CARLO GAVAZZI
Automation Components

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Solid State Relays & Motor Controllers

- Solid State Relays
- Motor Controllers
- Accessories

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Solid State Relays Motor Controllers

Solid State Relays
Overview

1 - Phase, PCB-Housing (for PCB mounting)

Type	Load Current	Line Voltage	Control Voltage	Ordering No.	Features
RP1A **RP1B**  Page 2-31	3 A	230 VAC	3-32VDC	**RP1A23D3** **RP1B23D3**	• Zero switching or instant-on • Up to 1000 Vpeak blocking voltage • Surface mount technology • Opto-isolated 4 kV (input-output) • Flexible encapsulation
	5 A			**RP1A23D5** **RP1B23D5**	
	5.5 A			**RP1A23D6** **RP1B23D6**	
			16 - 32 VAC	**RP1A23A6**	
	3 A	400 VAC	3-32 VDC	**RP1A40D3**	
			4-32 VDC	**RP1B40D3**	
	5 A		3-32 VDC	**RP1A40D5**	
			4-32 VDC	**RP1B40D5**	
	5.5 A		3-32 VDC	**RP1A40D6**	
			4-32 VDC	**RP1B40D6**	
	3A	480 VAC	4-32 VDC	**RP1A48D3** **RP1B48D3**	
	5 A			**RP1A48D5** **RP1B48D5**	
	5.5 A			**RP1A48D6** **RP1B48D6**	
RP1A..D10 **RP1B..D10**  Page 2-34	10 A	230 VAC	3 - 32 VDC	**RP1A23D10** **RP1B23D10**	• Zero switching or instant-on • Opto-isolated: > 4000 Vrms • Blocking voltage 1000 V_p
		400 VAC	4 - 32 VDC	**RP1A40D10** **RP1B40D10**	
		480 VAC		**RP1A48D10** **RP1B48D10**	
RAP  Page 2-37	3 A	400 VAC	3.5 - 40 VDC	**RAP 40 A3**	• Zero switching • Up to 1200 Vpeak blocking voltage • LED status indication • Opto-isolated 4 kV (input-output)
	5 A			**RAP 40 A5**	
	3 A	480 VAC	4.5 - 40 VDC	**RAP 48 A3**	
	5 A			**RAP 48 A5**	

DC, PCB-Housing (for PCB mounting)

Type	Load Current	Line Voltage	Control Voltage	Ordering No.	Features
RP1D  Page 2-40	1 A DC	350 VDC	4.25 - 32 VDC	**RP1D350D1**	• DC switching SSR • Surface mount technology • Opto-isolated 4kV (input-output) • Flexible encapsulation
	4 A DC	60 VDC		**RP1D060D4**	
	8 A DC			**RP1D060D8**	

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1-Phase, Industrial-Housing

Type	Load Current	Line Voltage	Control Voltage	Ordering No.	Control Plug type	Power Plug type	Features
RX1A **Thyrex** **Fully pluggable**	AC 51: 25A AC 53a: 5A	230 VAC	4 - 32 VDC	**RX1A23D25**	None	Faston	• Zero Switching AC Solid State Relay • LED indication • Up to 1200Vp blocking voltage • Integrated snubber network • Opto-isolated 4 kV • IP20 protection cover • Housing free of moulding mass • Option of high surge capability with RX 51 models
				RX1A23D25MF	Spring	Faston	
				RX1A23D25MC	Spring	Screw	
				RX1A23D25MP	Spring	Spring	
				RX1A23D25VF	Screw	Faston	
				RX1A23D25VC	Screw	Screw	
				RX1A23D25VP	Screw	Spring	
	AC 51: 50A AC 53a: 15A			**RX1A23D50**	None	Faston	
				RX1A23D50MF	Spring	Faston	
				RX1A23D50MC	Spring	Screw	
				RX1A23D50MP	Spring	Spring	
				RX1A23D50VF	Screw	Faston	
				RX1A23D50VC	Screw	Screw	
				RX1A23D50VP	Screw	Spring	
	AC 51: 50A AC 53a: 20A			**RX1A23D51**	None	Faston	
				RX1A23D51MF	Spring	Faston	
				RX1A23D51MC	Spring	Screw	
				RX1A23D51MP	Spring	Spring	
				RX1A23D51VF	Screw	Faston	
				RX1A23D51VC	Screw	Screw	
				RX1A23D51VP	Screw	Spring	
	AC 51: 25A AC 53a: 5A		24 - 275 VAC	**RX1A23A25**	None	Faston	
				RX1A23A25MF	Spring	Faston	
				RX1A23A25MC	Spring	Screw	
				RX1A23A25MP	Spring	Spring	
				RX1A23A25VF	Screw	Faston	
				RX1A23A25VC	Screw	Screw	
				RX1A23A25VP	Screw	Spring	
	AC 51: 50A AC 53a: 15A			**RX1A23A50**	None	Faston	
				RX1A23A50MF	Spring	Faston	
				RX1A23A50MC	Spring	Screw	
				RX1A23A50MP	Spring	Spring	
				RX1A23A50VF	Screw	Faston	
				RX1A23A50VC	Screw	Screw	
				RX1A23A50VP	Screw	Spring	
	AC 51: 50A AC 53a: 20A			**RX1A23A51**	None	Faston	
				RX1A23A51MF	Spring	Faston	
				RX1A23A51MC	Spring	Screw	
				RX1A23A51MP	Spring	Spring	
				RX1A23A51VF	Screw	Faston	
				RX1A23A51VC	Screw	Screw	
				RX1A23A51VP	Screw	Spring	
	AC 51: 25A AC 53a: 5A	480 VAC	4 - 32 VDC	**RX1A48D25**	None	Faston	
				RX1A48D25MF	Spring	Faston	
				RX1A48D25MC	Spring	Screw	
				RX1A48D25MP	Spring	Spring	
				RX1A48D25VF	Screw	Faston	
				RX1A48D25VC	Screw	Screw	
				RX1A48D25VP	Screw	Spring	
	AC 51: 50A AC 53a: 15A			**RX1A48D50**	None	Faston	
				RX1A48D50MF	Spring	Faston	
				RX1A48D50MC	Spring	Screw	
				RX1A48D50MP	Spring	Spring	
				RX1A48D50VF	Screw	Faston	
				RX1A48D50VC	Screw	Screw	
				RX1A48D50VP	Screw	Spring	
	AC 51: 50A AC 53a: 20A			**RX1A48D51**	None	Faston	
				RX1A48D51MF	Spring	Faston	
				RX1A48D51MC	Spring	Screw	
				RX1A48D51MP	Spring	Spring	
				RX1A48D51VF	Screw	Faston	
				RX1A48D51VC	Screw	Screw	
				RX1A48D51VP	Screw	Spring	
	AC 51: 25A AC 53a: 5A		24 - 275 VAC	**RX1A48A25**	None	Faston	
				RX1A48A25MF	Spring	Faston	
				RX1A48A25MC	Spring	Screw	
				RX1A48A25MP	Spring	Spring	
				RX1A48A25VF	Screw	Faston	
				RX1A48A25VC	Screw	Screw	
				RX1A48A25VP	Screw	Spring	
	AC 51: 50A AC 53a: 15A			**RX1A48A50**	None	Faston	
				RX1A48A50MF	Spring	Faston	
				RX1A48A50MC	Spring	Screw	
				RX1A48A50MP	Spring	Spring	
				RX1A48A50VF	Screw	Faston	
				RX1A48A50VC	Screw	Screw	
				RX1A48A50VP	Screw	Spring	
	AC 51: 50A AC 53a: 20A			**RX1A48A51**	None	Faston	
				RX1A48A51MF	Spring	Faston	
				RX1A48A51MC	Spring	Screw	
				RX1A48A51MP	Spring	Spring	
				RX1A48A51VF	Screw	Faston	
				RX1A48A51VC	Screw	Screw	
				RX1A48A51VP	Screw	Spring	

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1-Phase, Industrial-Housing (cont.)

Type	Load Current	Line Voltage	Control Voltage	Ordering No.	Features
RS1A 	10 A	230 VAC	3 - 32 VDC	**RS1A23D10**	• Zero switching • LED Indication • Up to 1200 Vpeak blocking voltage • Surface mount technology • Opto-isolated 4 kV (input-output) • Clip-on IP 20 protection • Housing free of moulding mass
	25 A			**RS1A23D25**	
	40 A			**RS1A23D40**	
	10 A		18 - 36 VAC/VDC	**RS1A23LA10**	
	25 A			**RS1A23LA25**	
	40 A			**RS1A23LA40**	
	10 A	400 VAC	4 - 32 VDC	**RS1A40D10**	
	25 A			**RS1A40D25**	
	40 A			**RS1A40D40**	
	10 A		18 - 36 VAC/VDC	**RS1A40LA10**	
	25 A			**RS1A40LA25**	
	40 A			**RS1A40LA40**	
	10 A	480 VAC	4 - 32 VDC	**RS1A48D10**	
	25 A			**RS1A48D25**	
	40 A			**RS1A48D40**	
	10 A		18 - 36 VAC/VDC	**RS1A48LA10**	
	25 A			**RS1A48LA25**	
	40 A			**RS1A48LA40**	
Page 2-48					
RS1A..A 	25 A	230 VAC	110 VAC ± 15%	**RS1A23A1-25**	• Zero switching AC Solid State Relay • LED indication • Blocking voltage: up to 850 Vp • Opto-isolation: > 4000 VAC
	40 A			**RS1A23A1-40**	
	25 A		230 VAC ± 15%	**RS1A23A2-25**	
	40 A			**RS1A23A2-40**	
	25 A		400 VAC ± 15%	**RS1A23A4-25**	
	40 A			**RS1A23A4-40**	
	25 A	400 VAC	230 VAC ± 15%	**RS1A40A2-25**	
	40 A			**RS1A40A2-40**	
	25 A		400 VAC ± 15%	**RS1A40A4-25**	
	40 A			**RS1A40A4-40**	
Page 2-53					
RM1A **RM1B** 	25 A	230 VAC	3 - 32 VDC	**RM1A23D25**	• Zero switching (RM1A) or instant-on (RM1B) • LED Indication • Up to 1400 Vpeak blocking voltage • Surface mount technology • Opto-isolated 4 kV (input-output) • Clip-on IP 20 protection • Housing free of moulding mass • Built-in varistor
	50 A			**RM1A23D50**	
	75 A			**RM1A23D75**	
	100 A			**RM1A23D100**	
	25 A		20-280 VAC/ 22-48 VDC	**RM1A23A25**	
	50 A			**RM1A23A50**	
	75 A			**RM1A23A75**	
	100 A			**RM1A23A100**	
	25 A	400 VAC	4 - 32 VDC	**RM1A40D25**	
	50 A			**RM1A40D50**	
	75 A			**RM1A40D75**	
	100 A			**RM1A40D100**	
	25 A		20-280 VAC/ 22-48 VDC	**RM1A40A25**	
	50 A			**RM1A40A50**	
	75 A			**RM1A40A75**	
	100 A			**RM1A40A100**	
	25 A	480 VAC	4 - 32 VDC	**RM1A48D25**	
	50 A			**RM1A48D50**	
	75 A			**RM1A48D75**	
	100 A			**RM1A48D100**	
	25 A		20-280 VAC/ 22-48 VDC	**RM1A48A25**	
	50 A			**RM1A48A50**	
	75 A			**RM1A48A75**	
	100 A			**RM1A48A100**	
	25 A	600 VAC	4 - 32 VDC	**RM1A60D25**	
	50 A			**RM1A60D50**	
	75 A			**RM1A60D75**	
	100 A			**RM1A60D100**	
	25 A		20-280 VAC/ 22-48 VDC	**RM1A60A25**	
	50 A			**RM1A60A50**	
	75 A			**RM1A60A75**	
	100 A			**RM1A60A100**	
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Solid State Relays
Overview

1-Phase, Industrial-Housing (cont.)

Type	Load Current	Line Voltage	Control Input	Ordering No.	Features
RM1A..M 	25 A	230 VAC	5 - 24 VDC/AC	**RM1A23M25**	• Zero switching • LED Indicator • Low voltage AC/DC control • Up to 1400 Vpeak blocking voltage • Surface mount technology • Opto-isolated 4 kV (input-output) • Clip-on IP 20 protection • Housing free of moulding mass • Built-in varistor
	50 A			**RM1A23M50**	
	75 A			**RM1A23M75**	
	100 A			**RM1A23M100**	
	25 A	400 VAC		**RM1A40M25**	
	50 A			**RM1A40M50**	
	75 A			**RM1A40M75**	
	100 A			**RM1A40M100**	
	25 A	480 VAC		**RM1A48M25**	
	50 A			**RM1A48M50**	
	75 A			**RM1A48M75**	
	100 A			**RM1A48M100**	
	25 A	600 VAC		**RM1A60M25**	
	50 A			**RM1A60M50**	
	75 A			**RM1A60M75**	
Page 2-63	100 A			**RM1A60M100**	
RM1C 	25 A	400 VAC	4.25 - 32 VDC	**RM1C40D25**	• Peak switching SSR • Ideal for switching of transformers and other highly inductive loads • Thyristor power units • LED indication • Self lifting terminals • Opto isolation: 4000 VACrms
	50 A			**RM1C40D50**	
	75 A			**RM1C40D75**	
	25 A	600 VAC		**RM1C60D25**	
	50 A			**RM1C60D50**	
Page 2-68	100A			**RM1C60D100**	
RM1E 	25 A	230 VAC	4 - 20 mA	**RM1E 23AA25**	• Analog switching (phase-angle control) for resistive and slightly inductive load applications • Variable intensity LED-indication according to input current • Integral snubber network
	50 A			**RM1E 23AA50**	
	100 A			**RM1E 23AA100**	
	25 A		0 - 10 VDC	**RM1E 23V25**	
	50 A			**RM1E 23V50**	
	100 A			**RM1E 23V100**	
	25 A	400 VAC	4 - 20 mA	**RM1E 40AA25**	
	50 A			**RM1E 40AA50**	
	100 A			**RM1E 40AA100**	
	25 A		0 - 10 VDC	**RM1E 40V25**	
	50 A			**RM1E 40V50**	
	100 A			**RM1E 40V100**	
	25 A	480 VAC	4 - 20 mA	**RM1E 48AA25**	
	50 A			**RM1E 48AA50**	
	100 A			**RM1E 48AA100**	
	25 A		0 - 10 VDC	**RM1E 48V25**	
	50 A			**RM1E 48V50**	
	100 A			**RM1E 48V100**	
	25 A	600 VAC	4 - 20 mA	**RM1E 60AA25**	
	50 A			**RM1E 60AA50**	
	100 A			**RM1E 60AA100**	
	25 A		0 - 10 VDC	**RM1E 60V25**	
	50 A			**RM1E 60V50**	
Page 2-72	100 A			**RM1E 60V100**	
RAM1A **RAM1B** 	25 A	230 VAC	3 - 32 VDC	**RAM1A23D25**	• Zero switching (RAM1A) or instant-on switching (RAM1B) AC Solid State Relay • LED indication • Clip-on IP20 protection cover • Blocking voltage: Up to: 1200 Vp • Opto-insulation: > 4000 VAC
	50 A			**RAM1A23D50**	
	75 A			**RAM1A23D75**	
	100 A			**RAM1A23D100**	
	125 A			**RAM1A23D125**	
	25 A		20-280 VAC/ 22-48 VDC	**RAM1A23A25**	
	50 A			**RAM1A23A50**	
	75 A			**RAM1A23A75**	
	100 A			**RAM1A23A100**	
	125 A			**RAM1A23A125**	
	25 A	600 VAC	4 - 32 VDC	**RAM1A60D25**	
	50 A			**RAM1A60D50**	
	75 A			**RAM1A60D75**	
	100 A			**RAM1A60D100**	
	125 A			**RAM1A60D125**	
	25 A		20-280 VAC/ 22-48 VDC	**RAM1A60A25**	
	50 A			**RAM1A60A50**	
	75 A			**RAM1A60A75**	
	100 A			**RAM1A60A100**	
Page 2-76	125 A			**RAM1A60A125**	

Solid State Relays
Overview

1-Phase, Industrial-Housing (cont.)

Type	Load Current	Line Voltage	Control Voltage	Ordering No.	Features
RA 	10 A	230 VAC	3 -32 VDC 10 -90 VAC/DC 90 -280 VAC/DC	**RA 2410 -D06** **RA 2410 LA6** **RA 2410 HA 06**	• Zero switching SSR • For resistive and inductive loads • Use direct copper bonding in their manufacture • Up to 1200 Vpeak blocking voltage • Opto-isolated 4 kV (input-output) • Antiparallel SCR-output
	25 A		3 -32 VDC 10 -90 VAC/DC 90 -280 VAC/DC	**RA 2425 -D06** **RA 2425 LA06** **RA 2425 HA06**	
	50 A		3 -32 VDC 10 -90 VAC/DC 90 -280 VAC/DC	**RA 2450 -D06** **RA 2450 LA06** **RA 2450 HA06**	
	90 A		3 -32 VDC 10 -90 VAC/DC 90 -280 VAC/DC	**RA 2490 -D06** **RA 2490 LA06** **RA 2490 HA06**	
	10 A	400 VAC	3 -32 VDC 10 -90 VAC/DC 90 -280 VAC/DC	**RA 4410 -D08** **RA 4410 LA08** **RA 4410 HA08**	
	25 A		3 -32 VDC 10 -90 VAC/DC 90 -280 VAC/DC	**RA 4425 -D08** **RA 4425 LA08** **RA 4425 H 08**	
	50 A		3 -32 VDC 10 - 90 VAC/DC 90 - 280 VAC/DC	**RA 4450 -D08** **RA 4450 LA08** **RA 4450 HA08**	
	90 A		3 -32 VDC 10 - 90 VAC/DC 90 - 280 VAC/DC	**RA 4490 -D08** **RA 4490 LA08** **RA 4490 HA08**	
	10 A	480 VAC	3 -32 VDC 10 - 90 VAC/DC 90 - 280 VAC/DC	**RA 4810 -D12** **RA 4810 LA12** **RA 4810 HA12**	
	25 A		3 -32 VDC 10 - 90 VAC/DC 90 - 280 VAC/DC	**RA 4825 -D12** **RA 4825 LA12** **RA 4825 HA12**	
	50 A		3 -32 VDC 10 - 90 VAC/DC 90 - 280 VAC/DC	**RA 4850 -D12** **RA 4850 LA12** **RA 4850 HA12**	
	90 A		3 -32 VDC 10 - 90 VAC/DC 90 - 280 VAC/DC	**RA 4890 -D12** **RA 4890 LA12** **RA 4890 HA12**	
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RA **High voltage/ High current**	50 A	600 VACrms	4.5 - 32 VDC	**RA 6050 -D16**	• Zero Switching SSR • High surge current capability • Up to 1600 Vpeak blocking voltage • Opto-isolated 4kV (input-output)
	90 A	400 VACrms 600 VACrms		**RA 4090 -D10** **RA 6090 -D16**	
	110 A	230 VACrms 400 VACrms 480 VACrms 600 VACrms		**RA 24110 -D06** **RA 40110 -D10** **RA 48110 -D12** **RA 60110 -D16**	
Page 2-86					
RA-T **RA-TF**	10 A 25 A	230 VAC	3 - 32 VDC	**RA 2410 -D06T** **RA 2425 -D06T**	• Zero Switching SSR • Low cost type • Opto-isolation (input-output) 4 KV
	10 A 25 A			**RA 2410 -D06TF** **RA 2425 -D06TF**	
Page 2-90					
RA **Low Noise** 	10 A 25 A	230 VAC	3 - 32 VDC	**RA 2410 -D06L** **RA 2425 -D06L**	• Zero switching SSR • Low electromagnetic noise emission
	10 A 25 A	400 VAC		**RA 4010 -D08L** **RA 4025 -D08L**	
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Solid State Relays
Overview

1-Phase, Industrial-Housing (cont.)

