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

- **AC semiconductor contactor**
- **Zero switching (RJ1A) or instant-on switching (RJ1B)[1]**
- **Direct copper bonding (DCB) technology**
- **LED-indication**
- **Self-lifting terminals**
- **2 input ranges: 4-32 VDC and 24-275 VAC/24-48VDC**
- **Operational ratings up to 30 AACrms and 600 VAC**
- **Blocking voltage: Up to 1200 V_p**
- **Opto-isolation: 4000 VACrms**
- **Over-temperature safety option[2]**
- **Option for UL508 listing[3]**
- **Germanischer Lloyd approval[4]**

Product Description

The *SOLITRON* Mini 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. The standard housing dimensions enable installation in limited space and the terminal layout allows both contactor (E) and SSR (U) type connection. Two 2.5mm² cables can be connected in each screw terminal to allow looping. A removable IP20 cover allows connection of a 4mm² cable with crimped terminal. 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 30 E P

- **Solid State Relay**
- **Number of poles**
- **Switching mode**
- **Rated operational voltage**
- **Control voltage**
- **Rated operational current**
- **Terminal layout**
- **Options**

Type Selection

Switching mode	Rated operational voltage	Control voltage	Rated operational current	Terminal layout	Options
A: Zero switching B: Instant-on switching[1]	23: 230 VACrms 60: 600 VACrms	D: 4-32 VDC[5] A: 24-275 VAC[5] 24-48 VDC	20: 20 AACrms 30: 30 AACrms	U: SSR E: Contactor	P: Over-temp. protection[2] V: Integrated varistor

Selection Guide

Rated operational voltage	Blocking voltage	Control voltage	Rated operational current 20 A	30 A	30A+OTP[2]
230 VACrms	650 V_p	4 - 32 VDC[5]	**RJ1A23D20E** **RJ1A23D20U**	**RJ1A23D30E** **RJ1A23D30U**	**RJ1A23D30EP**
		24 - 275 VAC / 24 - 48VDC[5]	**RJ1A23A20E** **RJ1A23A20U**	**RJ1A23A30E** **RJ1A23A30U**	**RJ1A23A30EP**
600 VACrms	1200 V_p	4 - 32 VDC[5]	**RJ1A60D20E** **RJ1A60D20U**	**RJ1A60D30E** **RJ1A60D30U**	**RJ1A60D30EP**
		24 - 275 VAC / 24 - 48VDC[5]	**RJ1A60A20E** **RJ1A60A20U**	**RJ1A60A30E** **RJ1A60A30U**	**RJ1A60A30EP**

Notes

1 RJ1B..: For instant-on version replace RJ1A with RJ1B. Example: RJ1B23D30E. Not available with OTP and not available with AC control voltage

2 "P" suffix: Over-temperature protection (OTP), available on 30A rated devices with type "E" terminals only

3 "M" suffix: Available only on request. Product ending with "M" is UL listed with NMFT, NMFT7 requirements for motor loads

4 GL approval applies to RJ1A (Zero Switching) versions only.

5 For Germanischer Lloyd approval D: 5 - 32 VDC

6 For Germanischer Lloyd approval A: 24 - 275 VAC/ 26 - 48 VDC

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..20..M	1/6	4.4A	1/2	4.9A	-	-	-	-
RJ1.60..20..M	1/6	4.4A	1/2	4.9A	1	4A	2	4.8A
RJ1.23..30..M	1/2	9.8A	1 1/2	10A	-	-	-	-
RJ1.60..30..M	1/2	9.8A	1 1/2	10A	3	8.5A	5	11A

Note: Surrounding ambient temperature is 40°C for motor rating applications.

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 69 Hz	45 to 69 Hz
Power factor	≥ 0.5 @ 230 VACrms	≥ 0.5 @ 600 VACrms
Integrated Varistor (RJ1.....V..)	275V	680V
Vibration	6g (According to EN50155)	6g (According to EN50155)
Approvals	UL (E80573), cUL (E80573) , CSA (204075), GL (75833-09HH)[6]	
CE-marking	Yes	
Pollution degree	2	
RoHS compliance	Yes	

