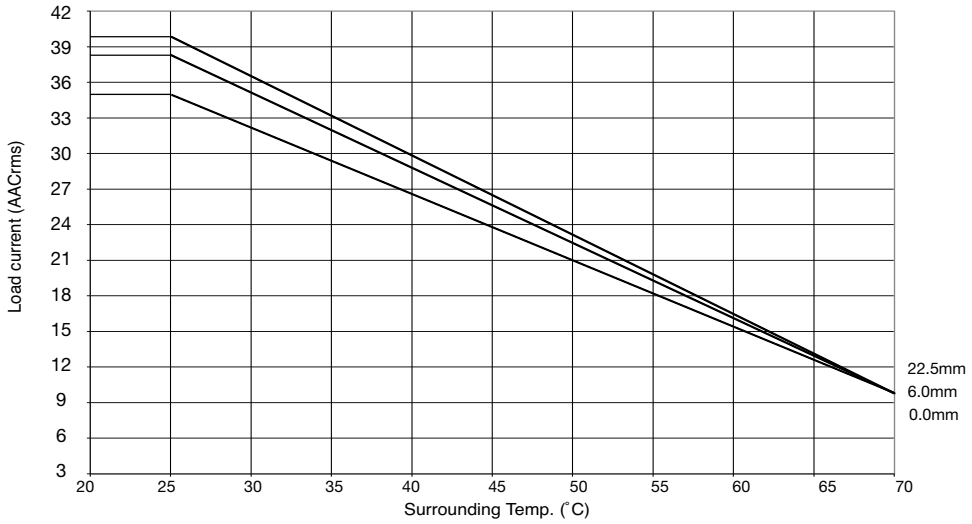
Housing Specifications

Weight RJ MIDI RJ MIDI w. fan		 Approx. 430g Approx. 460g
Housing material		PBT Flame retardant
Control terminal A1, A2 Cable size IEC data: UL data 	 Min Max Min Max	 1 x 0.5 mm^2 (1 x AWG20) 1 x 4.0 mm^2 (1 x AWG12) or 2 x 2.5 mm^2 (2 x AWG14) 1 x AWG 18 (Stranded & Solid) 1 x AWG 12 (Stranded & Solid) 2 x AWG 14 (Stranded & Solid)
Mounting torque max.		0.6 Nm with Pozidriv 0 bit
Control terminal screws		M3

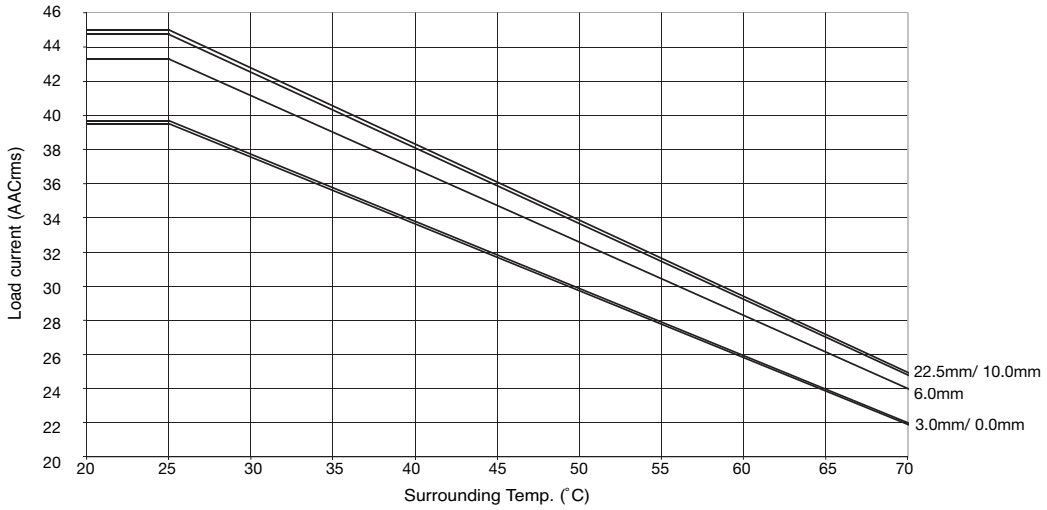
Power terminal L1, T1 Cable size IEC data: UL data 	 Min Max Min Max	 1 x 4 mm^2 (1 x AWG12) 1 x 25 mm^2 (1 x AWG3) or 2 x 10 mm^2 (2 x AWG6) 1 x AWG 12 (Stranded & Solid) 1 x AWG 3 (Stranded) 1 x AWG 10 (Solid) 2 x AWG 10 (Solid)
Mounting torque max.		2.5 Nm with Pozidriv 2 bit
Power terminal screws		M5