Type	Load Current	Line Voltage	Control Voltage	Ordering No.	Alarm Output	Features
RA-S **System Monitoring** 	25 A	120 VAC	> 7 VDC	**RA 1225 H06NOS**	NPN, NO	• Zero switching • For resistive and inductive loads • Direct-Bonding-Technology • Up to 1200 V_p blocking voltage • Opto-isolated 4 kV (input-output) • Antiparallel SCR-output • Internal circuit monitor • NPN- and PNP-transistor output • LED indication for alarm and supply NO = Normally open NC = Normally closed
				RA 1225 H06NCS	NPN, NC	
				RA 1225 H06POS	PNP, NO	
				RA 1225 H06PCS	PNP, NC	
	50 A			**RA 1250 H06NOS**	NPN, NO	
				RA 1250 H06NCS	NPN, NC	
				RA 1250 H06POS	PNP, NO	
				RA 1250 H06PCS	PNP, NC	
	90 A			**RA 1290 H06NOS**	NPN, NO	
				RA 1290 H06NCS	NPN, NC	
				RA 1290 H06POS	PNP, NO	
				RA 1290 H06PCS	PNP, NC	
	110 A			**RA 12110 H06NOS**	NPN, NO	
				RA 12110 H06NCS	NPN, NC	
				RA 12110 H06POS	PNP, NO	
				RA 12110 H06PCS	PNP, NC	
	25 A	230 VAC	> 7 VDC	**RA 2325 H06NOS**	NPN, NO	
				RA 2325 H06NCS	NPN, NC	
				RA 2325 H06POS	PNP, NO	
				RA 2325 H06PCS	PNP, NC	
	50 A			**RA 2350 H06NOS**	NPN, NO	
				RA 2350 H06NCS	NPN, NC	
				RA 2350 H06POS	PNP, NO	
				RA 2350 H06PCS	PNP, NC	
	90 A			**RA 2390 H06NOS**	NPN, NO	
				RA 2390 H06NCS	NPN, NC	
				RA 2390 H06POS	PNP, NO	
				RA 2390 H06PCS	PNP, NC	
	110 A			**RA 23110 H06NOS**	NPN, NO	
				RA 23110 H06NCS	NPN, NC	
				RA 23110 H06POS	PNP, NO	
				RA 23110 H06PCS	PNP, NC	
	25 A	400 VAC	> 7 VDC	**RA 4025 H10NOS**	NPN, NO	
				RA 4025 H10NCS	NPN, NC	
				RA 4025 H10POS	PNP, NO	
				RA 4025 H10PCS	PNP, NC	
	50 A			**RA 4050 H10NOS**	NPN, NO	
				RA 4050 H10NCS	NPN, NC	
				RA 4050 H10POS	PNP, NO	
				RA 4050 H10PCS	PNP, NC	
	90 A			**RA 4090 H10NOS**	NPN, NO	
				RA 4090 H10NCS	NPN, NC	
				RA 4090 H10POS	PNP, NO	
				RA 4090 H10PCS	PNP, NC	
	110 A			**RA 40110 H10NOS**	NPN, NO	
				RA 40110 H10NCS	NPN, NC	
				RA 40110 H10POS	PNP, NO	
				RA 40110 H10PCS	PNP, NC	
	25 A	480 VAC	> 7 VDC	**RA 4825 H12NOS**	NPN, NO	
				RA 4825 H12NCS	NPN, NC	
				RA 4825 H12POS	PNP, NO	
				RA 4825 H12PCS	PNP, NC	
	50 A			**RA 4850 H12NOS**	NPN, NO	
				RA 4850 H12NCS	NPN, NC	
				RA 4850 H12POS	PNP, NO	
				RA 4850 H12PCS	PNP, NC	
	90 A			**RA 4890 H12NOS**	NPN, NO	
				RA 4890 H12NCS	NPN, NC	
				RA 4890 H12POS	PNP, NO	
				RA 4890 H12PCS	PNP, NC	
	110 A			**RA 48110 H12NOS**	NPN, NO	
				RA 48110 H12NCS	NPN, NC	
				RA 48110 H12POS	PNP, NO	
				RA 48110 H12PCS	PNP, NC	

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Solid State Relays
Overview

DC, Industrial-Housing

Type	Load Current	Line Voltage	Control Voltage	Ordering No.	Features
RD 	1 A	200 VDC	3 - 32 VDC	**RD 2001 -D**	• DC switching SSR • High voltage switching • Opto-isolated 4 kV (input-output) • Medium current switching
		350 VDC		**RD 3501 -D**	
	5 A	60 VDC		**RD 0605 -D**	

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2-Phase, Industrial-Housing

Type	Load Current	Line Voltage	Control Voltage	Ordering No.	Features
RA2A 	2 x 25 A	230 VAC	4.5 - 32 VDC	**RA2A23D25** **RA2A23D25M**	• 2 independently switched poles • Zero Switching • Resistive and inductive AC loads • Opto-isolated 4 kV (input-output) • LED indication • Housing free of moulding mass
	2 x 40 A			**RA2A23D40** **RA2A23D40M**	
	2 x 25 A	400 VAC		**RA2A40D25** **RA2A40D25M**	
	2 x 40 A			**RA2A40D40** **RA2A40D40M**	
	2 x 25 A	480 VAC		**RA2A48D25** **RA2A48D25M**	
	2 x 40 A			**RA2A48D40** **RA2A48D40M**	
	2 x 25 A	600 VAC		**RA2A60D25** **RA2A60D25M**	
	2 x 40 A			**RA2A60D40** **RA2A60D40M**	

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3-Phase, Industrial-Housing

Type	Load Current	Line Voltage	Control Voltage	Ordering No.	Features
RZ3A 	3 x 25 A	400 VAC	5 VDC	**RZ3A40LD25**	• 3-Phase switching Solid State Relay • Zero switching • Integral snubber network • Over-temperature protection option with alarm output • IP 10 back-of-hand protection • LED indication of control input and over-temperature alarm status
			4-32 VDC	**RZ3A40D25**	
			24-275 VAC/24-50 VDC	**RZ3A40A25**	
	3 x 55 A		5 VDC	**RZ3A40LD55**	
			4-32 VDC	**RZ3A40D55**	
			24-275 VAC/24-50 VDC	**RZ3A40A55**	
	3 x 75 A		5 VDC	**RZ3A40LD75**	
			4-32 VDC	**RZ3A40D75**	
			24-275 VAC/24-50 VDC	**RZ3A40A75**	
	3 x 25 A	600 VAC	5 VDC	**RZ3A60LD25**	
			4-32 VDC	**RZ3A60D25**	
			24-275 VAC/24-50 VDC	**RZ3A60A25**	
	3 x 55 A		5 VDC	**RZ3A60LD55**	
			4-32 VDC	**RZ3A60D55**	
			24-275 VAC/24-50 VDC	**RZ3A60A55**	
	3 x 75 A		5 VDC	**RZ3A60LD75**	
			4-32 VDC	**RZ3A60D75**	
			24-275 VAC/24-50 VDC	**RZ3A60A75**	

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Solid State Relays
Overview

1-Phase, DIN-rail mounting

Type	Load Current	Line Voltage	Control Voltage	Ordering No.	Features
RMD 	20 A	230 VAC±15%	4 - 32 VDC	**RMD1H23D20**	• Hybrid relay: SSR / EMR • Integral bypassing of semiconductors • Internal over-temperature protection
			24 - 275 VAC/ 24 -190 VDC	**RMD1H23A20**	

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1-Phase, 1-Pole switching (with rear integrated heatsink)

Type	Load Current	Line Voltage	Control Voltage	Ordering No.	Over-temp. Protection	Alarm Output	Fan
RJ Mini RJ1A RJ1B 	AC 51 : 20 A AC 53a : 5 A	230 VAC	4 - 32 VDC	**RJ1A23D20E** **RJ1A23D20U**	No	No	No
	AC 51 : 30 A AC 53a : 15 A			**RJ1A23D30E** **RJ1A23D30U**			
				RJ1A23D30EP	Yes		
	AC 51 : 20 A AC 53a : 5 A		24 - 275 VAC / 24 - 48 VDC	**RJ1A23A20E** **RJ1A23A20U**	No		
	AC 51 : 30 A AC 53a : 15 A			**RJ1A23A30E** **RJ1A23A30U**			
				RJ1A23A30EP	Yes		
	AC 51 : 20 A AC 53a : 5 A	600 VAC	4 - 32 VDC	**RJ1A60D20E** **RJ1A60D20U**	No		
	AC 51 : 30 A AC 53a : 15 A			**RJ1A60D30E** **RJ1A60D30U**			
				RJ1A60D30EP	Yes		
	AC 51 : 20 A AC 53a : 5 A		24 - 275 VAC / 24 - 48 VDC	**RJ1A60A20E** **RJ1A60A20U**	No		
	AC 51 : 30 A AC 53a : 15 A			**RJ1A60A30E** **RJ1A60A30U**			
				RJ1A60A30EP	Yes		
			RJ1A.. . .E: Contactor terminal layout RJ1A.. . .U: Standard SSR terminal layout				
RJ Midi RJ1A RJ1B 	AC 51 : 45 A AC 53a : 20 A	230 VAC	4 - 32 VDC	**RJ1A23D45E**	No	No	No
				RJ1A23D45U	No	No	No
				RJ1A23D45EP	Yes	Yes	No
	AC 51 : 50 A AC 53a : 30 A			**RJ1A23D50E**	No	No	No
				RJ1A23D50U	No	No	No
				RJ1A23D50EP	Yes	Yes	No
	AC 51 : 75 A AC 53a : 30 A			**RJ1A23D75EP**	Yes	Yes	Yes
	AC 51 : 45 A AC 53a : 20 A		24 - 275 VAC / 24 - 48 VDC	**RJ1A23A45E**	No	No	No
				RJ1A23A45U	No	No	No
				RJ1A23A45EP	Yes	Yes	No
	AC 51 : 50 A AC 53a : 30 A			**RJ1A23A50E**	No	No	No
				RJ1A23A50U	No	No	No
				RJ1A23A50EP	Yes	Yes	No
	AC 51 : 75 A AC 53a : 30 A			**RJ1A23A75EP**	Yes	No	Yes
	AC 51 : 45 A AC 53a : 20 A	600 VAC	4- 32 VDC	**RJ1A60D45E**	No	No	No
				RJ1A60D45U	No	No	No
				RJ1A60D45EP	Yes	Yes	No
	AC 51 : 50 A AC 53a : 30 A			**RJ1A60D50E**	No	No	No
				RJ1A60D50U	No	No	No
				RJ1A60D50EP	Yes	Yes	No
	AC 51 : 75 A AC 53a : 30 A			**RJ1A60D75EP**	Yes	Yes	Yes
	AC 51 : 45 A AC 53a : 20 A		24 - 275 VAC / 24 - 48 VDC	**RJ1A60A45E**	No	No	No
				RJ1A60A45U	No	No	No
				RJ1A60A45EP	Yes	Yes	No
	AC 51 : 50 A AC 53a : 30 A			**RJ1A60A50E**	No	No	No
				RJ1A60A50U	No	No	No
				RJ1A60A50EP	Yes	Yes	No
	AC 51 : 75 A AC 53a : 30 A			**RJ1A60A75EP**	Yes	No	Yes
			RJ1A.. . .E: Contactor terminal layout RJ1A.. . .U: Standard SSR terminal layout				

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1-Phase, 1-Pole switching (with rear integrated heatsink)

Type	Load Current	Line Voltage	Control Voltage	Ordering No.	Over temp. Protection	Alarm Output	Fan
RJ Power RJ1A RJ1B 	AC 51 : 70 A AC 53a : 30 A	230 VAC	4 - 32 VDC	**RJ1A23D70E**	No	No	No
				RJ1A23D70U	No	No	No
				RJ1A23D70EP	Yes	Yes	No
	AC 51 : 90 A AC 53a : 30 A			**RJ1A23D90EP**	Yes	Yes	Yes
	AC 51 : 70 A AC 53a : 30 A		24 - 275 VAC / 24 - 48 VDC	**RJ1A23A70E**	No	No	No
				RJ1A23A70U	No	No	No
				RJ1A23A70EP	Yes	Yes	No
	AC 51 : 90 A AC 53a : 30 A			**RJ1A23A90EP**	Yes	No	Yes
	AC 51 : 70 A AC 53a : 30 A	600 VAC	4 - 32 VDC	**RJ1A60D70E**	No	No	No
				RJ1A60D70U	No	No	No
				RJ1A60D70EP	Yes	Yes	No
	AC 51 : 90 A AC 53a : 30 A			**RJ1A60D90EP**	Yes	Yes	Yes
	AC 51 : 70 A AC 53a : 30 A		24 - 275 VAC / 24 - 48 VDC	**RJ1A60A70E**	No	No	No
				RJ1A60A70U	No	No	No
				RJ1A60A70EP	Yes	Yes	No
	AC 51 : 90 A AC 53a : 30 A			**RJ1A60A90EP**	Yes	No	Yes
			RJ1A.. . .E: Contactor terminal layout RJ1A.. . .U: Standard SSR terminal layout				
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RJCSR Current Sensing 	AC51: 50A	230 VAC	4-32 VDC	**RJCS1A23D50EPNO** **RJCS1A23D50EPPO**	Yes	NPN, NO PNP, NO	No
		600 VAC		**RJCS1A60D50EPNO** **RJCS1A60D50EPPO**	Yes	NPN, NO PNP, NO	No
	AC51: 30A	230 VAC		**RJCSR1A23D30EPNO** **RJCSR1A23D30EPPO**	Yes	NPN, NO PNP, NO	No
		600 VAC		**RJCSR1A60D30EPNO** **RJCSR1A60D30EPPO**	Yes	NPN, NO PNP, NO	No
	AC51: 50A	230 VAC		**RJCSR1A23D50EPNO** **RJCSR1A23D50EPPO**	Yes	NPN, NO PNP, NO	No
		600 VAC		**RJCSR1A60D50EPNO** **RJCSR1A60D50EPPO**	Yes	NPN, NO PNP, NO	No
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Type	Load Current	Line Voltage	Control Input	Ordering No.	Features
RJ1P Modbus 	AC51: 50A	230 VAC	MBT - 2 wire Modbus RTU	**RJ1P23MBT50EBC** **RJ1P23MBT50ECS** **RJ1P23MBT50ECV**	• Modbus RTU interface over EIA-485 • RJ45 socket for easy installation • Dual sockets for daisy chaining • 4 selectable modes of operation - On/OFF, Phase angle, Burst firing and Distributed full cycle
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RJ1P Multi-Function Analog Switching 	AC51: 30A	230 VAC	0-10 VDC	**RJ1P23V30E**	• 5 selectable modes of operation: Phase Angle, Distributed Full Cycle and Burst Control (1,3 or 10s) • Load and control staus indication • Blocking voltage: Up to 1200V_p • Opto-isolation > 4000 VAC • Built-in varistor
			4 - 20 mA	**RJ1P23I30E**	
		480 VAC	0 -10 VDC	**RJ1P48V30E**	
			4 - 20 mA	**RJ1P48I30E**	
		600 VAC	0 - 10 VDC	**RJ1P60V30E**	
			4 - 20 mA	**RJ1P60I30E**	
	AC51: 50A	230 VAC	0-10 VDC	**RJ1P23V50E**	
			4 - 20 mA	**RJ1P23I50E**	
		480 VAC	0 -10 VDC	**RJ1P48V50E**	
			4 - 20 mA	**RJ1P48I50E**	
		600 VAC	0 - 10 VDC	**RJ1P60V50E**	
			4 - 20 mA	**RJ1P60I50E**	
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Solid State Relays
Overview

2-Phase, 2-Pole switching (with rear integrated heatsink)

Type	Load Current	Line Voltage	Control Voltage	Ordering No.	Features
RJ2A Mini  Page 2-149	AC 51: 2 x 12 A AC 51: 2 x 18 A	220VAC	4 - 32 VDC	**RJ2A22D12E** **RJ2A22D18E**	• 2 pole switching with common control input • LED indication for control status • Blocking voltage: Up to 1200 Vp • Opto isolation: > 4000 VAC
	AC 51: 2 x 12A AC 51: 2 x 18 A	480 VAC		**RJ2A48D12E** **RJ2A48D18E**	

Type	Load Current	Line Voltage	Control Voltage	Ordering No.	Integrated Heatsink	Features
RJD2A DUO Midi/ Power  Page 2-153	AC 51: 2 x 30A AC 53a: 2 x 30A	230 VAC	4 - 32 VDC	**RJD2A23D30E**	MIDI	• 2 independently switched poles • LED indication for each pole • Opto isolation > 4000 VAC
	AC 51: 2 x 45A AC 53a: 2 x 30A			**RJD2A23D45E**	POWER	
	AC 51: 2 x 30A AC 53a: 2 x 30A	600 VAC		**RJD2A60D30E**	MIDI	
	AC 51: 2 x 45A AC 53a: 2 x 30A			**RJD2A60D45E**	POWER	

3-Phase, 2-Pole switching (with rear integrated heatsink)

Type	Load Current	Line Voltage	Control Voltage	Ordering No.	Integrated Heatsink	Over-temp. Protection	Alarm Output
RJ2A Midi / Power  Page 2-157	AC 51: 3x25A AC 53a: 3x15A	220 VAC	5 - 32 VDC	**RJ2A22D25**	MIDI	No	No
				RJ2A22D25EP		Yes	Yes
			24 - 275 VAC / 24 - 190 VDC	**RJ2A22A25E**		No	No
				RJ2A22A25EP		Yes	Yes
	AC 51: 3x32A AC 53a: 3x15A		5 - 32 VDC	**RJ2A22D32**	POWER	No	No
				RJ2A22D32EP		Yes	Yes
			24 - 275 VAC / 24 - 190 VDC	**RJ2A22A32E**		No	No
				RJ2A22A32EP		Yes	Yes
	AC 51: 3x25A AC 53a: 3x15A	600 VAC	5 - 32 VDC	**RJ2A60D25**	MIDI	No	No
				RJ2A60D25EP		Yes	Yes
			24 - 275 VAC / 24 - 190 VDC	**RJ2A60A25E**		No	No
				RJ2A60A25EP		Yes	Yes
	AC 51: 3x32A AC 53a: 3x15A		5 - 32 VDC	**RJ2A60D32**	POWER	No	No
				RJ2A60D32EP		Yes	Yes
			24 - 275 VAC / 24 - 190 VDC	**RJ2A60A32E**		No	No
				RJ2A60A32EP		Yes	Yes

Solid State Relays
Overview

3-Phase, 3-Pole switching (with rear integrated heatsink)

Type	Load Current	Line Voltage	Control Voltage	Ordering No.	Integrated Heatsink	Over-temp. Protection	Alarm Output
RJ3A Midi/ Power 	AC 51: 3x20A AC 53a: 3x15A	220 VAC	5 - 32 VDC	**RJ3A22D20**	MIDI	No	No
				RJ3A22D20EP		Yes	Yes
			24 - 275 VAC / 24 - 190 VDC	**RJ3A22A20E**		No	No
				RJ3A22A20EP		Yes	Yes
	AC 51: 3x25A AC 53a: 3x15A		5 - 32 VDC	**RJ3A22D25**	POWER	No	No
				RJ3A22D25EP		Yes	Yes
			24 - 275 VAC / 24 - 190 VDC	**RJ3A22A25E**		No	No
				RJ3A22A25EP		Yes	Yes
	AC 51: 3x32A AC 53a: 3x15A		5 - 32 VDC	**RJ3A22D32EP**	MIDI (+ fan)	Yes	Yes
			24 - 275 VAC / 24 - 190 VDC	**RJ3A22A32EP**		Yes	No
	AC 51: 3x20A AC 53a: 3x15A	600 VAC	5 - 32 VDC	**RJ3A60D20**	MIDI	No	No
				RJ3A60D20EP		Yes	Yes
			24 - 275 VAC / 24 - 190 VDC	**RJ3A60A20E**		No	No
				RJ3A60A20EP		Yes	Yes
	AC 51: 3x25A AC 53a: 3x15A		5 - 32 VDC	**RJ3A60D25**	POWER	No	No
				RJ3A60D25EP		Yes	Yes
			24 - 275 VAC / 24 - 190 VDC	**RJ3A60A25E**		No	No
				RJ3A60A25EP		Yes	Yes
	AC 51: 3x32A AC 53a: 3x15A		5 - 32 VDC	**RJ3A60D32EP**	MIDI (+ fan)	Yes	Yes
			24 - 275 VAC / 24 - 190 VDC	**RJ3A60A32EP**		Yes	No

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Type	Load Current	Line Voltage	Control Voltage	Ordering No.	Integrated Heatsink	Features
RJT3A Trio Midi/ Power 	AC 51: 3 x 20A AC 53a: 3 x 15A	230 VAC	5 - 32 VDC	**RJT3A23D20**	MIDI	• 3 independently switched poles • LED indication for control status of each pole • Opto-isolation > 4000 VAC
	AC 51: 3 x 25A AC 53a: 3 x 15A			**RJT3A23D25**	POWER	
	AC 51: 3 x 20A AC 53a: 3 x 15A	600 VAC		**RJT3A60D20**	MIDI	
	AC 51: 3 x 25A AC 53a: 3 x 15A			**RJT3A60D25**	POWER	

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1-Phase, 1-Pole switching (with integrated heatsink)

Type	Load Current	Line Voltage	Control Voltage	Ordering No.	Integrated Heatsink	Alarm Output
RN1A RN1B 	AC51 : 30 A AC53a : 6 A	230 VAC	24-230±15% VAC/DC	**RN1A23A30**	RHN 1	No
			5 - 32 VDC	**RN1A23D30**		
	AC51 : 50 A AC53a : 12 A		24-230±15% VAC/DC	**RN1A23A50**	RHN 2	
			5 - 32 VDC	**RN1A23D50**		
	AC51 : 63 A AC53a : 24 A		24-230±15% VAC/DC	**RN1A23A63**	RHN 2	
			5 - 32 VDC	**RN1A23D63**		
	AC51 : 30 A AC53a : 6 A	400/480 VAC	24-230±15% VAC/DC	**RN1A48A30**	RHN 1	
			5 - 32 VDC	**RN1A48D30**		
	AC51 : 50 A AC53a : 12 A		24-230±15% VAC/DC	**RN1A48A50**	RHN 2	
			5 - 32 VDC	**RN1A48D50**		
	AC51 : 63 A AC53a : 24 A		24-230±15% VAC/DC	**RN1A48A63**	RHN 2	
			5 - 32 VDC	**RN1A48D63**		

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1-Phase, 1-Pole switching (with integrated heatsink) (cont.)