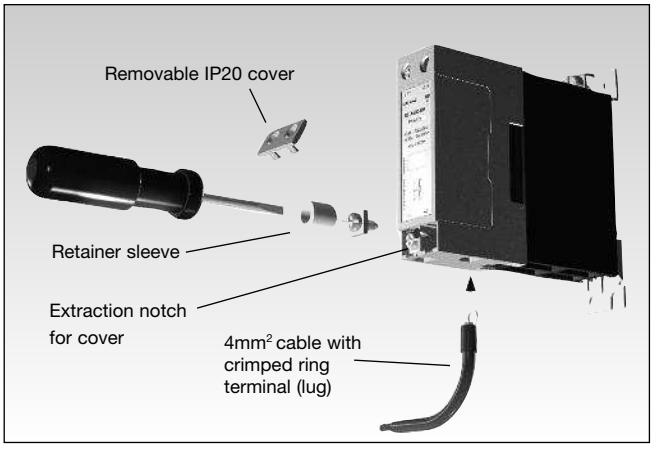
Input Specifications

	RJ1A..D	RJ1B.D	RJ..A
Control voltage range	4 to 32 VDC[5]	4.5 to 32 VDC	24-275VAC/ 24-48 VDC[6]
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
Max 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

Installation



Output Specifications

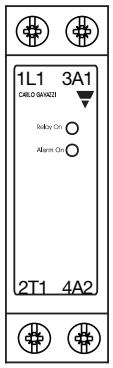
	RJ..20	RJ..30
Rated operational current AC51 @TA=25°C AC53a @Ta=25°C	 20 AACrms 5 AACrms	 30 AACrms 15 AACrms
Min. operational current	350 mAACrms	250mAACrms
Rep. overload current t = 1s	< 35 AACrms	<125 AACrms
Non rep. surge current Tj(init.) = 25°C and t = 10 ms	300 A_p	600 A_p
Off-state leakage current @ rated voltage and frequency	< 3 mArms	< 3 mArms
I^2t for fusing t = 10 ms	450 A^2s	1800 A^2s
On-state voltage drop @ rated current	1.6 Vrms	1.6 Vrms
Critical dV/dt off-state	500 V/µs	500 V/µs

Thermal Specifications

	RJ...D	RJ...A
Operating temperature for general use unless otherwise stated	-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