Derating vs spacing curves

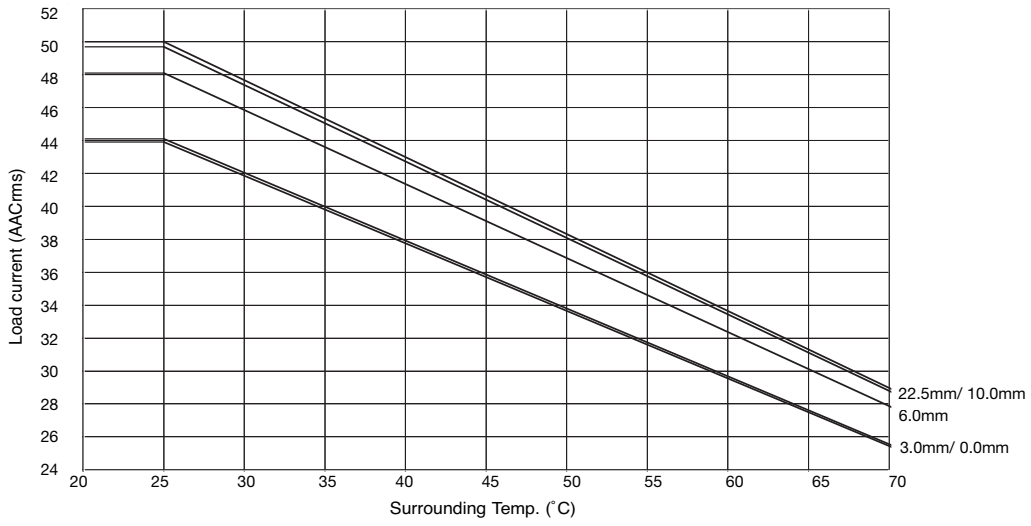
RJ1 ..40



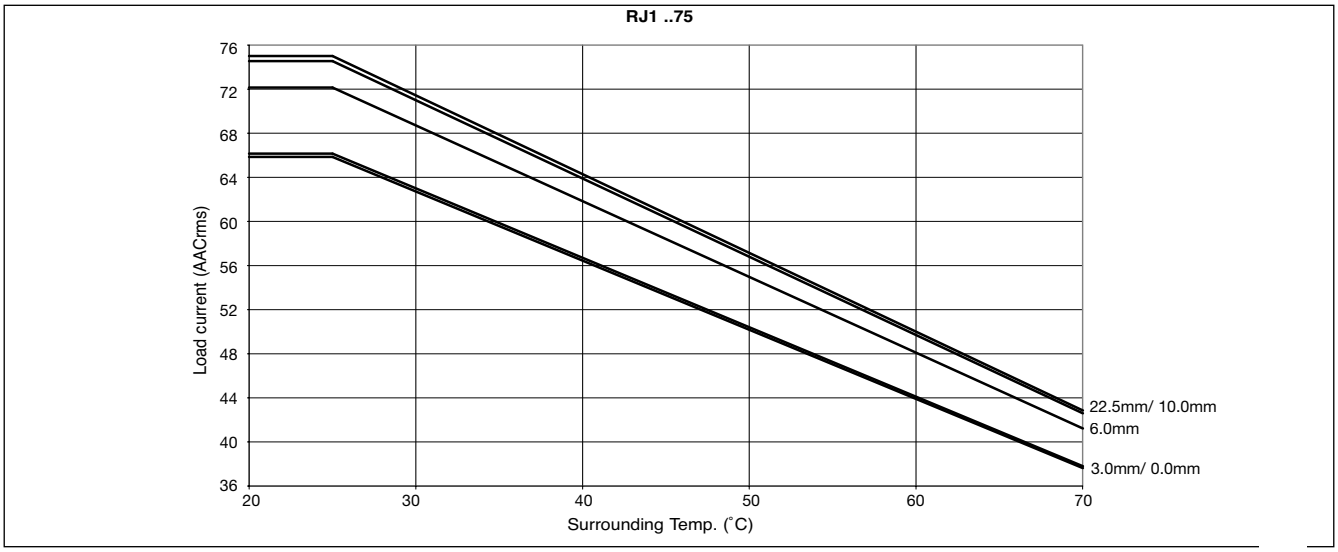
RJ1 ..45