Type	Load Current	Line Voltage	Control Voltage	Ordering No.	Integrated Heatsink	Alarm Output	Control Input
RN-S **System Monitoring** 	30 A	230 VAC	@ Vcc 20 - 32 VDC: 10 - 32 VDC	**RN1S23H30PO** **RN1S23H30PC** **RN1S23H30NO** **RN1S23H30NC**	RHN 1	PNP, NO PNP, NC NPN, NO NPN, NC	Active High
			@ Vcc 20 - 32 VDC: Vcc -10 V	**RN1S23L30PO** **RN1S23L30PC** **RN1S23L30NO** **RN1S23L30NC**		PNP, NO PNP, NC NPN, NO NPN, NC	Active Low
	50 A		@ Vcc 20 - 32 VDC: 10 - 32 VDC	**RN1S23H50PO** **RN1S23H50PC** **RN1S23H50NO** **RN1S23H50NC**	RHN 2	PNP, NO PNP, NC NPN, NO NPN, NC	Active High
			@ Vcc 20 - 32 VDC: Vcc - 10 V	**RN1S23L50PO** **RN1S23L50PC** **RN1S23L50NO** **RN1S23L50NC**		PNP, NO PNP, NC NPN, NO NPN, NC	Active Low
	30 A	400 VAC	@ Vcc = 20 - 32 VDC: 10 - 32 VDC	**RN1S40H30PO** **RN1S40H30PC** **RN1S40H30NO** **RN1S40H30NC**	RHN 1	PNP, NO PNP, NC NPN, NO NPN, NC	Active High
			@ Vcc = 20 - 32 VDC: Vcc -10 V	**RN1S40L30PO** **RN1S40L30PC** **RN1S40L30NO** **RN1S40L30NC**		PNP, NO PNP, NC NPN, NO NPN, NC	Active Low
	50 A		@ Vcc = 20 - 32 VDC: 10 - 32 VDC	**RN1S40H50PO** **RN1S40H50PC** **RN1S40H50NO** **RN1S40H50NC**	RHN 2	PNP, NO PNP, NC NPN, NO NPN, NC	Active High
			@ Vcc = 20 - 32 VDC: Vcc -10 V	**RN1S40L50PO** **RN1S40L50PC** **RN1S40L50NO** **RN1S40L50NC**		PNP, NO PNP, NC NPN, NO NPN, NC	Active Low
	30 A	480 VAC	@ Vcc = 20 - 32 VDC: 10 - 32 VDC	**RN1S48H30PO** **RN1S48H30PC** **RN1S48H30NO** **RN1S48H30NC**	RHN 1	PNP, NO PNP, NC NPN, NO NPN, NC	Active High
			@ Vcc = 20 - 32 VDC: Vcc -10 V	**RN1S48L30PO** **RN1S48L30PC** **RN1S48L30NO** **RN1S48L30NC**		PNP, NO PNP, NC NPN, NO NPN, NC	Active Low
	50 A		@ Vcc = 20 - 32 VDC: 10 - 32 VDC	**RN1S48H50PO** **RN1S48H50PC** **RN1S48H50NO** **RN1S48H50NC**	RHN 2	PNP, NO PNP, NC NPN, NO NPN, NC	Active High
			@ Vcc = 20 - 32 VDC: Vcc -10 V	**RN1S48L50PO** **RN1S48L50PC** **RN1S48L50NO** **RN1S48L50NC**		PNP, NO PNP, NC NPN, NO NPN, NC	Active Low

NO: Normally open
NC: Normally closed
Vcc: Supply voltage

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Type	Load Current	Line Voltage	Control Input	Ordering No.	Integrated Heatsink	Features
RN1F **Analog Full Cycle Switching** 	30A	120 VAC	4-20 mA	**RN1F12I30**	RHN 1	• Analog switching for resistive loads • LED indication for control status
	50A			**RN1F12I50**	RHN 2	
	30A		0-10 VDC	**RN1F12V30**	RHN 1	
	50A			**RN1F12V50**	RHN 2	
	30A	230 VAC	4-20 mA	**RN1F23I30**	RHN 1	
	50A			**RN1F23I50**	RHN 2	
	30A		0-10 VDC	**RN1F23V30**	RHN 1	
	50A			**RN1F23V50**	RHN 2	
	30A	480 VAC	4-20 mA	**RN1F48I30**	RHN 1	
	50A			**RN1F48I50**	RHN 2	
	30A		0-10 VDC	**RN1F48V30**	RHN 1	
	50A			**RN1F48V50**	RHN 2	

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Solid State Relays
Overview

2-/3-Phase, 2-Pole switching (with integrated heatsink)

Type	Load Current	Line Voltage	Control Input	Ordering No.	Integrated Heatsink	Features
RN2A **RN2B**  Page 2-167	AC51 : 2 x 15 A AC53a : 2 x 6 A	230 VAC	24-230±15% VAC/DC	**RN2A23A30**	RHN 1	• 2 independently switched poles • LED indication for each pole
			5 - 32 VDC	**RN2A23D30**		
	AC51 : 2 x 25 A AC53a : 2 x 12 A		24-230±15% VAC/DC	**RN2A23A50**	RHN 2	
			5 - 32 VDC	**RN2A23D50**		
	AC51 : 2 x 15 A AC53a : 2 x 6 A	400/480 VAC	24-230±15% VAC/DC	**RN2A48A30**	RHN 1	
			5 - 32 VDC	**RN2A48D30**		
	AC51 : 2 x 25 A AC53a : 2 x 12 A		24-230±15% VAC/DC	**RN2A48A50**	RHN 2	
			5 - 32 VDC	**RN2A48D50**		
RN2F **Analogue Full Cycle Switching**  Page 2-176	2 x 15 A	120 VAC	4-20 mA	**RN2F12I30**	RHN 1	• 2 pole analog switching for resistive loads • LED indication for control operation and alarm status
	2 x 25 A			**RN2F12I50**	RHN 2	
	2 x 15 A		0-10 VDC	**RN2F12V30**	RHN 1	
	2 x 25 A			**RN2F12V50**	RHN 2	
	2 x 15 A	230 VAC	4-20 mA	**RN2F23I30**	RHN 1	
	2 x 25 A			**RN2F23I50**	RHN 2	
	2 x 15 A		0-10 VDC	**RN2F23V30**	RHN 1	
	2 x 25 A			**RN2F23V50**	RHN 2	
	2 x 15 A	480 VAC	4-20 mA	**RN2F48I30**	RHN 1	
	2 x 25 A			**RN2F48I50**	RHN 2	
	2 x 15 A		0-10 VDC	**RN2F48V30**	RHN 1	
	2 x 25 A			**RN2F48V50**	RHN 2	
RN3A  Page 2-180	AC51 : 3 x 15 A AC53a: 3 x 12 A	220 VAC	5-32 VDC	**RN3A22D15**	RHN 1	• Analog switching for resistive loads • LED indication for control status
	AC51 : 3 x 30 A AC53a: 3 x 12 A			**RN3A22D30**	RHN 2	
	AC51 : 3 x 15 A AC53a: 3 x 12 A	400 VAC		**RN3A40D15**	RHN 1	
	AC51 : 3 x 30 A AC53a: 3 x 12 A			**RN3A40D30**	RHN 2	
	AC51 : 3 x 15 A AC53a: 3 x 12 A	480 VAC		**RN3A48D15**	RHN 1	
	AC51 : 3 x 30 A AC53a: 3 x 12 A			**RN3A48D30**	RHN 2	

Heatsink and Temperature Limit Switch

Type	Dimensions H x W x D (mm)	R_{th} T_{SW}	Ordering No.	Additional suffix for factory mounting	Features
RHS- Heatsinks	81 x 44 x 13.5	-	RHS00	H8	DIN Rail adapter
	82 x 105 x 20	5.0 K/W	RHS300	H1	Heatsink
	82 x 45 x 49	3.0 K/W	RHS100	H0	Heatsink
	103 x 45 x 55	2.7 K/W	RHS45C	H15	Heatsink
	103 x 45 x 81	2.0 K/W	RHS45B	H5	Heatsink
	103 x 90 x 80	1.35 K/W	RHS90A	H16	Heatsink
	103 x 112 x 80	1.1 K/W	RHS112A	H17	Heatsink
	83 x 118 x 96	0.8 K/W	RHS301	H2	Heatsink
	100 x 240 x 93	0.4 K/W	RHS320	H13	Heatsink
	141 x 122 x 121	-	RHS301F115	H9	Fan with mounting bracket
	141 x 122 x 121	-	RHS301F230	H11	Fan with mounting bracket
	154 x 122 x 125	0.25 K/W	RHS301F115C	H10	Heatsink + fan assembly
	154 x 122 x 125	0.25 K/W	RHS301F230C	H12	Heatsink + fan assembly
	103 x 22.5 x 37	3.7 K/W	RHS23A	H20	Heatsink for RX modules
	103 x 22.5 x 83	1.9 K/W	RHS23B	H21	Heatsink for RX modules
	100 x 100 x 38	1.2 K/W	RHS101		Heatsink
	200 x 300 x 40	0.3 K/W	RHS330		Heatsink for multiple SSRs
Page 5-4	For factory mounting of device to Carlo Gavazzi heatsink add suffix “Hx”. Example, model no. for RM1A23D25 mounted on RHS45C would be RM1A23D25H15.				
UP - Temperature Limit Switch	3 x 6.5 x 10	70°C	UP62-70	Fits all 3-phase Solid State Relays and Motor Controller Output Modules.	
		80°C	UP62-80		
Page 5-18		90°C	UP62-90		

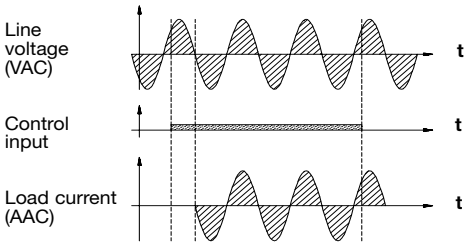
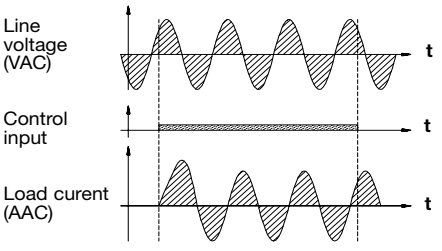
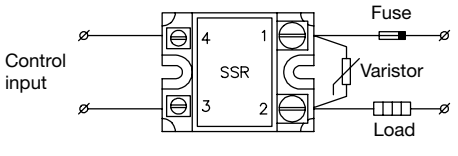
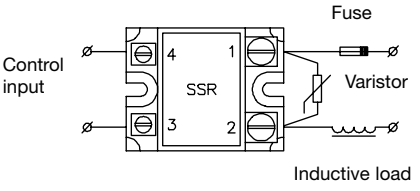
Solid State Relays
General Information

Types of SSRs

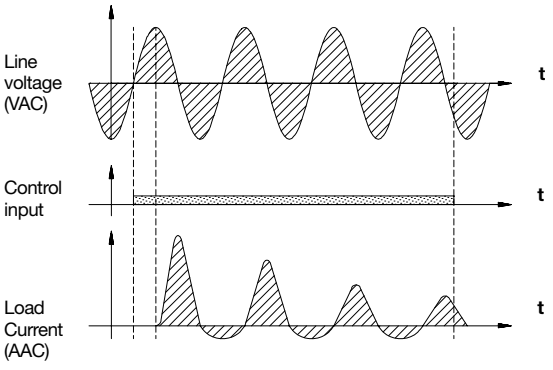
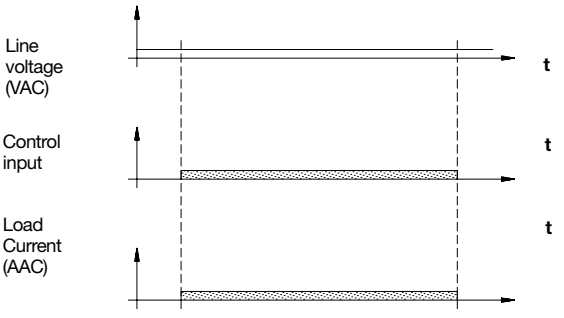
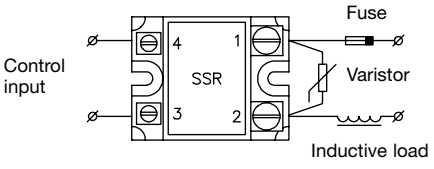
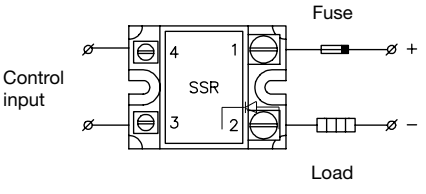
Control input
In most SSRs galvanic separation is achieved by optocouplers. These optocouplers, equipped with integrated trigger circuit (optotriac), provide the switching function required for the corresponding load type.

We distinguish between:

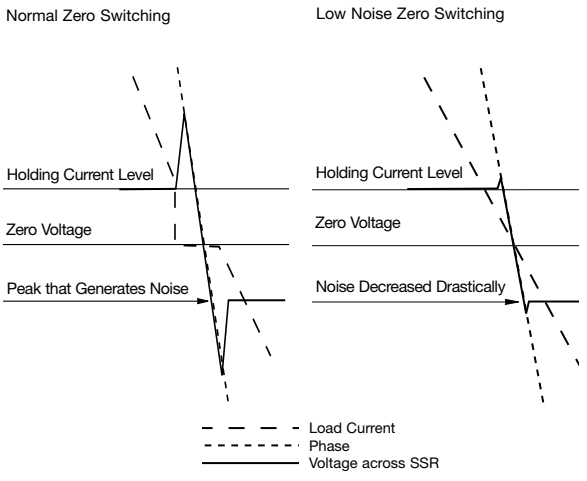
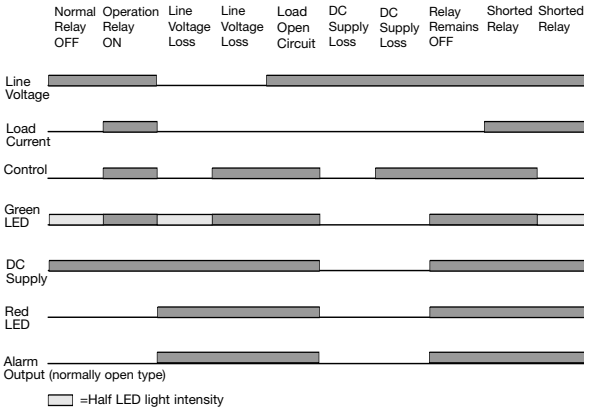
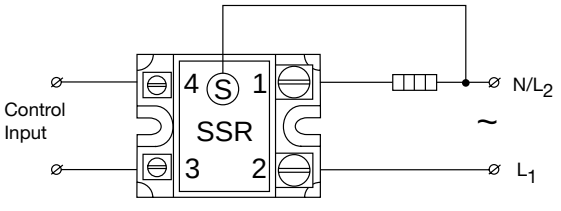
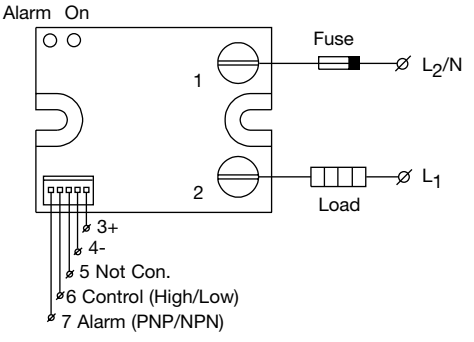
- ZS: Zero Switching
- IO: Instant-on Switching
- PS: Peak Switching
- AS: Analog Switching
- DCS: DC Switching
- FS: Full Cycle Switching

Type	**Zero Switching SSR (ZS)** For resistive, inductive or capacitive loads	**Instant-on Switching SSR (IO)** For inductive loads
Description	When applying the control voltage, the AC SSR output is activated at the first zero crossing of the line voltage. The response time is hereafter less than a halfperiod, i.e. typically below 10 ms at 50 Hz. ZS SSRs are employed in a host of applications with resistive loads (temperature control) and control of incandescent lamps. The ZS types are the most commonly used SSRs due to their extensive use with plastic moulding machines, packing machines, soldering machines as well as machines for the food processing industry. ZS SSRs are used in various applications, such as interfacing resistive loads or lighting installations. Due to high surge current- and blocking voltage capabilities, SSRs of this switching type will also perform successfully with most inductive and capacitive loads.	The SSR output is activated immediately after applying control voltage. Consequently, this relay can turn on anywhere along the AC sinusoidal voltage curve. The typical response time is thus less than 1 ms. (Relays equipped with reed contacts are inherently instant-on types.) This SSR is particularly suitable in applications where a fast response time or phase angle control is desired.
Function		
Application	 Note: For SSR without integrated voltage protection	

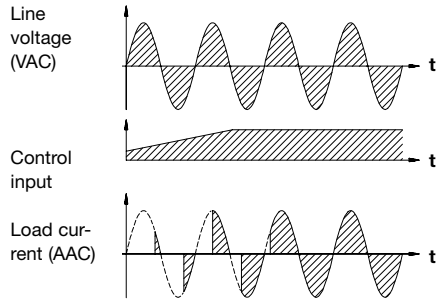
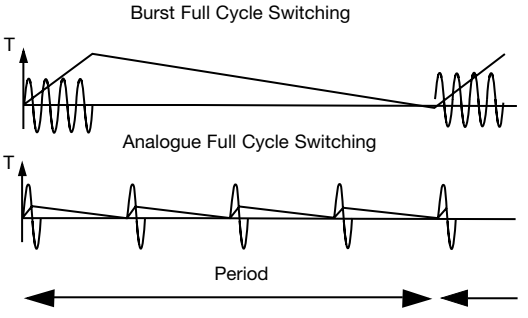
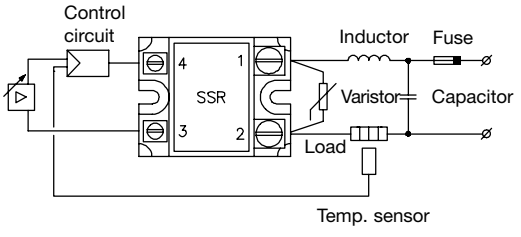
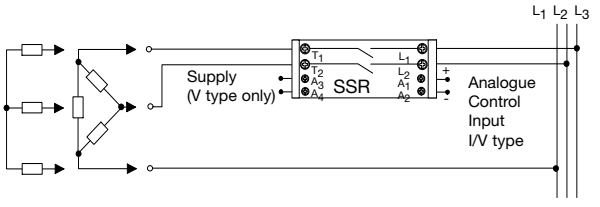
Types of SSRs (cont.)