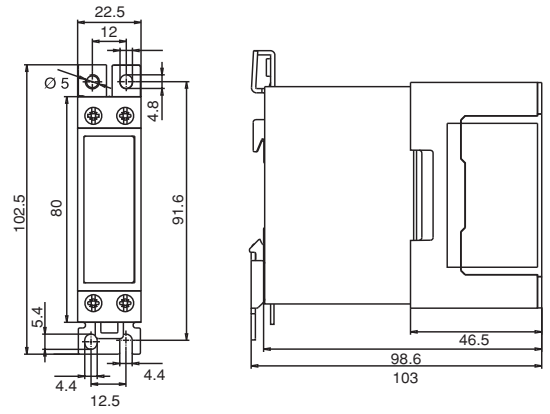
RJ1A.....E



RJ1A.....U

L1: Phase
T1: Load
A1: Control + or ~
A2: Control - or ~

Dimensions

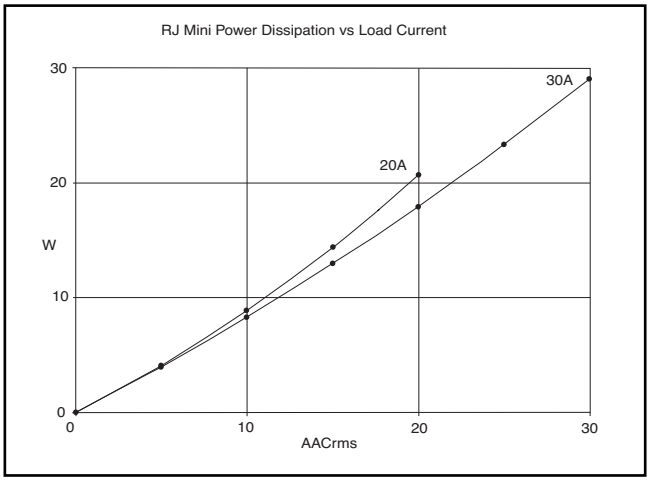


All dimensions in mm

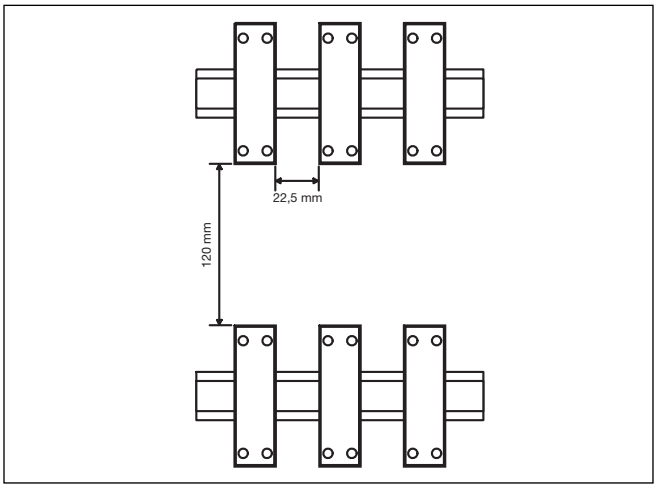
Housing Specifications

Weight		Approx. 225 g
Housing material		PBT Flame retardant
Power and control terminals L1, T1, A1, A2		
IEC data	min.	1 x 0.5 mm^2
	max.	2 x 2.5 mm^2
UL data		
	min.	1 x 18AWG (Stranded and Solid)
	max.	1 x 14AWG (Stranded and Solid) 2 x 14AWG (Stranded and Solid)
Mounting torque max.		2 Nm
Screw size		M4