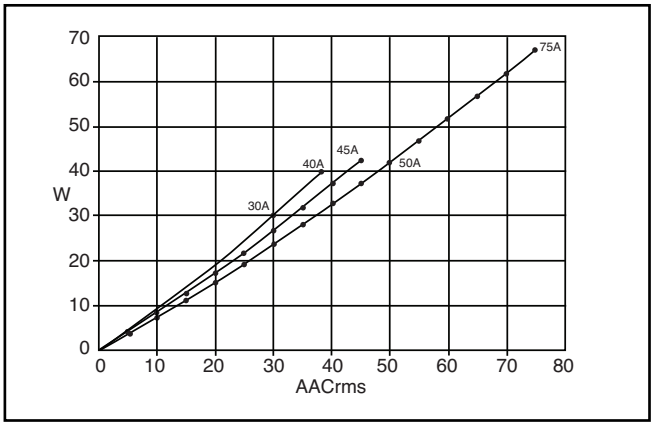
RJ1 ..50



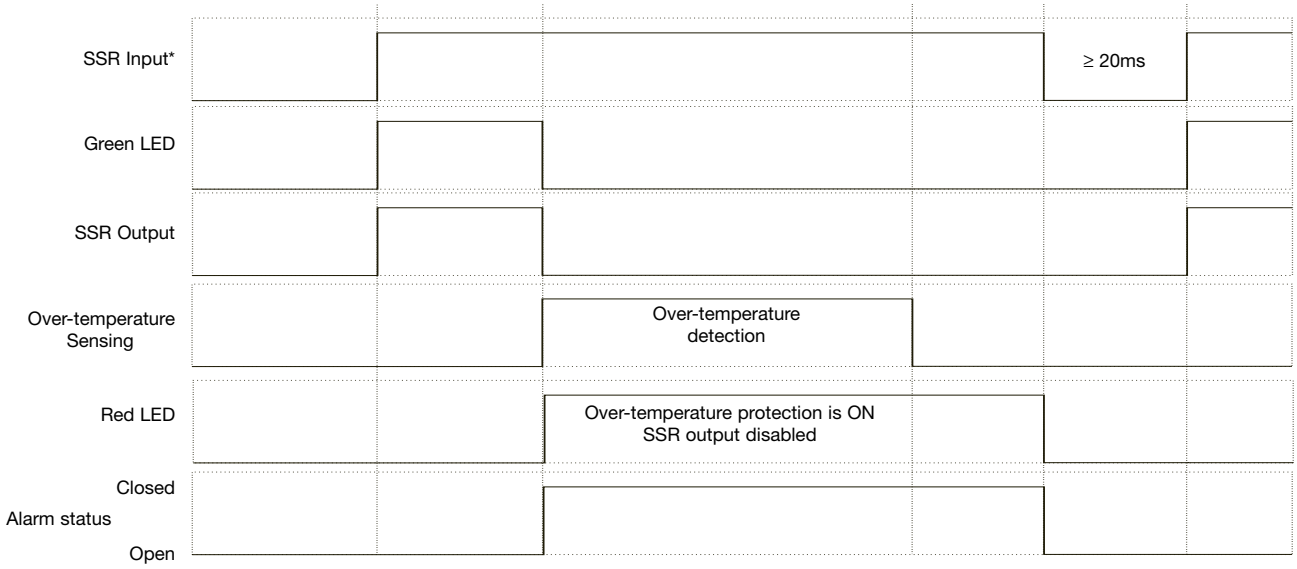
Derating vs spacing curves (cont.)