Type	Peak Switching SSR (PS) For inductive loads with remanent iron core	DC Switching SSR (DCS) For resistive and inductive loads
Description	The peak switching SSR is designed in a way that the power output is activated at the first peak of the line voltage upon application of the control voltage. After the first half period the PS SSR operates as an ordinary ZS relay. The peak of the inrush current could hereafter be reduced during the first half-period for inductive loads.	The power semiconductor in the DC switching relay operates in accordance with the control input status. The response time is less than 100 µs. DCS SSRs are used with resistive and inductive loads for the control of DC motors and valves. When switching inductive loads it will be necessary to interconnect a free wheeling diode surplus voltage parallel to the load as protection.
Function		
Application		

Types of SSRs (cont.)

Type	Low Noise SSR (LN) For resistive and inductive loads	System Monitoring SSR (SM) For resistive and inductive loads
Description	The Low Noise SSR is designed for light industrial environments and fulfills the generic emission standard EN61000-6-3. By controlling the switching mode of the semiconductors, the peak level of the zero voltage turn-on is minimised, thus reducing the noise emitted by the SSR. Low Noise SSRs are particularly suitable for applications where electromagnetic noise must be limited to avoid interference with other equipment. In this kind of environment, noise generated by standard SSRs is considered critical or unsafe. Low noise SSRs can be used with both resistive and inductive loads.	The system monitoring (sense) SSR provides an alarm output in the event of a circuit failure. Internal circuits monitor: - line voltage - load current - correction functioning of the SSR - SSR input status. The relay is designed for applications where immediate fault detection is required. An alarm output signal is available to determine fault status.
Function		
Application		

Types of SSRs (cont.)

Type	Analog Switching SSR (AS) For resistive, inductive or capacitive loads	Full Cycle SSR (FC) For resistive loads
Description	Since the control input of the analog relay - according to specifications 4 to 20 mADC - can be varied, the output operates in accordance with the phase control principle. The relay is equipped with a built-in synchronization circuit in order to achieve phase angle control. The output is proportional to the input voltage or input current. The transfer function is linearized and reproducible. These SSRs are highly advantageous in closed loop applications or where soft starting can limit high inrush currents.	The Full Cycle SSR uses an analogue switching principle that provides a number of full cycles that are evenly distributed over a fixed time period. The number of cycles switched during the time period is directly proportional to the control input applied to the SSR. Since the full cycles are distributed, this SSR provides high accuracy in temperature control and creates less noise. Compared to conventional Burst control, the Full Cycle SSR reduces the stress on the load by limiting the band within which the load cycles.
Function		
Application		

Power output
Depending on the application, various questions concerning the power output of the SSR need to be clarified. The most important parameters are

- Line voltage (load voltage)
- Load current
- Type of load (application)

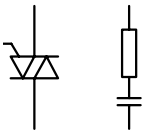
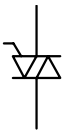
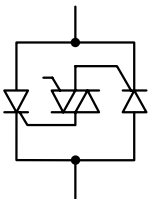
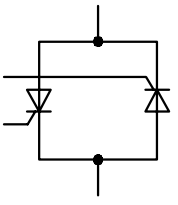
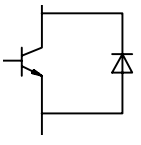
in order to be able to select the correct SSR. To avoid unnecessary maintenance expenses, the selection needs to be as accurate as possible.

Line voltage
The voltage range of an SSR must be selected according to the line voltage in the application. For the non-repetitive peak transient voltage of the SSR, both transients from the mains and voltage peaks from the application need to be considered.

A corresponding protective element like a freewheeling diode (only DC), a varistor or a snubber (RC) can be incorporated in order to protect the output semiconductor.

Load current
The relay must be selected in a way that the continuous load current in the application does not exceed the corresponding nominal value of the relay. It is important to take into consideration the continuous load current in relation to the ambient temperature. With inductive loads, such as motors, valves, etc., the SSR must be sized or selected according to the highest expected surge current.

Types of SSRs (cont.)

Load switching component	Symbol	Application
Triac The triac consists of two antiparallel thyristors mounted on the same chip in order to give full-wave operation at a single gate. A snubber is often mounted across the SSR in order to reduce the dV/dt.		The triac SSR is the most cost-effective solution in applications with low dV/dt demands, e.g. applications with heating elements with almost constant resistance.
Snubberless Triac The snubberless triac is a further development of the triac in which the two thyristors on the chip are well separated. Consequently, a higher dV/dt capability is achieved. In this way the internal snubber can be eliminated.		The snubberless triac proved itself in power electronics applications for several years. The elimination of the snubbers also reduces the leakage current in the switching circuit. The snubberless triac is common in resistive and inductive applications (up to 25 A) .
Alternistor The alternistor is developed especially for industrial use. The alternistor consists of two antiparallel thyristors and a gate triac integrated in the same chip. The thyristors are well separated. The triac will block uncontrolled turn-on during commutation.		The alternistor output is widely used in SSRs for resistive and inductive loads.
Thyristor (SCR) The antiparallel thyristor solution is most common for industrial SSRs. The solution requires two separate SCRs and two trigger circuits, which give optimum dV/dt capability.		The antiparallel SCR SSR is used for all load types, such as resistive, inductive and even capacitive loads. An SCR in a diode bridge is only used in PCB relays with load currents of less than 2 A.
Transistor The transistor option - often the open collector configuration - is used in the DC SSRs. A free-wheeling diode is normally mounted across the transistor to avoid damage from back-EMV from inductive loads.		The transistor is used for DC loads such as DC motors, solenoids or valves.

Advantages and Limitations

SSRs offer the user many outstanding features and should be treated as a separate class of relay. However, due to the design of SSRs, the user is always faced with a few limitations which are different from those of electromechanical relays (EMR). The following outline of advantages and limitations of SSRs will serve as a guide to the professional use of these devices.

Advantages

* Long life and high reliability - more than 10^9 operations
* No contact arcing, low EMI, high surge capability
* High resistance to shock and vibration
* High resistance to aggressive chemicals and dust
* No electromechanical noise
* Logic compatibility
* Fast switching
* Low coupling capacitance

Long life and high reliability
In SSRs from Carlo Gavazzi an optimized thermal design is achieved by applying the "Direct Copper Bonding" technology. This technology finally eliminates the thermal fatigue between chip (silicon) and terminals (copper). Furthermore, it reduces the thermal resistance between junction and ambient.

The DCB substrate, on which the chip is soldered, consists of a ceramic insulator (Al_2O_3) with a layer of copper (Cu) on both sides. The copper is bonded with the ceramic material in order to get similar thermal expansion conditions for both materials. Thereby the mechanical stress between silicon chip and copper will be minimized while the relay is in operation.

The ceramic material provides a 4 kV insulation between copper leads and heatsink. A lower temperature difference (ΔT) on the junction will increase the lifetime of the relay, and an increase of the switching frequency can help to achieve a more reliable application.

No contact arcing
No contact arcing will occur since switching takes place inside the semiconductor material, which changes from a non-conductor to a conductor at the signal of the control input. Line and load radiation are reduced considerably because the SCRs, alternistors or triacs are basically current latching devices, which will turn off as soon as the current is near zero. This is known as "zero crossing turn off". This greatly reduces the radiated electromagnetic interference (EMI), and this reduction of EMI is often well received by the equipment designers.

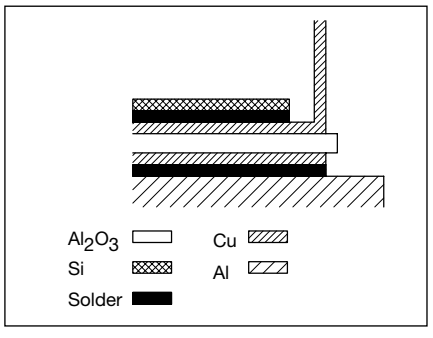
High resistance
SSRs with optocoupler inputs are fully embedded in the housing material and consequently, since no moving parts are used, they are highly resistant to vibrations and shock.

Advantages and Limitations (cont.)

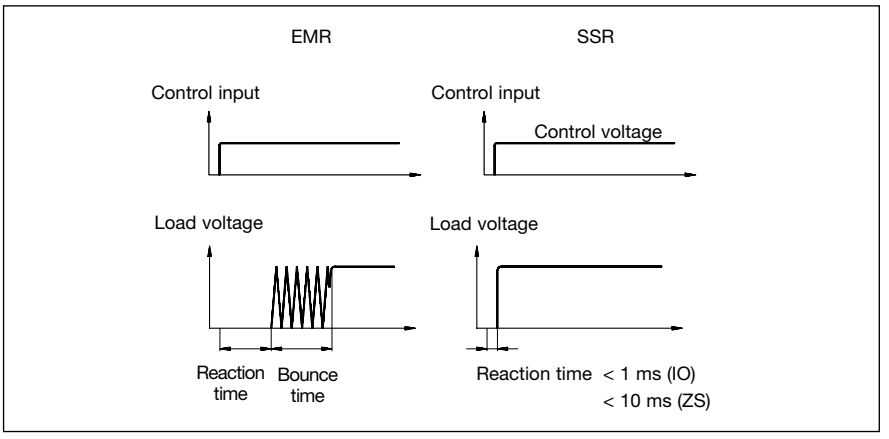
High resistance to aggressive chemicals and dust
Neither sand, dust nor aggressive chemicals can disrupt the trouble-free operation of a Solid State Relay.

No electromechanical noise
SSRs do not create mechanical noise since everything is controlled entirely electronically. In applications such as office machinery or in medical equipment this is for the benefit of the user.

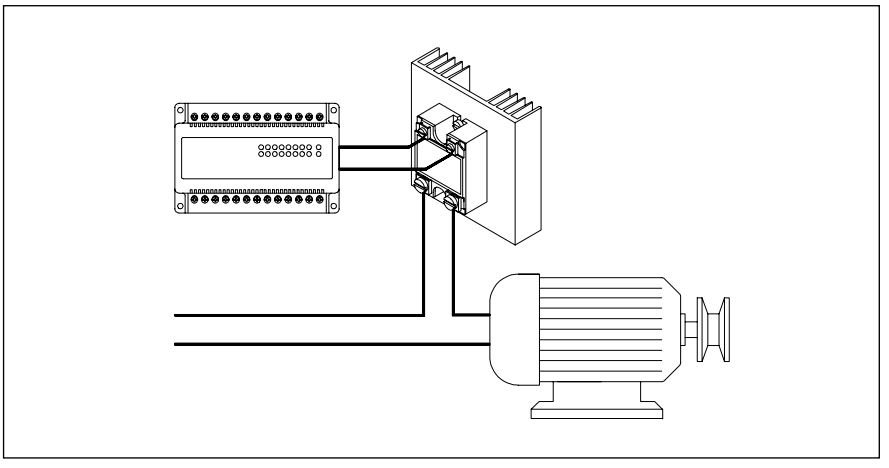
Logic compatibility
SSRs are available with input circuits which are directly compatible with logic components for CMOS, TTL, microprocessors or analog circuits.Logic compatibility is important since SSRs are often directly controlled by PLCs or other logic outputs. High-current SSRs can be driven with minimal currents of less than 10 mA @ 24 VDC.



The direct copper bonding technology



Switching characteristics of EMR and SSR



Logic compatibility to PC/PLC

Fast switching
Instant-on SSRs feature a turn-on time of less than 1 ms. This fast switching capability makes it possible to phase angle control the power output by means of an external control circuit. In the analog switching relay this function is already built-in.

Low coupling capacitance
The very low coupling capacitance between input and output of SSRs is inherent in the optocoupler used in most SSR designs. The resulting lower off-state leakage current is important in medical applications, office machinery, household appliances or in industrial applications.

Limitations

* Contact voltage drop
* Finite transient voltage resistance and dV/dt limitations
* Leakage currents and dI/dt limitations

Contact voltage drop
The contact voltage drop across the thyristor is usually 1 to 1.6 V. Voltage drop together with load current are basic figures for the calculation of the power losses. Excessive heat can easily destroy the power semiconductor. It is therefore indispensable to calculate the power dissipation and to use adequate heatsinking.

Finite transient voltage resistance
The AC mains contains all kinds of voltage spikes and transients. These transients may result from other components like motors, solenoids, switches, transformers or contactors - not to mention external sources such as lightning.

If overvoltage protection is not provided, the thyristors used in SSRs might exceed their breakdown voltage and will turn on for less than a halfperiod. The non-repetitive peak voltage is the maximum off-state voltage which the output switching device can withstand without switching on.

Whenever they are not built-in, varistors for transient voltage protection should be fitted across the output. The varistors must be rated for the line voltage in the application. The energy absorption of a disc varistor is always proportional to its size. Therefore it is recommended to use varistors with a diameter of minimum 14 mm for PCB SSRs and 20 mm relays for chassis mounting.

Limitations due to rapid voltage change
The junction of any semiconductor exhibits some capacitance. An alternating voltage imposes capacitance on this junction, which results in a current where $I = C \times dV/dt$.

If this current is sufficiently high, a regenerative action may occur causing the SCR to turn on. This regenerative action is similar to the gate turn-on.

The expression "dV/dt" defines a voltage change in relation to time. It is usually given in volts per microsecond (V/µs).

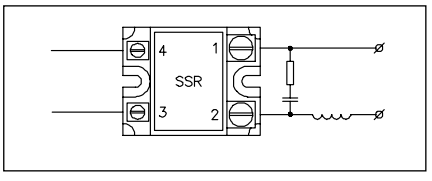
Advantages and Limitations (cont.)

Off-state dV/dt
The off-state dV/dt is the parameter defining the voltage rise capability of the SSR, i.e. the max. allowable rate of increase in voltage across the output terminals which will not switch on the SSR. Typically it lies within the range of 100 to 1000 V/µs.

Commutating dV/dt
The dV/dt is expressed in volts per microsecond (V/µs) and indicates the rate of voltage rise which the SSR output switching device can withstand without being turned on again as long as the load is off. The commutating dV/dt rating of an SSR is a measure of its ability to switch off an inductive load.

With the current crossing zero and turning off the load, the voltage rise across the output semiconductor could, due to too high dV/dt, immediately turn on the SSR (without applying control voltage). Consequently, with inductive loads, where the phase shift between current and voltage is large, the chance of an exceptional dV/dt value is very high.

Snubber
With a high load inductance, a very common method to eliminate random firing through interference, or spontaneous refiring through commutating dV/dt, is to connect an RC network, known as "snubber", across the SSR terminals. The capacitance (C) in conjunction with the impedance of the load attenuates the voltage waveforms transmitted via the mains or occuring when switching on an inductive load.



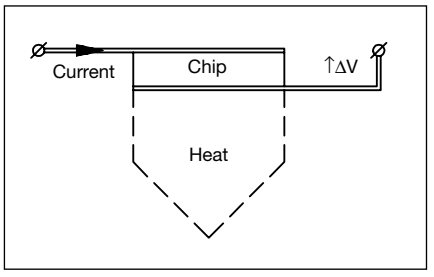
Snubber circuit

Standard values are:
R < 100 Ω, C < 0.22 µF.

Most of the modern SSRs from Carlo Gavazzi have such a high dV/dt capability that the snubber can be eliminated.

Off-state leakage current
SSRs always have off-state leakage currents. The thyristors, control circuitry and snubber network all supply small off-state currents, which usually total from about 1 to 10 mA rms.

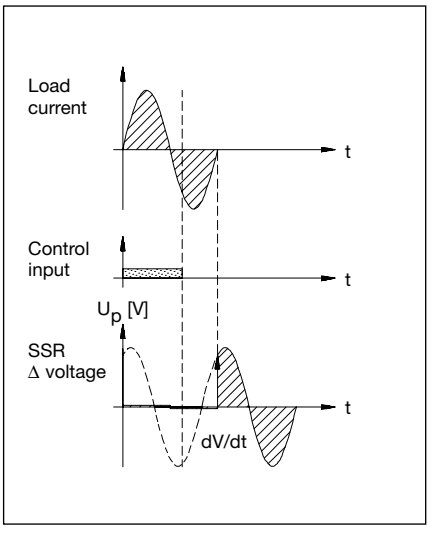
These leakage currents should be taken into account when either indicators are



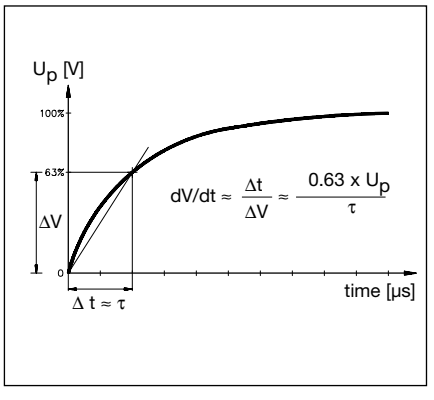
Heat dissipation from contact voltage drop

used, or the circuit may actually be touched, say for servicing. A resistor across the indicator and a line safety breaker are the standard means by which these limitations can be overcome.

dI/dt limitation
The rate of rise of current (dI/dt) is normally assumed to be low compared with the time required for the thyristor to reach full on-state conduction. In installations there is a certain amount of inductance which limits the rate of rise of current.



The dV/dt caused by phase shift



Rate of rise of voltage - the dV/dt

Remedies

In order to achieve proper function and a reliable application the user should consider:

1. A heatsink to remove the dissipated power

2. A varistor to protect against overvoltage transients

3. A fuse to limit current passing through the SSR thus resulting in:
a. short-circuit protection
b. overload protection

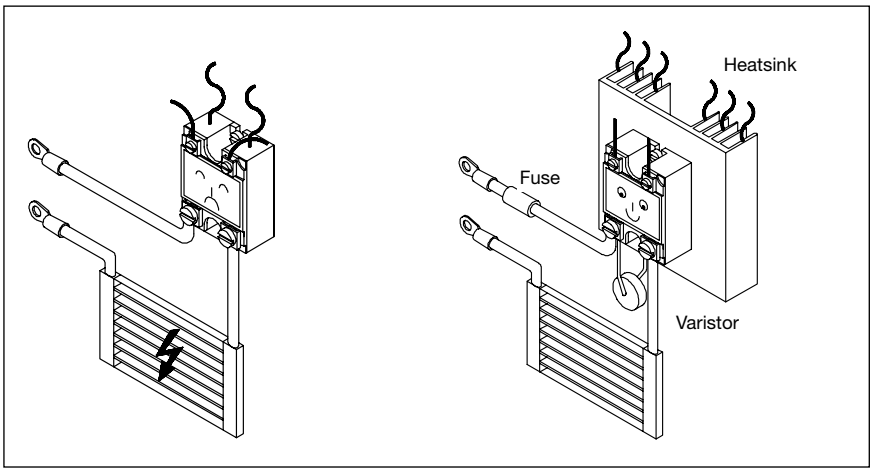
4. Self-induction in the system must be sufficiently high, in order to limit dI/dt.

5. A circuit breaker to disconnect mechanically the SSR application from the mains (safety measure).

Solid State Relays
General Information

Application

When looking for a relay to solve your switching application requirements, you should consider the advantages of SSRs and how to deal with the limitations.