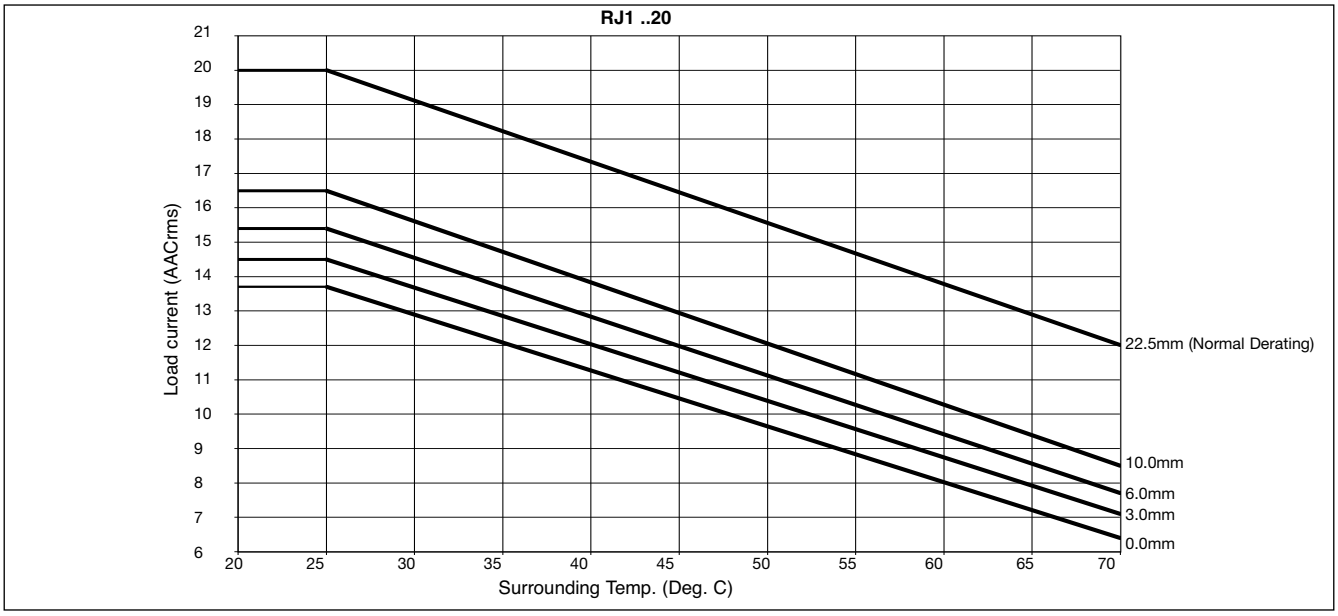
Dissipation Curve

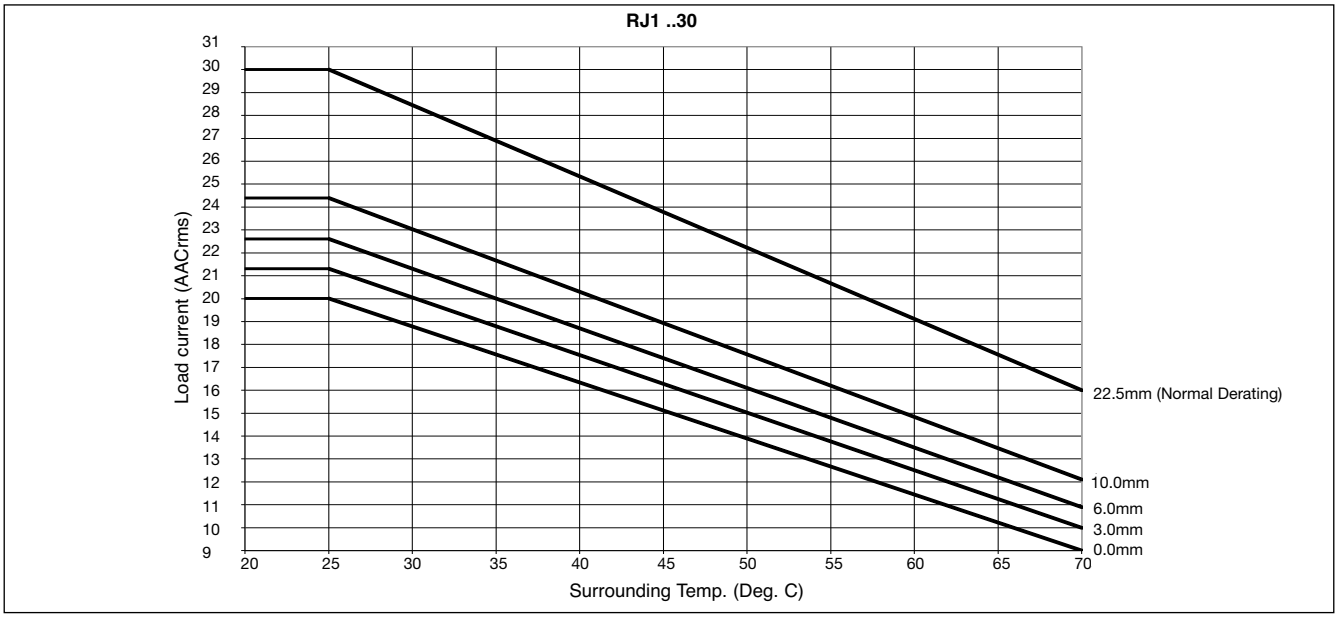


Panel Mounting

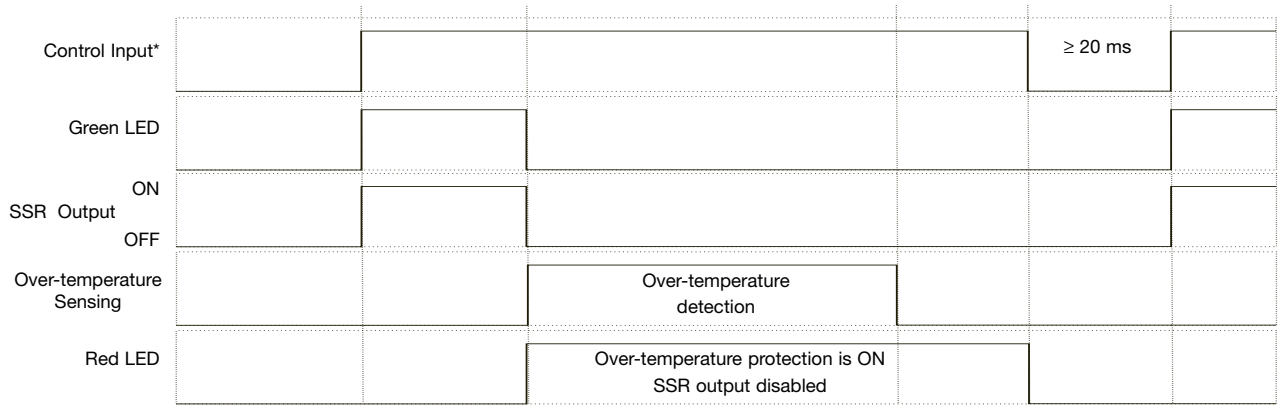


Derating vs. Spacing Curves





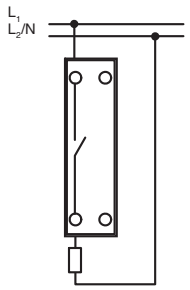
Over-temperature Protection (option: ...P)