Dissipation Curve



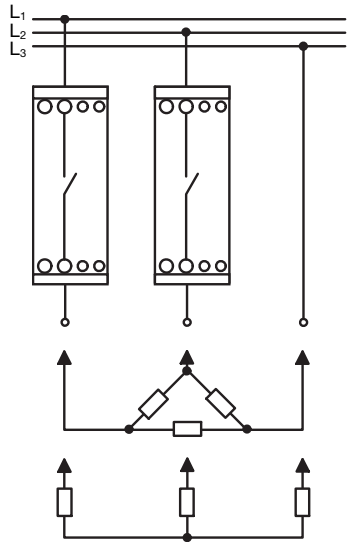
Over-temperature Protection



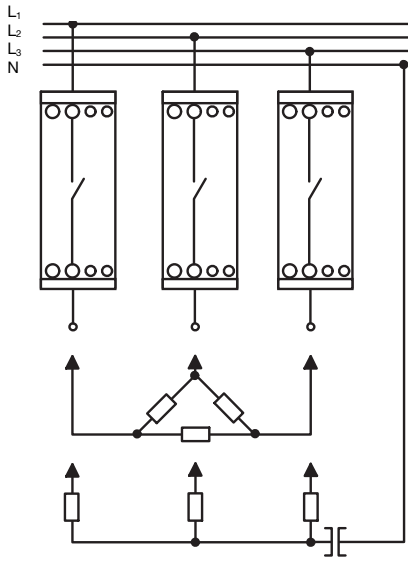
*After over-temperature condition is removed, SSR can be reset by switching OFF the control input for more than 20 ms and switching back ON: this will switch ON the SSR output

Applications

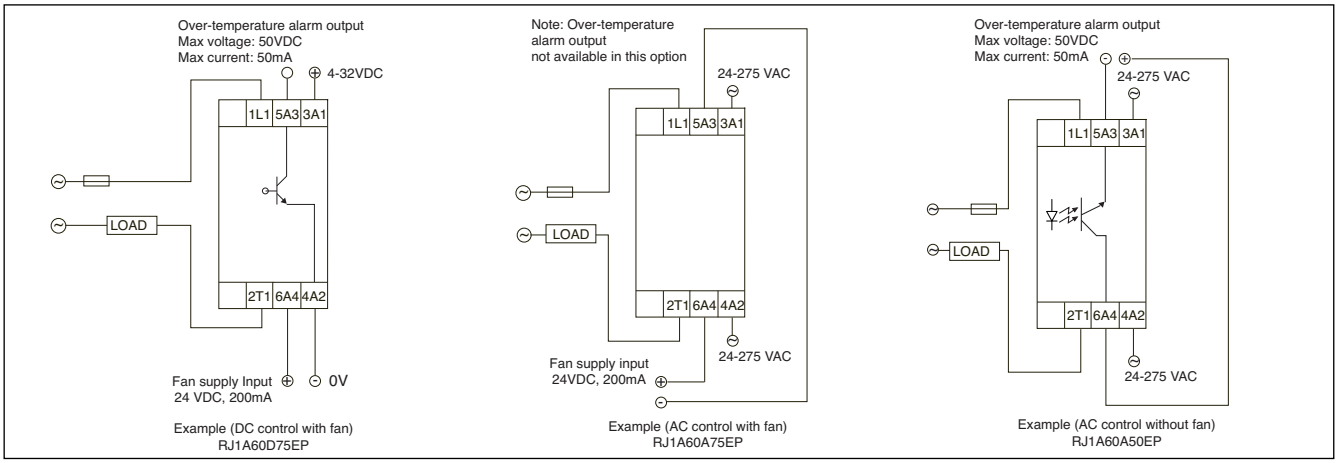
Two single pole relays in
3-phase application
Delta and star.
(Economy Switch)