When installed properly, the Solid State Relay will last millions of operations

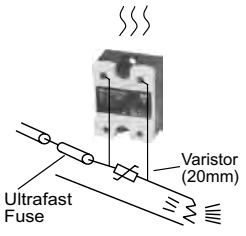
A. Heating systems
- Electric ovens
- Soldering systems
- Plastic processing systems
- Galvanic systems (electro-plating)
- Film developing systems
- Packaging industry
- Rubber industry
- Cooking systems

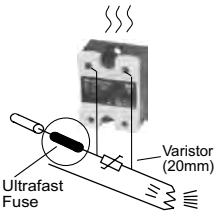
B. Optical equipment and systems
- Photocopiers
- Light equipment
- Traffic light controls

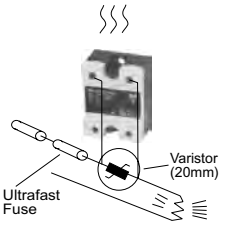
C. Electric motor drives
- Position control X-Y
- Valve positioning
- Soft starting, braking, reversing

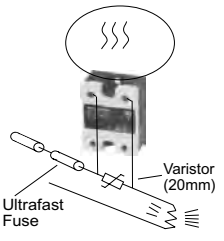
D. Transformer supply
- Welding equipment
- Light systems with transformer supply

Important matters to be observed when installing an SSR:









1. General Information

Load current, line voltage, ambient temperature and load type are crucial factors when using Solid State Relays. It is necessary to carry out a critical analysis of the application and perform proper calculations when using all Carlo Gavazzi Solid State Relay products.

2. Overload Protection

The relay must be protected against overload (short-circuit) by means of an external semiconductor fuse. Carlo Gavazzi provides the basic calculation to help you select the right fuse.

3. Voltage Transient Protection

Ideal protection is achieved through varistors (metal oxide varistors) mounted across the power semiconductor. The varistor voltage has to match with the line voltage in your application. Wrong selection can cause limited protection or a hazardous situation. On a number of models, the varistor is already mounted internally.

4. Overheat Protection

The relay must be protected effectively against excessive heat. Thermal stress will reduce the lifetime of your SSR drastically. Therefore it is necessary to choose the appropriate heatsinks, taking into account ambient temperature, load current and duty cycle. A thin film of thermally conducting compound will reduce the thermal resistance between the relay and the heatsink.

Solid State Relays
General Information

Glossary

Blocking voltage – The highest instantaneous value of the off-state voltage that the SSR can withstand without switching to the on-state.

Rated operational current – The maximum steady state load current that the SSR can control. In many cases external heatsinking is required in order to utilize maximum rated operational current. The correct utilization category rated value has to be selected as required by the application. Examples and definitions of utilization categories can be found in page 2-26 of this catalog.

Minimum operational current – The minimum load current required by the SSR for it to conduct properly.

Repetitive overload current – The maximum rms value of a current overload for time duration of maximum 1second.

Non-repetitive surge current I_{TSM}– On-state current pulse of short duration whose application would cause the maximum rated junction temperature to be exceeded, but which is assumed to occur rarely and with a limited number of such occurrences (10 pulses with a duration of 10ms per pulse and 15 seconds between each pulse application) during the service life of the device and to be a consequence of unusual circuit conditions (for example, a fault). If the absolute rating is exceeded, the device may be destroyed.

I^2t for fusing – The maximum thermal energy, expressed as ampere squared seconds that the SSR can tolerate for a half-period when protected by semiconductor fuses. In order to protect the SSR, the I^2t rating of a fuse must be lower than I_{TSM} (2/2 x tp, where tp is the total clearing time of the fuse.

Off-state leakage current – Current flowing through the load when the SSR is in the off-state. Parameter is specified at maximum load voltage.

On-state voltage drop – The RMS voltage across the SSR at rated load current.

Power factor – The power factor is cos ϕ, where ϕ is the phase angle between the current and the voltage in the load circuit, the factor is giving the active part of the power consumption. Cos ϕ is lagging unless otherwise stated and L (the inductive component) should not exceed 0.5H.

Critical dV/dt off-state – Highest value of the rate of rise of off-state voltage that will not cause switching of the SSR from the off-state to the on-state.

Control voltage range – The full range of input voltage within which the SSR can operate.

Pick-up voltage – The input voltage level at which the SSR is guaranteed to be in the on-state.

Drop-out voltage – The input voltage below which the SSR is guaranteed to be in the off-state.

Note: Sometimes it can be observed that the SSR can be in on or off state at levels other than stated for pick-up and drop-out. However, functionality and EMC performance at these levels is not guaranteed.

Reverse voltage – The maximum reverse polarity dc control voltage that can be applied to the SSR without damage to the control circuit.

Response time pick-up – The time from application of control voltage till the SSR turns fully on.

Response time drop-out – The time from removal of control voltage till the SSR turns off.

Operating temperature – The range of ambient temperature surrounding the SSR within which the SSR can operate.

Storage temperature – The temperature range to which the SSR can be exposed without electrical or mechanical damage.

Rated isolation voltage – The rms voltage that the SSR can withstand without breakdown. Also referred to as dielectric voltage.

Solid State Relays
General Information

Isolation

The rated isolation voltage is an indication of the dielectric strength of the insulation used in the equipment. EN 60947, VDE 0805 and UL 508 request verification by a test in which the insulation is subjected to a 50Hz or 60Hz essentially sinusoidal potential for 1 minute. The value of this potential is 1000V plus 2 x rated voltage of equipment.

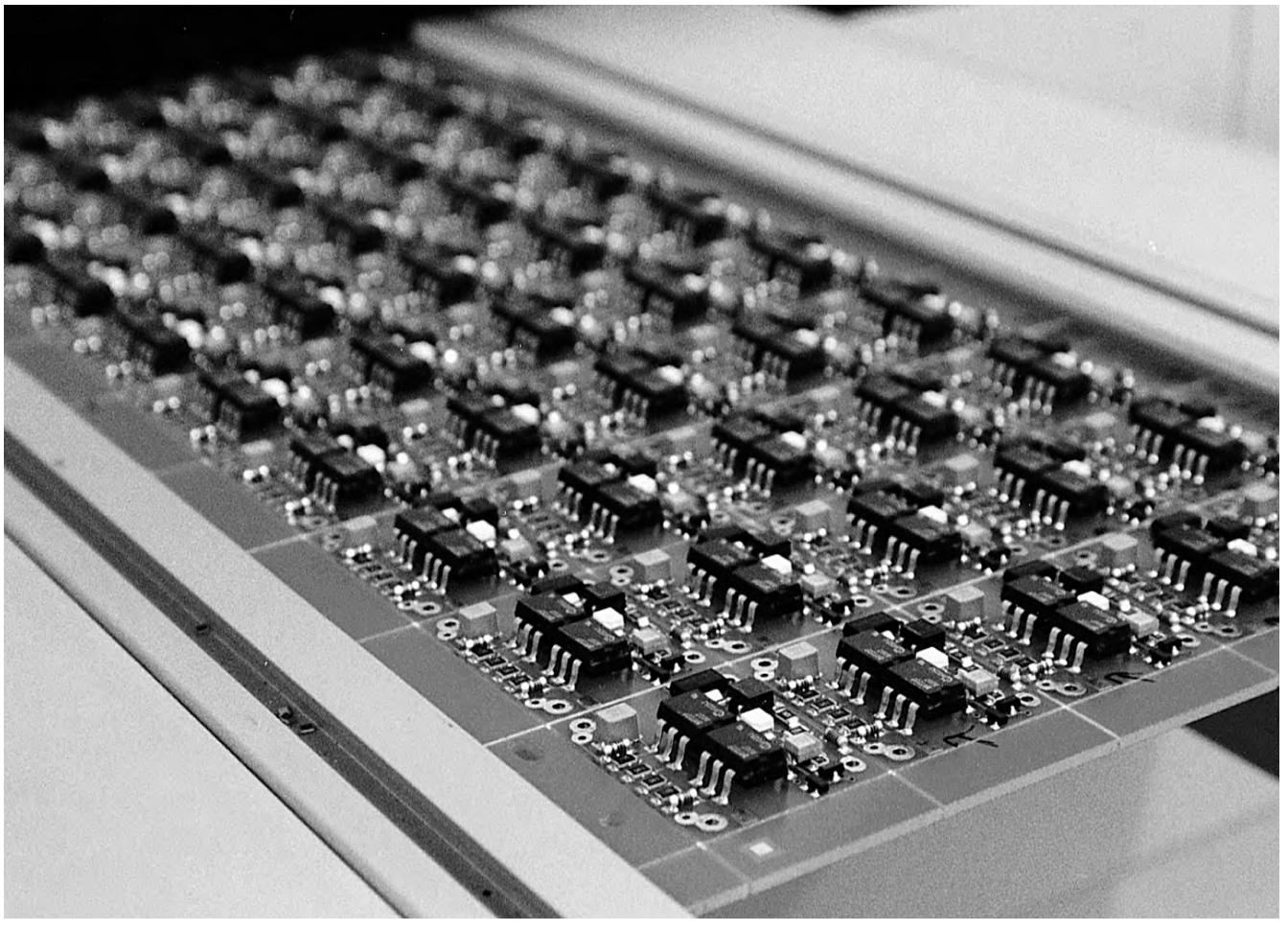
EN 50178, electronic equipment for use in power installations, require a test voltage between circuits and accessible surfaces (non conductive or conductive but not connected to protective earth) of nearly 4kVrms.

Protective earth connection (PE)
EN 60204-1, EN 60335-1 and other important international application standards require exposed conductive parts of equipment (parts which are not normally live, but can become live when insulation fails) to be connected to protective earth, PE. The connection betwen the earthing terminal or earthing contact and earthed metal parts shall have low resistance.

Electrical build-up
Safety regarding clearance, creepage and insulation barriers is based on the latest international coordination standards IEC 60664, 60664-1.

Isolation

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



Solid State Relays
General Information

General Specifications

General Specifications

Operational voltage range	24 to 280 VACrms
Blocking voltage	≥ 650 Vp
Zero voltage turn-on	≤ 20 V
Operational frequency range	45 to 65 Hz
Power factor	≥ 0.5
Approvals	CSA, UL, CUL VDE, TUV

Approvals
CSA, UL, CUL VDE, TUV

Standards
To ensure the widest possible scope of application in electrical equipment and machinery, Carlo Gavazzi's SSRs are designed in accordance with the following standards:

IEC/EN 60947-1, 60947-4-2,
60947-4-3, 60529, 60664-1, 60068-2
CSA C.22.2 No.14-05
UL 508, 840
VDE 0805, 0700

USA,
Underwriters Laboratories Inc.
(UL 508 & UL 840)

UL listed

UL listed to Canadian safety standards

UL listed to U.S. and Canadian safety standards

UL recognised component

UL recognised component to canadian safety requirements

UL recognised component to U.S. and Canadian Safety requirements

Canada, Canadian Standards Association
(C 22.2 No.14-05)

Germany, Verband der Elektronik Informationstechnik e.v.
(VDE 0805, 0700)

Germany, Rheinland/Berlin - Brandenburg
(VDE 0805, 0700)

Housing Specifications

Material
Housings and potting compound are UL-approved and flame, heat and impact resistant.

Housing Specifications

Weight	Approx. 110 g
Housing material	Noryl GFN 1, black
Base plate	Aluminium
Potting compound	Polyurethane
Relay	
Mounting screws	M5
Mounting torque	≤ 1.5 Nm
Control terminal	
Mounting screws	M3 x 6
Mounting torque	≤ 0.5 Nm
Power terminal	

Material
Housings: Noryl GFN 1
Potting compound:
Polyurethane.

Protection against electric shock
Terminal protection against direct contact.

Degree of protection (IEC 60529)
IP 00 Non-protected
IP 10 Back-of-hand protected
IP 20 Finger-protected

The technical specifications of the degree of protection are in accordance with IEC 60529 (IEC 60947-1).

Examples of utilisation categories for low-voltage switchgear and controlgear

Extract from EN 60947-1: 2004

Nature of current	Category	Typical applications	Relevant IEC product standard
A.C.	AC-1	Non-inductive or slightly inductive loads, resistance furnaces	60947-4-1
	AC-2	Slip-ring motors: starting, switching off	
	AC-3	Squirrel-cage motors: starting, switching off motors during running	
	AC-4	Squirrel-cage motors: starting, plugging[1], inching [2]	
	AC-5a	Switching of electric discharge lamp controls	
	AC-5b	Switching of incandescent lamps	
	AC-6a	Switching of transformers	
	AC-6b	Switching of capacitor banks	
	AC-8a	Hermetic refrigerant compressor motor control with manual resetting of overload releases	
	AC-8b	Hermetic refrigerant compressor motor control with automatic resetting of overload releases	
	AC-52a	Control of slip ring motor stators: 8h duty with on-load currents for start, acceleration, run	60947-4-2
	AC-52b	Control of slip ring motor stators: intermittent duty	
	AC-53a	Control of squirrel-cage motors: 8h duty with on-load currents for start, acceleration, run	
	AC-53b	Control of squirrel-cage motors: intermittent duty	
	AC-58a	Control of hermetic refrigerant compressor motors with automatic resetting of overload releases: 8h duty with on-load currents for start, acceleration, run	
	AC-58b	Control of hermetic refrigerant compressor motors with automatic resetting of overload releases: intermittent duty	
	AC-51	Non-inductive or slightly inductive loads, resistance furnaces	60947-4-3
	AC-55a	Switching of electrical discharge lamp controls	
	AC-55b	Switching of incandescent lamps	
	AC-56a	Switching of transformers	
	AC-56b	Switching of capacitor banks	
D.C.	DC-1	Non-inductive or slightly inductive loads, rsistance furnaces	60947-4-1
	DC-3	Shunt-motors, starting, plugging [1], inching [2]. Dynamic breaking of motors	
	DC-5	Series-motors, starting, plugging[1], inching [2]). Dynamic breaking of motors	
	DC-13	Control of electromagnets	60947-5-1

1) By plugging is understood stopping or reversing the motor rapidly by reversing motor primary connections while the motor is running.
2) By inching (jogging) is understood energizing a motor once or repeatedly for short periods to obtain small movements of the driven mechanism.

Solid State Relays
General Information

Standards

Carlo Gavazzi products are designed in accordance to both EN/IEC standards and various third party norms. Typical third party approval bodies are UL, CSA, VDE and TUV. Whereas the CE mark is self regulatory, the other approvals are governed by third party test labs.

CG products fall within the scope of the Low Voltage Directive for the purpose of CE marking. Conformance to harmonised standards under the LVD give presumption of conformity to the safety requirements of the LVD. The following is a list of harmonised standards which Carlo Gavazzi Solid State Relays are designerd in accordance with:

EN 60947-1	Low Voltage switchgear and controlgear. Part 1 – General Rules
EN 60947-4-1	Low Voltage switchgear and controlgear. Part 4 – Contactors and motor starters. Section 1 – Electromechanical contactors and motor starters.
EN 60947-4-2	Low Voltage switchgear and controlgear. Part 4 – Contactors and motor starters. Section 2 – AC semiconductor motor controllers and starters.
EN 60947-4-3	Low Voltage switchgear and controlgear. Part 4 – Contactors and motor starters. Section 3 – AC semiconductor motor controllers and starters for non-motor loads.
EN 60529	Degrees of protection provided by enclosures.
EN 60664-1	Insulation coordination for equipment within low voltage systems. Part 1 – Priciples, requirements and tests.
EN 60664-3	Insulation coordination for equipment within low voltage systems. Part 3 – Use of coatings to achieve insulation coordination of printed board assemblies.

Another CE marking directive that effects electrical products is the EMC Directive. But components such as Caro Gavazzi Solid State Relays, intended to be incorporated in another equipment and hence do not perform any direct function on their own, are outside the scope of the EMC directive. However, we still perform EMC testing on our products. The following is a list of EMC generic standards used:

EN 61000-6-3 (replaces EN50081-1)	EMC - Generic Emission Standard Part 3 : Residential, Commercial and Light Industrial Environments
EN 61000-6-4 (replaces EN50081-2)	EMC - Generic Emission Standard Part 4 : Industrial Environment
EN 61000-6-1 (replaces EN50082-1)	EMC Generic Immunity Standard Part 1 : Residential, Commercial and Light Industrial Environments
EN 61000-6-2 (replaces EN50082-2)	EMC - Generic Immunity Standard Part 2 : Industrial Environment

These generic EMC standards give a list of limits which products must reach when tested according to the various tests. These tests are done according to the following standards:

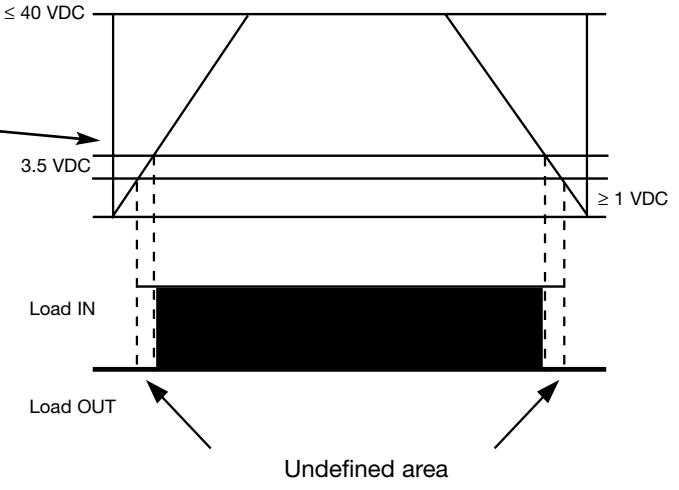
EN 61000-4-2	Electrostatic discharge immunity test
EN 61000-4-3	Radiated, radio-frequency, electromagnetic field immunity test
EN 61000-4-4	Electrical fast transient / burst immunity test
EN 61000-4-5	Surge immunity test
EN 61000-4-6	Immunity to conducted disturbances, induced by radio-frequency fields
EN 61000-4-11	Voltage dips, short interruptions and voltage variations immunity tests
EN 55011	Radiated and conducted electromagnetic emission for Industrial, Scientific and Medical radio-frequency equipment
EN 55022	Radiated and conducted electromagnetic emission for Information Technology equipment

Apart from the EN/IEC (standards), other third party approval bodies require the device to be constructed in accordance to their own norms. The UL approval requires the device to be according to UL508 (Industrial control equipment) and UL840 (Insulation Coordination including clearance and creepage distances for electrical equipment). The CSA approval require conformity to C22.2 No 14-05 (Industrial Control Equipment – Industrial Products). VDE and TUV approvals are given in accordance with EN 60950 (VDE 0805) – Safety of information technology equipment or EN 60335-1 (VDE 0700) – Safety of household and similar electrical appliances.

Control voltage

Input Specifications

Control voltage range	3.5 V to 40 VDC
Pick up voltage	≤ 3.5 VDC
Drop out voltage	≥ 1 VDC
Reverse voltage	≤ 0 VDC
Response time pick up	≤ 1/2 cycle
Response time drop out	≤ 1/
Input current (through current limit	



General Specifications

	RAP 40 A .	RA
Operational voltage range	10 V to 440 VAC_{rms}	20 V
Blocking voltage	≥ 1000 V	>
Zero voltage turn-on	≤ 20 V	
Operational frequency range	45 to 65 Hz	
Power factor	≥ 0.2	
Approvals	CSA, UL, VDE	

Operational voltage range
The voltage range within which correct operation by the SSR is possible (rms-value).

Blocking voltage
When this voltage limit is exceeded, the SSR will switch through without being triggered.

Solid State Relays
General Information

Heatsink Selection

The max. thermal resistance from the backplate of the SSR to ambient (R_{thSA}) is calculated for different current levels and different ambient temperature values.

These calculations are given in a chart as shown below (fig. 1). The table also includes the calculated power dissipation at a given nominal current.

Important notice:

Use silicone-based thermal grease between heatsink and SSR. If non-silicone thermal grease is used, you should check if the chemical replacing the silicone is harmful to the material used in the SSR housing. Recommended silicone-based types: Dow Corning.