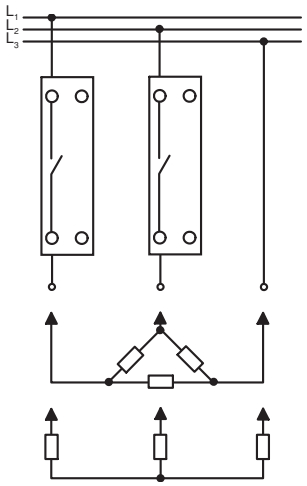
*After over-temperature condition is removed, SSR can be reset by switching OFF the control input for more than 20 ms and switching back ON: this will switch ON the SSR output

Applications

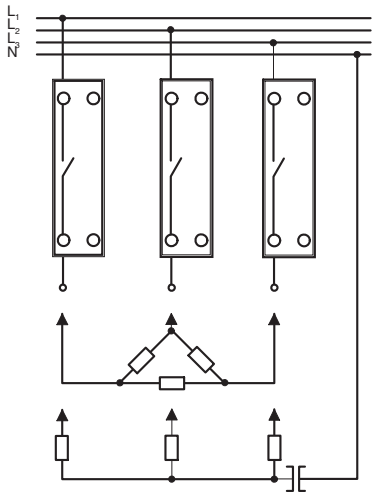
Single pole relay application
Line-Neutral, Line-Line



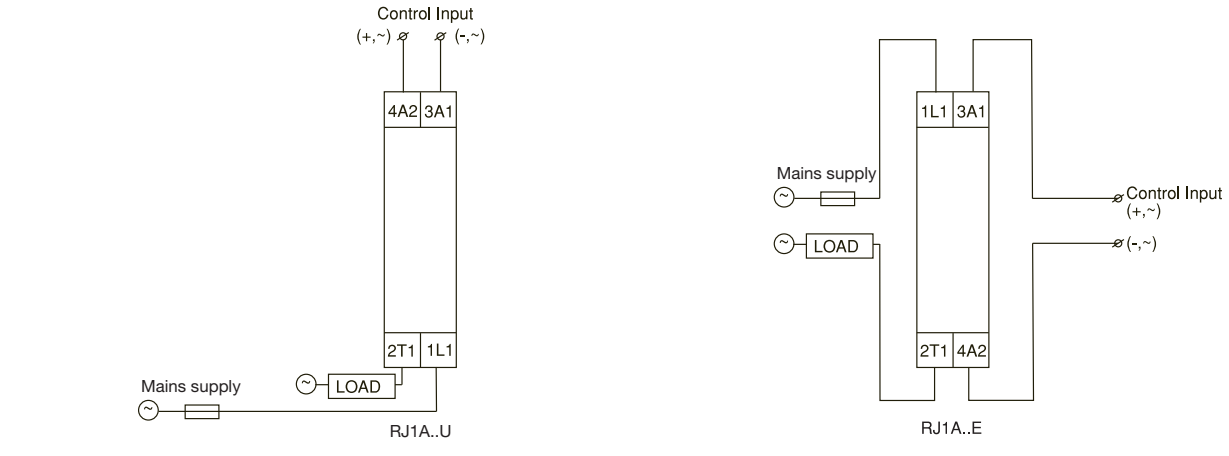
2 single pole relays in 3-phase application
Delta and star connection (economy switch)



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



Connection Example



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	cURus, CSA
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
20A								
22 I^2t = 450A^2s	230 VAC	20 A	10.3 x 38	660 gRB 10-20	CMS10 1P	10,3x38	60 034 34.25	51 063 04
	600 VAC	20 A	10.3 x 38	660 gRB 10-20	CMS10 1P	10,3x38	60 034 34.25	51 063 04
30A								
22 I^2t = 1680A^2s	230 VAC	30 A	10.3 x 38	660 gRB 10-30	CMS14 1P	22x58	50 140 34.50	51 060 04
	600 VAC	30 A	10.3 x 38	660 gRB 10-30	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
RJ1yxxx20	20A
RJ1yxxx30	40A

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 [mm²]	Minimum length of Cu wire conductor [m][1]
RJ 20	S201 - Z4 (4A)	S201 - B2 (2A)	1.0	21.0
	S201 - Z6 UC (6A)	S201 - B2 (2A)	1.0	21.0
			1.5	31.5
RJ 30	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
	S202 - Z25 (25A)	S202-B13 (13A)	2.5	19.0
			4.0	30.4

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.