3 single pole relays in
3-phase application
Delta, Star, Star with neutral



Connection Examples



Agency Approvals & EMC

CE marking	
Low Voltage Directive	IEC / EN 60947-4-3
EMC Immunity	IEC / EN 61000-6-3
EMC Emission	IEC / EN 61000-6-1
Electrostatic Discharge (ESD) Immunity	IEC / EN 61000-4-2
	8kV, PC2 Air discharge
	4kV, PC2 Contact
Electrical Fast Transient Burst Immunity	IEC / EN 61000-4-4
Output	2kV, performance criteria 1
Input	1kV, performance criteria 1
Electrical Surge Immunity	IEC / EN 61000-4-5
Output, line to line	1kV, performance criteria 2
Output, line to earth	2kV, performance criteria 2
Input, line to line	1kV, performance criteria 2
Intput, line to earth	2kV, performance criteria 2
Radio Interference field emissions (radiated)	IEC / EN 55011 Class B (light industry)

Approvals	RJ.....	UL (E80573), cUL (E80573), CSA (204075)
	RJ.....M	UL (172877), cUL (172877)
Restrictions of hazardous substances		RoHS
Radiated Radio Frequency Immunity		EN 61000-4-3
10V/m, 80 - 1000 Mhz		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 10ms/20ms, 70% for 500ms		Performance criteria 2
40% for 200ms		Performance criteria 3
Voltage Interruptions Immunity		IEC / EN 61000-4-11
0% for 5000ms		Performance criteria 3
Radio Interference voltage emissions (conducted)		IEC / EN 55011 Class A (industrial)

Protection with Semiconductor Fuses

Relay type	Rated oper. voltage	Max. fuse	Fuse Size Ferraz (mm)	Fuse type Ferraz	Fuseholder Ferraz	Fuse Size Siba (mm)	Fuse type Siba	Fuseholder Siba
45A								
22 I^2t = 6600A^2s	230 VAC	40 A	14 x 51	6.9xx CP gRC 14 x 51/40	CMS14 1P	14 x 51	50 124 34.40	50 058 04
	600 VAC	40 A	14 x 51	6.9xx CP gRC 14 x 51/40	CMS14 1P	14 x 51	50 124 34.40	50 058 04
50A								
22 I^2t = 18000A^2s	230 VAC	50 A	14 x 51	6.9xx CP gRC 14 x 51/40	CMS14 1P	22x58	50 140 34.50	51 060 04
	600 VAC	50 A	14 x 51	6.9xx CP gRC 14 x 51/40	CMS14 1P	22x58	50 140 34.50	51 060 04

Protection for 65kArms Short Circuit Current Rating (according to UL508)

Suitable for use on a circuit capable of delivering not more than 65,000 Arms symmetrical amperes, 600 volts maximum when protected by Class J fuses. The maximum allowed current value of the fuses is reported in the table below.

Use fuses only

Type	Maximum allowed ampere rating of the fuse
RJ1yxxx40	40A
RJ1yxxx45	60A
RJ1yxxx50	90A
RJ1yxxx75	90A

Protection with Circuit Breakers (ABB)

Solid State Relay type	Model no. for Z - type M. C. B. (rated current)	Model no. for B - type M. C. B. (rated current)	Wire cross sectional area [mm^2]	Minimum length of Cu wire conductor [m][1]
RJ 45	S201 - Z20 (20A)	S201-B10 (10A)	1.5	4.2
			2.5	7.0
			4.0	11.2
	S202 - Z20 (20A)	S202-B10 (10A)	1.5	1.8
			2.5	3.0
			4.0	4.8
	S201 - Z32 (32A)	S201-B16 (16A)	2.5	13.0
			4.0	20.8
			6.0	31.2
	S202 - Z32 (32A)	S202-B16 (16A)	2.5	5.0
			4.0	8.0
			6.0	12.0
			10.0	20.0
	S202 - Z50 (50A)	S202-B25 (25A)	4.0	14.8
			6.0	22.2
			10.0	37.0
RJ 50, RJ 75	S201 - Z50 (50A)	S201-B25 (25A)	4.0	4.8
			6.0	7.2
			10.0	12.0
			16.0	19.2
	S201 - Z63 (63A)	S201-B32 (32A)	6.0	7.2
			10.0	12.0
			16.0	19.2

1. between MCB and SSR Relay (including return path which goes back to the mains).

Note: A prospective current of 6kA and a 230/400V power supply system is assumed for the above suggested specifications. For cables with different cross section than those mentioned above please consult Carlo Gavazzi's Technical Support Group.