RM....25

Load current [A]	Thermal resistance [K/W]					Power dissipation [W]	
25	2.70	2.34	1.98	1.61	1.25	0.89	28
22.5	3.10	2.69	2.28	1.86	1.45	1.04	24
20	3.61	3.13	2.65	2.18	1.70	1.23	21
17.5	4.26	3.70	3.14	2.59	2.03	1.47	18
15	5.14	4.47	3.80	3.14	2.47	1.80	15
12.5	6.38	5.56	4.73	3.91	3.09	2.27	12
10	8.25	7.19	6.14	5.08	4.02	2.97	9
7.5	11.4	9.94	8.49	7.04	5.59	4.14	7
5	17.7	15.4	13.2	11.0	8.74	6.51	4
2.5	-	-	-	-	18.2	13.6	2
	20	30	40	50	60	70	T_A
						Ambient temp. [°C]	

Fig. 1

Together with the calculation charts for the different SSR families the standard heatsinks of the Carlo Gavazzi product range are also given for easy selection:

Carlo Gavazzi Heatsink (see Accessories)	**Thermal resistance...**	**...for power dissipation**
No heatsink required	---	N/A
RHS 300	5.00 K/W	> 0 W
RHS 100	3.00 K/W	> 25 W
RHS 45C	2.70 K/W	> 60 W
RHS 45B	2.00 K/W	> 60 W
RHS 90A	1.35 K/W	> 60 W
RHS 45C plus fan	1.25 K/W	> 0 W
RHS 45B plus fan	1.20 K/W	> 0 W
RHS 112A	1.10 K/W	> 100 W
RHS 301	0.80 K/W	> 70 W
RHS 90A plus fan	0.45 K/W	> 0 W
RHS 112A plus fan	0.40 K/W	> 0 W
RHS 301 plus fan	0.25 K/W	> 0 W
Consult your distribution	> 0.25 K/W	N/A
Infinite heatsink - No solution	---	N/A

Fig. 2

Example:

Current = 20 A resistive load

$T_{ambient}$ = 50° C (measured in the panel when the system is running)

Selected relay: RM1A40D25

In the chart (fig. 1) the maximum thermal resistance for the heatsink is found to be 2.18 K/W.

In the heatsink selection table (fig. 2) the standard heatsink with the next lower thermal resistance is selected. This is RHS 45B with R_{thSA} = 2.00 K/W.

Thermal protection

For the 3-phase SSRs, e.g. the RZ3A..25, it is possible to mount a temperature limit switch, UP 62 -.., for thermal protection of the relay.

The charts for the 3-phase SSRs are calculated in such a way that the chip temperature lies within the specification. In order not to exceed these limitations one can easily mount a temperature switch (Klixon) at the back of the relay near the built-in heatsink.

The TLS can be ordered for three different temperature ranges. The standard selections are 70, 80 and 90°C.

Selection Guide

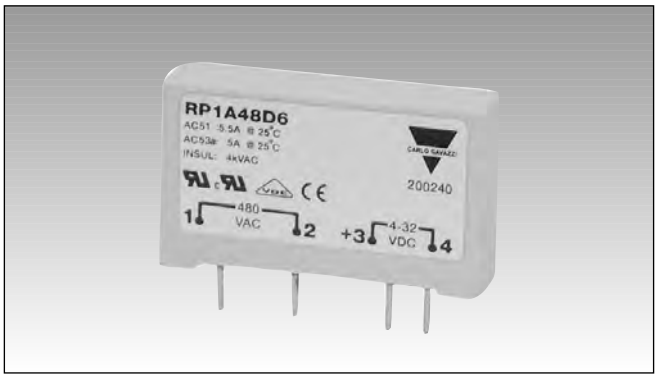
Application / Relay	Heater (resistive)	Lamp (resistive)	Lamp (Halogen)	1-phase Motor	3-phase Motor	Small Trans-former	Trans-former 1-ph/3-ph*	Contactor, Coil, Valve DC 13
PCB-mounting								
Switching mode	ZS	ZS	ZS	ZS (IO)	ZS (IO)	ZS (IO)	PS	ZS (IO)
3 A Triac	3 A	1.5 A		2 A	2 A	0.5 A		1.5 A
5 A Triac	5A	4A		3A	3A	0.8A		3A
5.5 A Triac	5.5A	4.5A		5A	5 A	0.8 A		3 A
5 A SCR - Alternistor	4 A	3A		3A	3A	0.8A		3A
Chassis mounting								
10 A Triac	8 A	5 A	2 A					
25 A Triac	16 A	10 A	4 A					
10 A SCR - antiparallel/ Alternistor	10 A	8 A	3 A	3 A	3 A			
25 A SCR - antiparallel/ Alternistor	25 A	15 A	6 A	5 A	6 A		10 A	
40 A Alternistor	40 A	25 A	12 A	12 A	10 A			
50 A SCR - antiparallel	50 A	30 A	15 A	15 A	12 A		20 A	
75 A antiparallel	75 A*	50 A	25 A	20A	24 A		25 A	
90 A SCR - antiparallel	90 A*	50 A	25 A	20 A	24 A			
100 A SCR antiparallel	100 A*	60 A	30 A	30 A	40 A		30 A	
110 A SCR - antiparallel	110 A*	60 A	30 A	30 A	40 A			
125 A SCR - antiparallel	125 A	60 A	30 A	30 A	40 A			

ZS: Zero switching
IO: Instant-on switching
PS: Peak switching

*Terminals designed for 63 A max.

Data for Ta_{max} = 25°C (77°F)

Solid State Relays
PCB, 1-Phase ZS/IO
Types RP1A, RP1B



- AC Solid State Relay for PCB mounting
- Zero switching or instant-on
- Rated operational current: 3, 5 or 5.5 AACrms
- Rated operational voltage: Up to 480 VACrms
- Surface mount technology
- Flexible encapsulation for extended life
- Control voltage: 3 to 32 VDC* / 16 to 32 VAC**
- Opto-isolation: > 4000 VACrms
- Blocking voltage: Up to 1000 V_p
- Non-repetitive surge current: Up to 250 A_p

Product Description

The RP1 is an SSR series for socket- or PCB-mounting, providing an ideal interface between logic controls and AC loads. The RP1 is designed for resistive and inductive loads up to 480VACrms. Two regulated control voltage ranges cover most standard input requirements in an economic package. These features allow a direct substitution of existing PCB mounted relays with RP1. Internally this new series enjoys an improved technical design with the introduction of stress-free flexible encapsulation and automated assembly of components. Opto-isolation and load switching are performed by individual components, providing higher reliability than monolithic designs. Additionally RP1..6 is a special version with high current surge capability that reduces fusing requirements. This relay can also drive higher AC53a loads up to 5 A. The Solid State technology used can withstand peak voltages of 1000V, making the RP1 series suitable to drive AC loads such as valve solenoids and small induction motors.

Ordering Key

RP 1 A 23 D 3

- **Solid State Relay (PCB)**
- **Number of poles**
- **Switching mode**
- **Rated operational voltage**
- **Control voltage**
- **Rated operational current**

Type Selection

Switching mode	Rated operational voltage	Rated operational current	Control voltage
A: Zero switching B: Instant-On switching	23: 230 VACrms 40: 400 VACrms 48: 480 VACrms	3: 3 AACrms 5: 5 AACrms 6: 5.5 AACrms	D: 3 to 32 VDC* A: 16 to 32 VAC** * 4 to 32 VDC for RP1A48.. 4 to 32 VDC for RP1B40.. and RP1B48.. ** Only available for 230V, 5.5 A

Selection Guide

Rated operational voltage	Non-rep. voltage	Control voltage	Rated operational current 3 AACrms	5 AACrms	5.5 AACrms
230 VACrms	650 Vp	3 to 32 VDC	**RP1A23D3** **RP1B23D3**	**RP1A23D5** **RP1B23D5**	**RP1A23D6** **RP1B23D6**
		16 to 32 VAC	-	-	**RP1A23A6**
400 VACrms	850 Vp	3 to 32 VDC	**RP1A40D3**	**RP1A40D5**	**RP1A40D6**
		4 to 32 VDC	**RP1B40D3**	**RP1B40D5**	**RP1B40D6**
480 VACrms	1000 Vp	4 to 32 VDC	**RP1A48D3** **RP1B48D3**	**RP1A48D5** **RP1B48D5**	**RP1A48D6** **RP1B48D6**

Selection Guide (mounted on DIN EN adaptor)

Rated operational voltage	Non-rep. voltage	Control voltage	Rated operational current 3 AACrms	5 AACrms	5.5 AACrms
230 VACrms	650 Vp	5 to 34 VDC	**RP1A23D3M1** **RP1B23D3M1**	**RP1A23D5M1** **RP1B23D5M1**	**RP1A23D6M1*** **RP1B23D6M1**
		16 to 32 VAC	-	-	**RP1A23A6M1**

* For operational voltages ≥ 230 VACrms add suffix M2 to part no.

General Specifications

	RP1.23..	RP1.40..	RP1.48..
Operational voltage range			
RP1A...	12 - 265 VACrms	20 - 440 VACrms	20 - 530 VACrms
RP1B...	12 - 265 VACrms	12 - 440 VACrms	12 - 530 VACrms
Blocking voltage	650 V_p	850 V_p	1000 V_p
Rated insulation input to output	4 kVACrms	4 kVACrms	4 kVACrms
Operational frequency range	45 - 65 Hz	45 - 65 Hz	45 - 65 Hz
Power factor	> 0.5	> 0.5	> 0.5
Zero voltage turn-on	< 10 V	< 10 V	< 10 V
Approvals	UL, cUL, VDE*	UL, cUL, VDE*	UL, cUL, VDE*
CE-marking	Yes	Yes	Yes

* VDE 0700, VDE 0805 (excluding RP1A23A6)

Input Specifications

	RP1...A.	RP1A23A6
Control voltage		16 - 32 VAC
RP1.23.. RP1A40..	3-32 VDC	-
RP1B40.. RP1.48..	4-32 VDC	-
Pick-up voltage		10 VAC
RP1.23.. RP1A40..	2.8 VDC	-
RP1B40.. RP1.48..	3.8 VDC	-
Drop-out voltage	1.2 VDC	5 VAC
Max. input curent		13 mAAC
RP1A...	10 mADC	-
RP1B...	15 mADC	-
Max. reverse voltage	32 VDC	-
Response time pick-up		
RP1A...	< 10 ms	-
RP1B... 12 VDC/ 50 Hz	< 160 µs	-
5 VDC/ 50 Hz	< 320 µs	-
Response time drop-out		< 20 ms
RP1A...	< 10 ms	-
RP1B...	< 10 ms	-

Output Specifications

	RP1....3	RP1....5	RP1....6
Rated operational current			
AC 51 @ T_a = 25°C	3 A	5 A	5.5 A
AC 53a @ T_a = 25°C	2 A	3 A	5 A
Min. operational load current	20 mA	20 mA	20 mA
Rep. overload current t=1 s	10 AACrms	12 AACrms	16 AACrms
Non-rep. surge current t=20 ms	65 A_p	80 A_p	250 A_p
Off-state leakage current	< 1 mA	< 1 mA	< 1 mA
I^2t for fusing t=10 ms	20 A^2s	50 A^2s	340 A^2s
Critical dV/dt off state min.	250 V/µs	500 V/µs	500 V/µs
On-state voltage drop @ rated current	< 1.2 Vrms	< 1.2 Vrms	< 1.2 Vrms

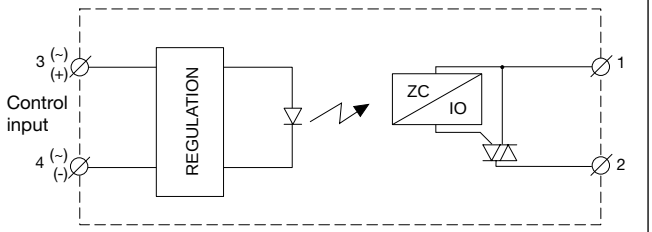
Thermal Specifications

Operating temperature	-20° to +70°C (-4° to +158°F)
Storage temperature	-40° to +100°C (-40° to +212°F)

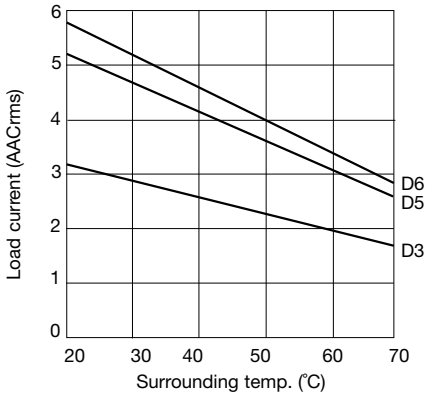
Insulation Input - Output

Insulation resistance	≥ 10^{10} Ω
Insulation capacitance	≤ 8 pF

Functional Diagram

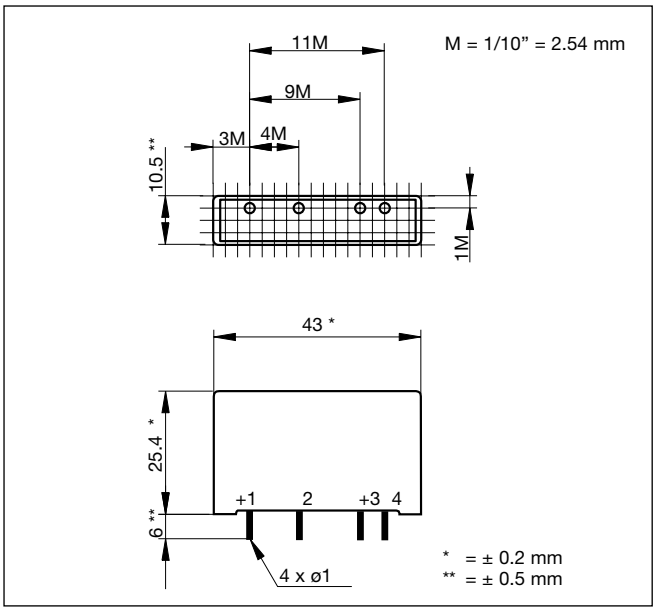


Derating Curve



Derating curve is used for finding max. load current at an elevated ambient temperature. The 3 lines in the graph represent the 3 nominal current ratings of the RP1 series (RP1...D3/D5/D6).

Dimensions



Applications

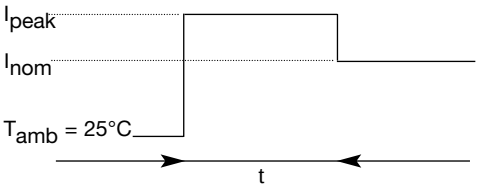
These relays can be used to switch heaters, motors, lights, valves or solenoids.

When used at full load current, the relays must be placed vertically. If more than one relay is mounted, please allow a minimum distance of 20 mm in between for sufficient air cooling.

Housing Specifications

Weight	Approx. 20 g
Housing material	PBT, grey
Terminals	Copper alloy, tin-plated
Terminals soldering temperature	max. 300°C for 5 sec.
Potting compound	Flame-retardant flexible silicone rubber

Increased Current Options



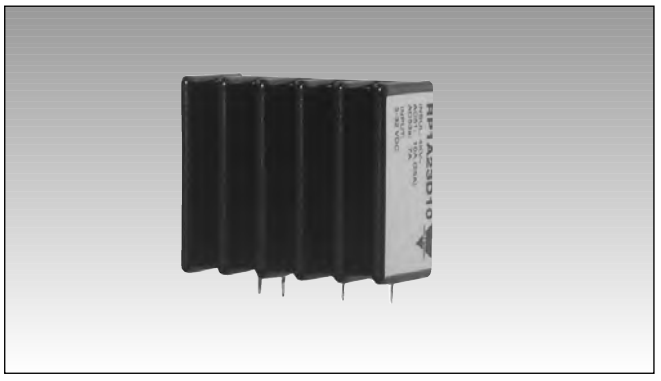
I peak (Amps)	6	8	10
D5 : t (minutes)	15	5	3
D6 : t (minutes	15	5	3

Note: Even though the D3 can withstand a slight increase in current for a limited time, it is not recommended for this purpose.

Accessories

M1 DIN-rail adaptor (photo)
M2 DIN-rail adaptor (for V > 230VAC)
Varistors
Fuses
For further information refer to "General Accessories".

Solid State Relays
PCB 1-Phase ZS/IO
Types RP1A..D10, RP1B..D10



- **AC Solid State Relay primarily for PCB mounting**
- **Zero switching or instant-on**
- **Rated operational current: 10 AACrms (25 AACrms with forced air cooling)**
- **Rated operational voltage: Up to 480 VACrms**
- **Surface mount technology**
- **Flexible encapsulation for extended life**
- **Control voltage: 4 to 32 VDC***
- **Opto-isolation: > 4000 VACrms**
- **Blocking voltage: up to 1000 V_p**
- **Non-repetitive surge current: up to 250 A_p**

Product Description

The RP1..D10 is a SSR series for socket or PCB-mounting, providing an ideal interface between logic controls and AC loads. The RP1..D10 is designed for resistive and inductive load switching up to 480VACrms. The integral heatsink allows switching of a high current in this compact package. Opto-isolation and load switching are performed by individual components, providing higher reliability. This relay can also drive high AC53a loads up to 7 AACrms. The Solid State technology used can withstand peak voltages of 1000V, making the RP1..D10 series suitable to drive AC loads such as loaded induction motors.

Ordering Key

RP 1 A 48 D 10

- **Solid State Relay (PCB)**
- **Number of poles**
- **Switching mode**
- **Rated operational voltage**
- **Control voltage**
- **Rated operational current**

Type Selection

Switching mode	Rated operational voltage	Rated operational current	Control voltage
A: Zero switching B: Instant-On switching	23: 230 VACrms 40: 400 VACrms 48: 480 VACrms	10: 10 AACrms	D: 4-32 VDC * 3-32 VDC for RP1.23D10

Selection Guide

Rated operational voltage	Blocking voltage	Control voltage	Rated operational current 10 AACrms
230 VACrms	650 V_p	3-32 VDC	**RP1A23D10**
400 VACrms	850 V_p	4-32 VDC	**RP1A40D10**
480 VACrms	1000 V_p		**RP1A48D10**

General Specifications

		RP1.23D10	RP1.40D10	RP1.48D10
Operational voltage range				
	RP1A	12-265 Vrms	20- 440 Vrms	20-530 Vrms
	RP1B	12-265 Vrms	12- 440 Vrms	12-530 Vrms
Blocking voltage		< 650 V_p	< 850 V_p	< 1000 V_p
Rated isolation input to output		4 kVArms	4 kVArms	4 kVArms
Operational frequency range		45 - 65 Hz	45 - 65 Hz	45 - 65 Hz
Power factor		> 0.5	> 0.5	> 0.5
Zero voltage turn-on		< 10 VACrms	< 10 VACrms	< 10 VACrms
Approvals		UL, cUL	UL, cUL	UL, cUL
CE-marking		Yes	Yes	Yes

Input Specifications

Control voltage DC	
RP1.23D10	3 - 32 VDC
RP1.40D10, RP1.48D10	4 - 32 VDC
Pick-up voltage	
RP1.23D10	2.8 VDC
RP1.40D10, RP1.48D10	3.8 VDC
Drop-out voltage	1.2 VDC
Reverse voltage	32 VDC
Max. input current	
RP1A..D10	10 mA
RP1B..D10	17 mA
Response time pick-up	
RP1A..D10	≤ 1/2 cycle
RP1A..D10 @ Vin ≥ 5VDC	≤ 200 µs
Response time drop-out	
RP1B..D10	≤ 1/2 cycle
RP1B..D10 @ Vin ≥ 5VDC	≤ 1/2 cycle

Output Specifications

Rated operational current	
AC51 @ Ta=25°C	10 AACrms
AC53a @ Ta=25°C	7 AACrms
Min. operational load current	10 mAACrms
Rep. overload current t=1 s	16 AACrms
Non-rep. surge current t=20 ms	250 A_p
Off-state leakage current @ rated voltage and frequency	< 3 mAACrms
I^2t for fusing t=10 ms	340 A^2s
Critical dV/dt off-state min.	1000 V/µs
On-state voltage drop max. @ rated current	< 1.5 VACrms

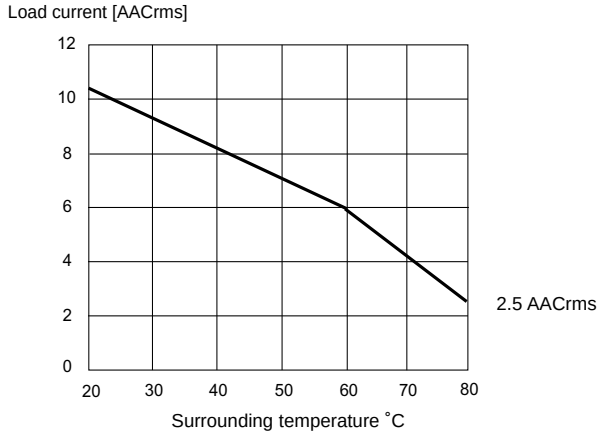
Thermal Specifications

Operating temperature	-30° to +80°C (-22° to +176° F)
Storage temperature	-40° to +100°C (-40° to +212°F)

Housing Specifications

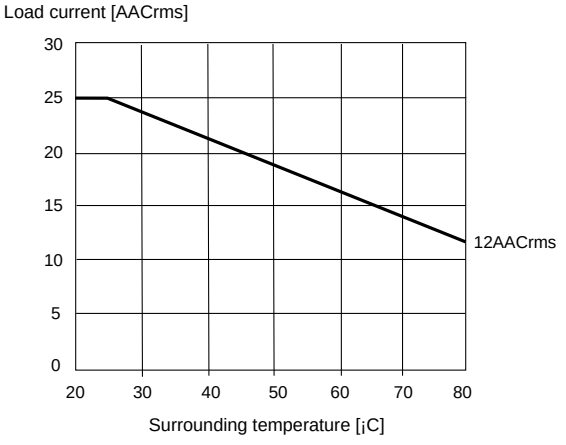
Weight	Approx. 40 g
Housing material	Black Epoxy coating
Terminals	Copper alloy, tin-plated
Terminals soldering temperature	max. 300°C for 5 sec.

Derating Curve (convection cooling)



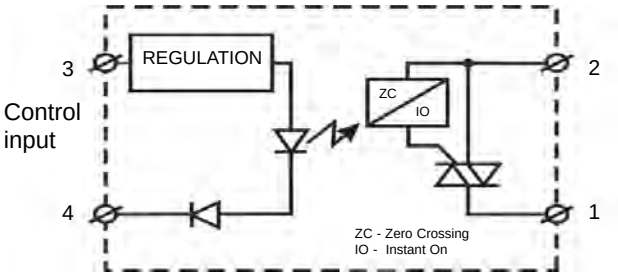
Derating curve is used for finding max. load current at an elevated ambient temperature.

Derating Curve (forced air cooling at 15m³/h)



Derating curve is used for finding max. load current at an elevated ambient temperature.

Functional Diagram

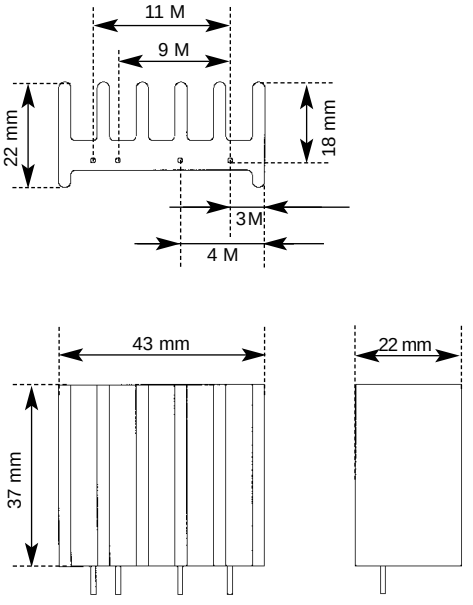


Applications

These relays can be used to switch heaters, motors, lights, valves or solenoids.

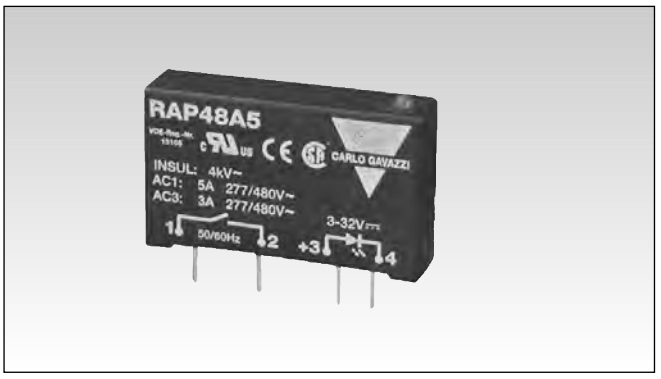
If more than one relay is mounted, please allow a minimum distance of 20 mm in between for sufficient air cooling.

Dimensions



M = 2.54 mm = 1/10 “

Solid State Relays
PCB, 1-Phase ZS
Types RAP 40 A ., RAP 48 A .



- **AC Solid State Relay for PCB mounting**
- **Zero switching**
- **Rated operational current: 3 or 5 AACrms**
- **Blocking voltage: Up to 1200 V_p**
- **Rated operational voltage: Up to 480 VACrms**
- **Input range: 3.5 to 40 VDC**
  4.5 to 40 VDC
- **Isolation: OPTO (input-output) 4000 VACrms**
- **LED status indication**
- **Low off-state leakage current**
- **High surge ratings**

Product Description

The RAP-series from Carlo Gavazzi is a Solid State Relay family for socket- or PCB-mounting. With built-in LED status indication for control input, the relay is an ideal interface between PLC's or other logic controls and load. The housing design and packing allows automatic insertion and soldering.

The relay has been designed to switch inductive or resistive loads as long as enough attention is paid to the specifications stated in this data sheet, e.g. max. current, ambient temperature etc.

The use of optotriacs for galvanic separation together with alternistors as output devices give the most advanced performance. Additional snubbers are no longer necessary. The zero switching relay also works with inductive loads due to its high surge capability. An internal heatsink optimizes the thermal resistance between chip and ambient air, thereby increasing the lifetime of the relay.

Ordering Key

RAP 48 A 5

- **Solid State Relay (PCB)**
- **Switching mode**
- **Mounting type**
- **Rated operational voltage**
- **Housing type**
- **Rated operational current**

Type Selection

Switching mode	Rated operational voltage	Rated operational current	Control voltage
A: Zero switching	40: 400 VACrms 48: 480 VACrms	3: 3 AACrms 5: 5 AACrms	3.5 to 40 VDC 4.5 to 40 VDC

Selection Guide

Rated operational voltage	Control voltage	Rated operational current 3 AACrms	5 AACrms
400 VACrms	3.5 to 40 VDC	**RAP 40 A 3**	**RAP 40 A 5**
480 VACrms	4.5 to 40 VDC	**RAP 48 A 3**	**RAP 48 A 5**

General Specifications

	RAP 40 A .	RAP 48 A .
Operational voltage range	10 to 440 VACrms	20 to 530 VACrms
Blocking voltage	≥ 1000 V_p	≥ 1200 V_p
Zero voltage turn-on	≤ 20 V	≤ 40 V
Operational frequency range	45 to 65 Hz	45 to 65 Hz
Power factor	≤ 0.2	≤ 0.2
Approvals	UL, CSA, VDE	UL, CSA, VDE
CE-marking	Yes	Yes

Input Specifications

	RAP 40 A .	RAP 48 A .
Control voltage range	3.5 to 40 VDC	4.5 to 40 VDC
Pick-up voltage	3.5 VDC	4.5 VDC
Drop-out voltage	1 VDC	2 VDC
Reverse voltage	6 VDC	6 VDC
Response time pick-up	≤ 1/2 cycle	≤ 1/2 cycle
Response time drop-out	≤ 1/2 cycle	≤ 1/2 cycle
Input current (through current limiter)	≤ 12 mA	≤ 12 mA

Output Specifications

	RAP 4.. A 3	RAP 4.. A 5
Rated operational current AC 51 AC 53a	3 AACrms 2.5 AACrms	5 AACrms 3 AACrms
Minimum operational current	20 mAACrms	20 mAACrms
Rep. overload current t=1 s	≤ 6 AACrms	≤ 12 AACrms
Non-rep. surge current t=20 ms	60 A_p	90 A_p
Off-state leakage current @ rated voltage and frequency	≤ 1 mAACrms	≤ 1 mAACrms
I^2t for fusing t= 10 ms	≤ 18 A^2s	≤ 40 A^2s
On-state voltage drop @ rated current	≤ 1.2 VACrms	≤ 1.2 VACrms
Critical dV/dt off-state	≥ 100 V/µs	≥ 100 V/µs

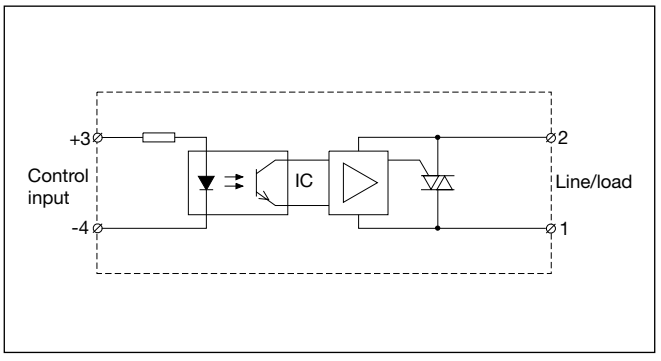
Thermal Specifications

	RAP .. A 3	RAP .. A 5
Operating temperature	-20° to +70°C (-4 to +158°F)	-20° to +70°C (-4 to +158°F)
Storage temperature	-40° to +100°C (-40° to +212°F)	-40° to +100°C (-40° to +212°F)
Junction temperature	≤ 125°C (257°F)	≤ 125°C (257°F)
R_{th} junction to case	≤ 20.5 K/W	≤ 15.6 K/W
R_{th} junction to ambient	≤ 33 K/W	≤ 21 K/W

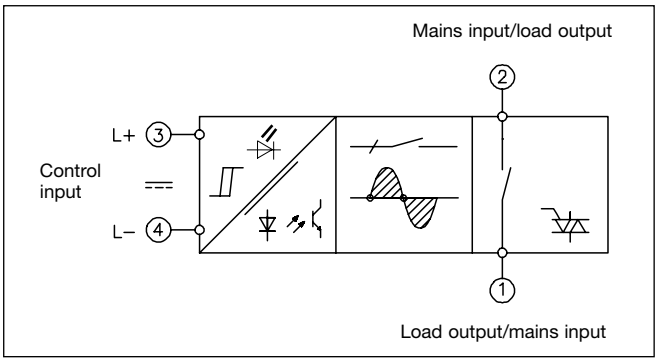
Insulation Input - Output

Rated isolation voltage	≥ 4000 VACrms
Insulation resistance	≥ 10^{10} Ω
Insulation capacitance	≤ 8 pF
Reference voltage according to VDE 01 10 B Insulation group C	500 VACrms, 600 VDC

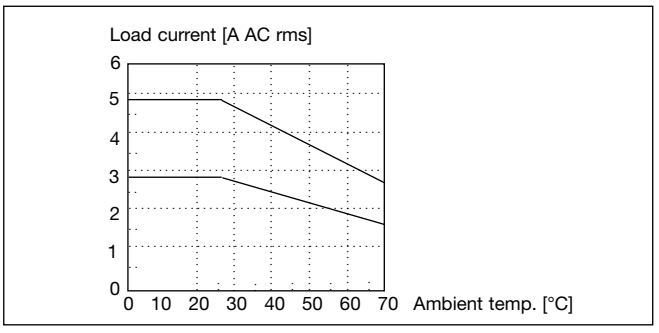
Wiring Diagram



Functional Diagram



Derating Curve



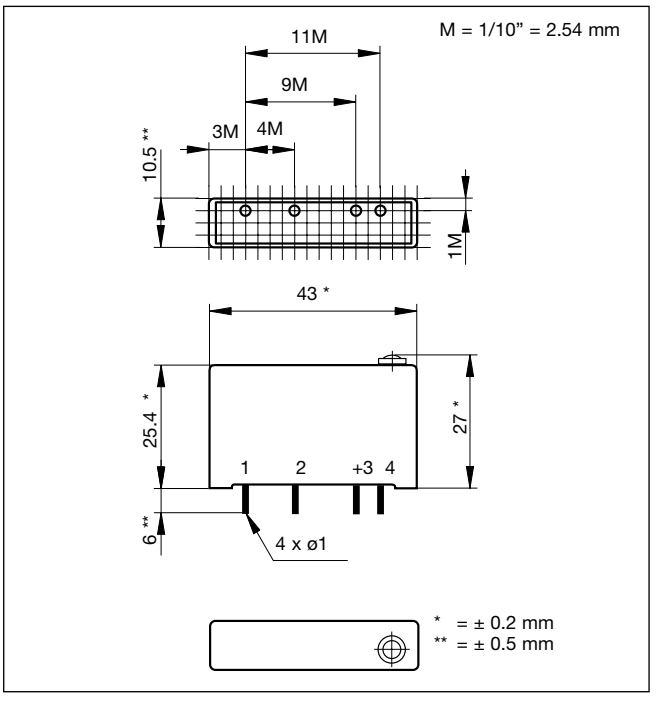
Applications

These relays can be used to switch heaters, motors, lights, valves or solenoids.
When used at full load cur-rent, the relays must be placed vertically. If more than one relay is mounted, please allow a minimum distance of 20 mm in between for sufficient air cooling.

Housing Specifications

Weight	Approx. 10 g
Housing material	Noryl GFN 1, black
Terminals	Copper, tin-plated
Terminals soldering temp.	max. 300°C for 5 sec.
Potting compound	Flame-retardant polyurethane

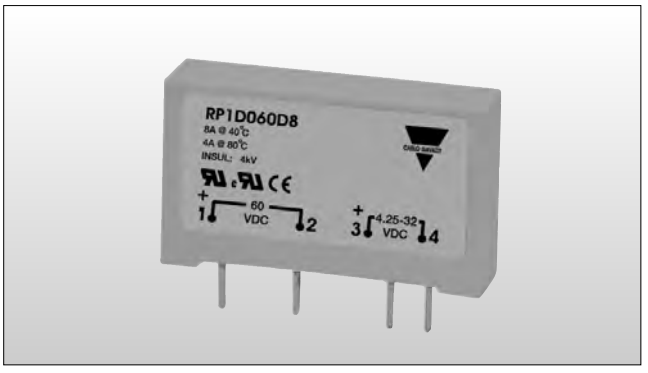
Dimensions



Accessories

Varistors
Fuses
For further information refer to “General Accessories”.

Solid State Relays
PCB, 1-Phase DCS
Type RP1D



- **DC Solid State Relay for PCB mounting**
- **Rated operational current: Up to 8 ADC**
- **Rated operational voltage: Up to 350 VDC**
- **Surface mount technology**
- **Flexible encapsulation for extended life**
- **Control voltage: 4.25 to 32 VDC**
- **Isolation (Input - Output): 4000 VACrms**

Product Description

The DC switching relay for PCB mounting is used in applications where there is a need for fast switching of small DC loads with a high input/output insulation of more than 4000 VACrms. The DC switching relay always switches on and off in accordance with the applied control voltage.

Ordering Key

RP 1 D 060 D 8

- **Solid State Relay (PCB)**
- **Number of poles**
- **Switching mode**
- **Rated operational voltage**
- **Control voltage**
- **Rated operational current**

Type Selection

Switching mode	Rated operational voltage	Control voltage	Rated operational current
D: DC switching	060: 60 VDC 350: 350 VDC	D: 4.25 to 32 VDC	1: 1 ADC 4: 4 ADC 8: 8 ADC

Selection Guide

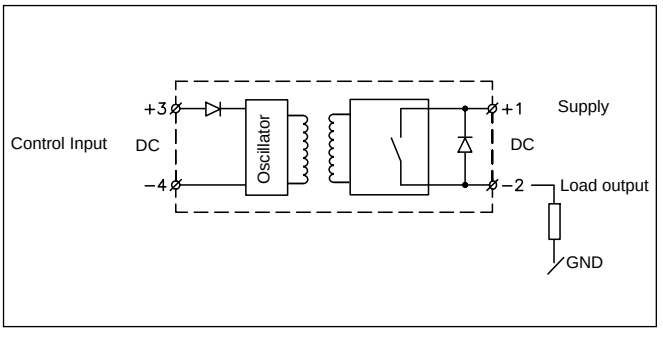
Rated operational voltage	Control voltage	Rated operational current 1 ADC	4 ADC	8ADC
60 VDC	4.25 to 32 VDC		**RP1D060D4***	**RP1D060D8***
350 VDC	4.25 to 32 VDC	**RP1D350D1****		

* add suffix 'M1' to part no. for DIN rail mountable module, example: RP1D060D4M1
** add suffix 'M2' to part no. for DIN rail mountable module, example: RP1D350D1M2

General Specifications

	RP1D060...	RP1D350...
Operational voltage range	1 to 60 VDC	1 to 350 VDC
Off-state blocking voltage	60 VDC	350 VDC
CE-marking	Yes	Yes
Approvals	UL, cUL	UL, cUL

Wiring Diagram



Housing Specifications

Weight	Approx. 20 g
Housing material	PBT, grey
Terminals	Copper alloy, tin-plated
Potting compound	Flame-retardant flexible silicone rubber

Thermal Specifications

Operating temperature	-20° to +80°C (-4° to +176°F)
Storage temperature	-40° to +100°C (-40° to +212°F)

Output Specifications

		RP1D350D1	RP1D060D4	RP1D060D8
Rated operational current @ Ta=40°C	DC1	1 ADC	4 ADC	8 ADC
	DC5	1 ADC	4 ADC	8 ADC
	DC13	1 ADC	4 ADC	8 ADC
Minimum operational current		1 mADC	1 mADC	1 mADC
Rep. overload current t=1 s		20 ADC	15 ADC	60 ADC
Off-state leakage current @ rated voltage		< 0.01 mADC	< 0.01 mADC	< 0.01 mADC
On-state voltage drop @ rated current		< 0.5 VDC	< 0.5 VDC	< 1.0 VDC

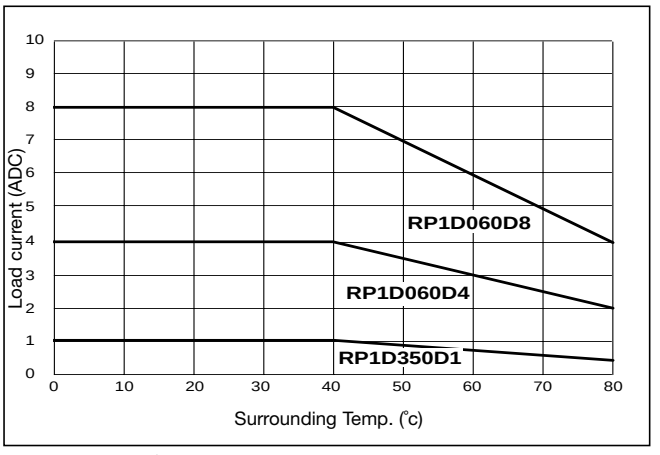
Input Specifications

Control voltage range	4.25 to 32 VDC
Pick-up voltage @ Ta=25°C	3.3 VDC
Drop-out voltage	1 VDC
Reverse voltage	32 VDC
Switching frequency	< 100 Hz
Response time pick-up @ Vin ≥ 5 VDC	< 100 µs
Response time drop-out @Vin ≤ 24 VDC max.	< 250 µs
Input current	15mA

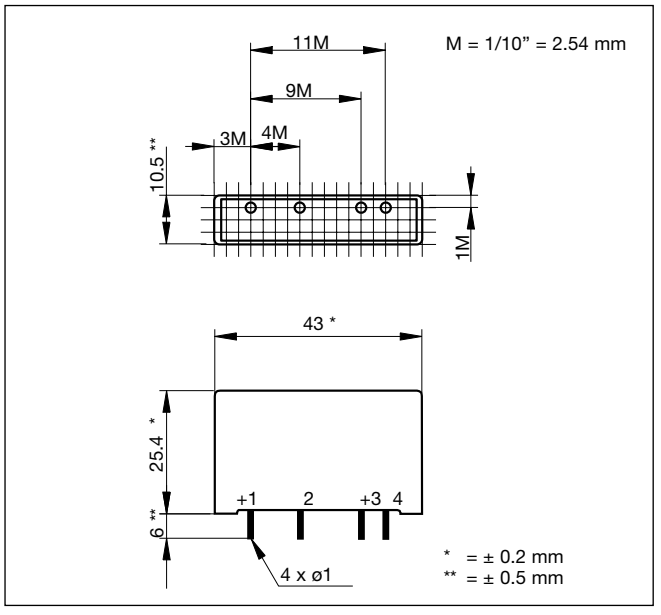
Isolation Input - Output

Rated isolation voltage	> 4000 VACrms

Derating Curve



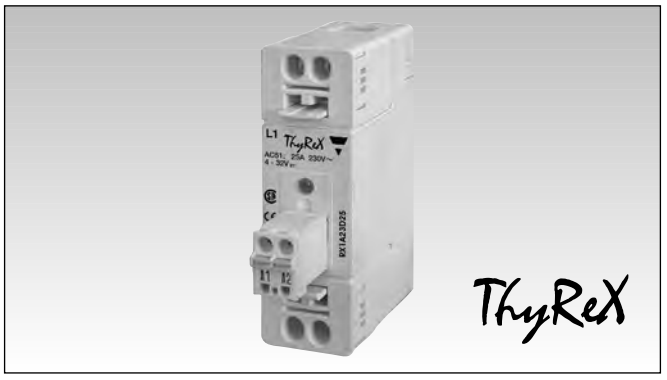
Dimensions



Accessories

M1 Din-rail adaptor (photo)
Fuses
For further information refer to "General Accessories".

Solid State Relays
Industrial, 1-Phase ZS, Fully Pluggable
Type RX1A



- **Zero switching (RX1A) AC Solid State Relay**
- **Direct copper bonding (DCB) technology**
- **LED indication**
- **IP 20 protection cover**
- **Screw, Spring or FASTON terminal options**
- **Housing free of moulding mass**
- **2 input ranges: 4-32 VDC and 24-275 VAC**
- **Operational ratings up to 50 AACrms and 480 VACrms**
- **Blocking voltage: Up to 1200 V_p**
- **Opto-isolation: > 4000 VACrms**
- **Integrated snubber network**

Product Description

The RX ThyReX is an extremely compact industrial SSR that is fully pluggable to make installation and servicing easy. This zero switching relay can be used for resistive and inductive loads. The position of the M4 mounting holes makes this solution interchangeable with standard hockey-puck relays. The control plug can have either screw or spring terminals. The power connection can be a screw type plug, a spring type plug or an open two-spade FASTON solution that comes with safety covers (no plugs). Both screw and spring type power plugs have a specially designed security leaver to lock/unlock. To facilitate assembly, the RX ThyReX can be ordered with its own thermal pad (optional).

Ordering Key

RX 1 A 48 D 50 M P HT

- **Solid State Relay**
- **Number of poles**
- **Switching mode**
- **Rated operational voltage**
- **Control voltage**
- **Rated operational current**
- **Control plug type**
- **Power plug type**
- **Options**

Type Selection

Switching mode	Rated operational voltage	Control voltage	Rated operational current	Control plug type	Power plug type	Options
A: Zero Switching	23: 230 VACrms 48: 480 VACrms	A: 24-275 VAC D: 4 - 32 VDC	25 : 25 AACrms 50 : 50 AACrms 51 : 50 AACrms*	M: Spring V: Screw	F: Faston C: Screw P: Spring	Blank: Basic HT: Thermal Pad H20: RHS23A** H21: RHS23B**

* High surge

** Add suffix 'H2x' to RX part no. for mounting of RX unit to heatsink type RHS23A or RHS23B. For such assemblies, attached derating curve should be consulted for appropriate selection of operational load current. Note that RX1A...25...H21 version is not available.

General Specifications

	RX1A23..	RX1A48..
Operational voltage range	24 to 265 VACrms	42 to 552 VACrms
Blocking voltage	≥ 650 V_p	≥ 1200 V_p
Zero voltage turn-on	≤ 10 V	≤ 10 V
Operational frequency range	45 to 65 Hz	45 to 65 Hz
Power factor	> 0.5 @ 230 VACrms	> 0.5 @ 480 VACrms
Pollution degree		
RX1A...D...	3	3
RX1A...A...	2	2
Approvals	UL, cUL, CSA	UL, cUL, CSA
CE-marking	Yes	Yes

Thermal Specifications

Operating temperature	-30° to +70°C (-22° to +158°F)
Storage temperature	-40° to +80°C (-40° to +176°F)
Junction temperature	≤ 125°C (257°F)

Isolation

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

Control Plug with Spring Terminals - Power Plug with Spring Terminals

Rated operational voltage	Non-rep. voltage	Control voltage	Rated operational current 25 A	50 A	50 A (high surge)
230 VACrms	650Vp	4-32 VDC	**RX1A23D25MP**	**RX1A23D50MP**	**RX1A23D51MP**
		24-275 VAC	**RX1A23A25MP**	**RX1A23A50MP**	**RX1A23A51MP**
480 VACrms	1200Vp	4-32 VDC	**RX1A48D25MP**	**RX1A48D50MP**	**RX1A48D51MP**
		24-275 VAC	**RX1A48A25MP**	**RX1A48A50MP**	**RX1A48A51MP**

Control Plug with Spring Terminals - Power Plug with Screw Terminals

Rated operational voltage	Non-rep. voltage	Control voltage	Rated operational current 25 A	50 A	50 A (high surge)
230 VACrms	650Vp	4-32 VDC	**RX1A23D25MC**	**RX1A23D50MC**	**RX1A23D51MC**
		24-275 VAC	**RX1A23A25MC**	**RX1A23A50MC**	**RX1A23A51MC**
480 VACrms	1200Vp	4-32 VDC	**RX1A48D25MC**	**RX1A48D50MC**	**RX1A48D51MC**
		24-275 VAC	**RX1A48A25MC**	**RX1A48A50MC**	**RX1A48A51MC**

Control Plug with Screw Terminals - Power Plug with Screw Terminals

Rated operational voltage	Non-rep. voltage	Control voltage	Rated operational current 25 A	50 A	50 A (high surge)
230 VACrms	650Vp	4-32 VDC	**RX1A23D25VC**	**RX1A23D50VC**	**RX1A23D51VC**
		24-275 VAC	**RX1A23A25VC**	**RX1A23A50VC**	**RX1A23A51VC**
480 VACrms	1200Vp	4-32 VDC	**RX1A48D25VC**	**RX1A48D50VC**	**RX1A48D51VC**
		24-275 VAC	**RX1A48A25VC**	**RX1A48A50VC**	**RX1A48A51VC**

Control Plug with Screw Terminals - Power Plug with Spring Terminals

Rated operational voltage	Non-rep. voltage	Control voltage	Rated operational current 25 A	50 A	50 A (high surge)
230 VACrms	650Vp	4-32 VDC	**RX1A23D25VP**	**RX1A23D50VP**	**RX1A23D51VP**
		24-275 VAC	**RX1A23A25VP**	**RX1A23A50VP**	**RX1A23A51VP**
480 VACrms	1200Vp	4-32 VDC	**RX1A48D25VP**	**RX1A48D50VP**	**RX1A48D51VP**
		24-275 VAC	**RX1A48A25VP**	**RX1A48A50VP**	**RX1A48A51VP**

Control Plug with Spring Terminals - Power: FASTON Terminals

Rated operational voltage	Non-rep. voltage	Control voltage	Rated operational current 25 A	50 A	50 A (high surge)
230 VACrms	650Vp	4-32 VDC	**RX1A23D25MF**	**RX1A23D50MF**	**RX1A23D51MF**
		24-275 VAC	**RX1A23A25MF**	**RX1A23A50MF**	**RX1A23A51MF**
480 VACrms	1200Vp	4-32 VDC	**RX1A48D25MF**	**RX1A48D50MF**	**RX1A48D51MF**
		24-275 VAC	**RX1A48A25MF**	**RX1A48A50MF**	**RX1A48A51MF**

Control Plug with Screw Terminals - Power: FASTON Terminals

Rated operational voltage	Non-rep. voltage	Control voltage	Rated operational current 25 A	50 A	50 A (high surge)
230 VACrms	650Vp	4-32 VDC	**RX1A23D25VF**	**RX1A23D50VF**	**RX1A23D51VF**
		24-275 VAC	**RX1A23A25VF**	**RX1A23A50VF**	**RX1A23A51VF**
480 VACrms	1200Vp	4-32 VDC	**RX1A48D25VF**	**RX1A48D50VF**	**RX1A48D51VF**
		24-275 VAC	**RX1A48A25VF**	**RX1A48A50VF**	**RX1A48A51VF**

Output Specifications

	RX1A...25...	RX1A...50...	RX1A...51... (high surge)
Rated operational current			
AC51 @ Ta=25°C	25 Arms	50 Arms	50 Arms
AC53a @ Ta=25°C	5 Arms	15 Arms	20 Arms
Min. operational current	150 mA	250 mA	400 mA
Rep. overload current	< 55 AACrms	< 125 AACrms	< 150 AACrms
Non-rep. surge current t=10 ms	325 A_p	600 A_p	1150 A_p
Off-state leakage current @ rated voltage and frequency	< 3 mArms	< 3 mArms	< 3 mArms
I^2t for fusing t= 10 ms	< 525 A^2s	< 1800 A^2s	< 6600 A^2s
On-state voltage drop	≤ 1.6 Vrms	≤ 1.6 Vrms	≤ 1.6 Vrms
Critical dV/dt off-state min.	500 V/µs	500 V/µs	500 V/µs

Housing Specifications

Weight	
without plugs	Approx. 64 g
with plugs	Approx. 86 g
Housing material	PA, grey
Baseplate	Aluminium
Control terminal (screw)	
Terminal tightening screws	M3
Max. terminal tightening torque	0.8 Nm with Philips bit
Min. cross-sectional area of cable (stranded)	1 x 0.05mm^2 (1 x AWG30)
Max. cross-sectional area of cable (stranded)	1 x 2.5mm^2 (1 x AWG12)or 2 x 1.5mm^2 (2 x AWG16)
Control terminal (spring)	
Insulation stripping length	10mm
Min. cross-sectional area of cable (stranded)	1 x 0.2mm^2 (1 x AWG24)
Max. cross-sectional area of cable (stranded)	1 x 2.5mm^2 (1 x AWG12)

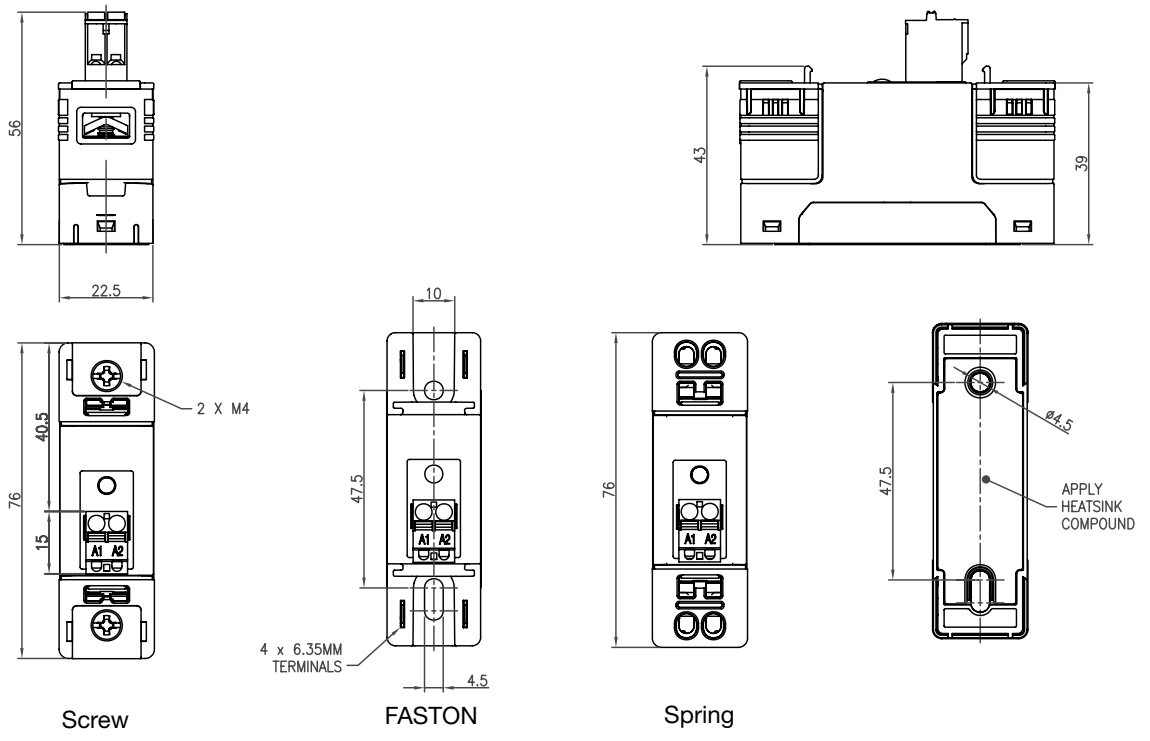
Power terminal (screw)	
Terminal screws	M4
Maximum tightening torque	2 Nm with Posidriv 2 bit
Min. cross-sectional area of cable with bootlace ferrule	1 x 1.5mm^2 (1 x AWG16)
Max. cross-sectional area of cable with bootlace ferrule	1 x 6.0mm^2 (1 x AWG10) or 2 x 6.0mm^2 (2 x AWG10)
Ring terminal, max. outer diameter	10mm
Power terminal (spring)	
Insulation stripping length	13mm
Min. cross-sectional area of cable (stranded)	1 x 0.5mm^2 (1 x AWG20)
Max. cross-sectional area of cable (stranded)	2 x 6.0mm^2 (2 x AWG10)
Power terminal (FASTON)	
FASTON terminal size	6.3 x 0.8mm
Max. allowable relative humidity (no moisture condensation)	95%
Mounting	
Mounting screws	M4
Mounting torque	1.5 Nm

Input Specifications

	RX1A...D...	RX1A...A...
Control voltage range	4-32 VDC	24 - 275 VAC
Pick-up voltage	3.5 VDC	18 VAC
Reverse voltage	32 VDC	-
Drop out voltage	1.2 VDC	6 VAC
Input current @ max input voltage	≤ 12 mA	-
RMS input current	-	≤ 36 mA
Avarege rectified input current	-	≤ 12 mA
Response time pick-up	≤ 10 ms	≤ 20 ms
Response time drop-out	≤ 10 ms	≤ 70 ms

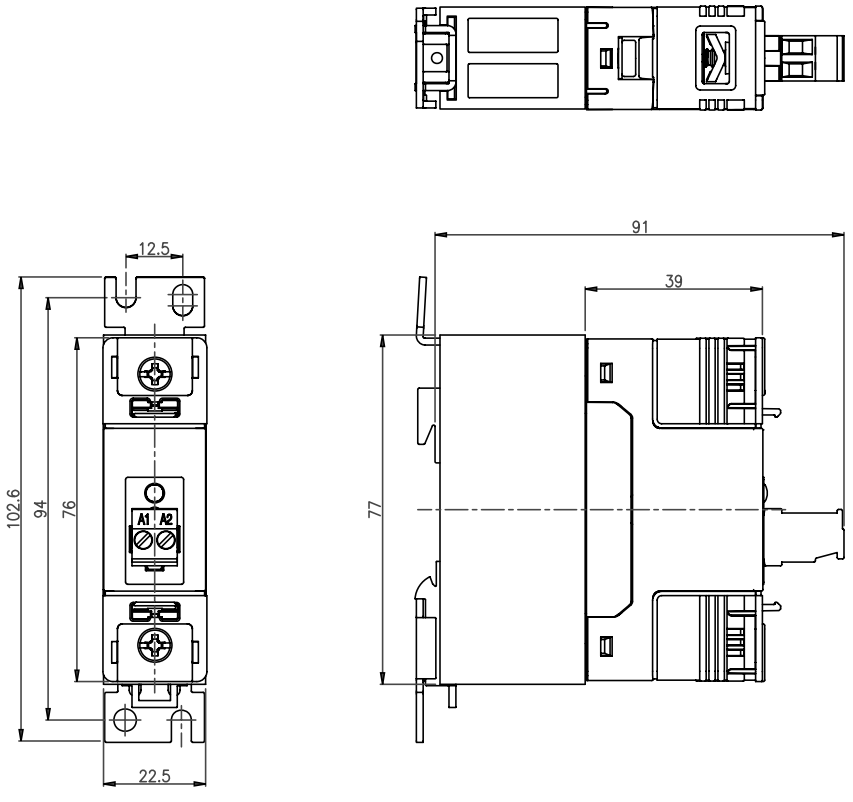
Data specified @ Ta=25°C

Dimensions



All dimensions in mm

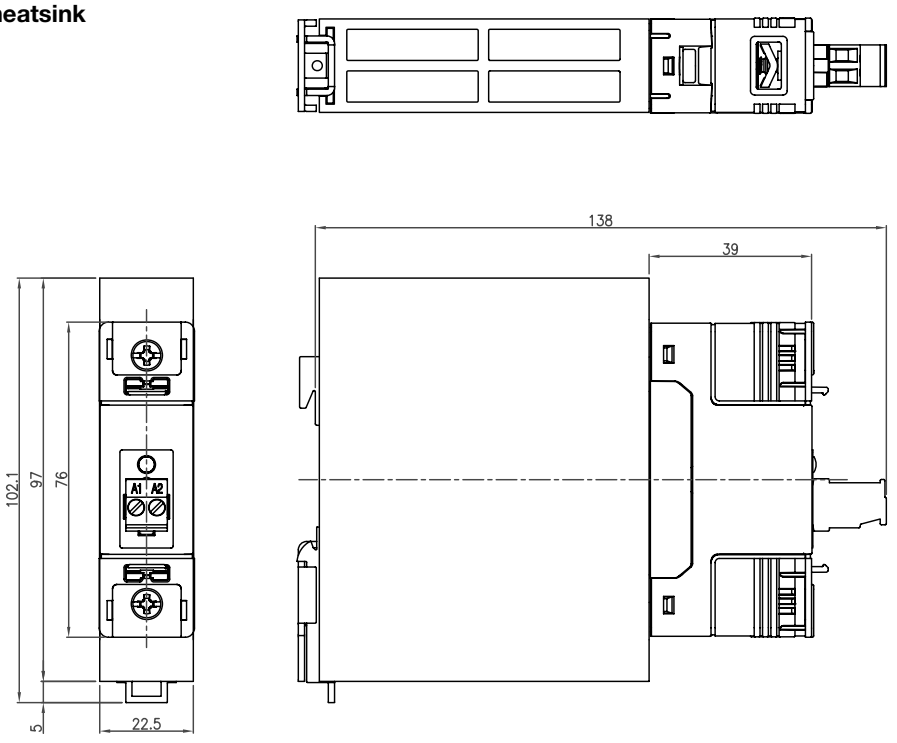
RX1A on RHS23A heatsink



All dimensions in mm

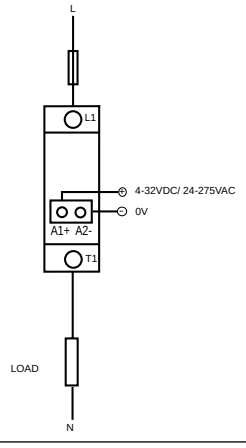
Dimensions (cont.)

RX1A on RHS23B heatsink

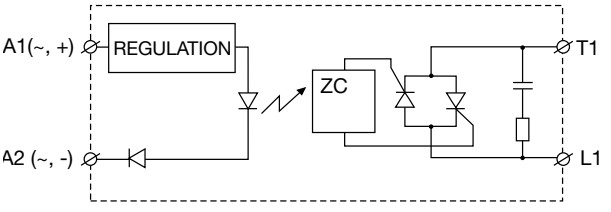


All dimensions in mm

Wiring Diagram



Functional Diagram



Accessories

RX1A....25, RX1A....50, RX1A....51	Main module without input or output plugs
RCV25	Packet of 20 input plugs with screw terminals
RCM25	Packet of 20 input plugs with spring terminals
RPC60	Packet of 10 output plugs with screw terminals
RPP60	Packet of 10 output plugs with spring terminals
RPFCAP	Packet of 10 FASTON touch protection covers

Heatsink Dimensions (load current versus ambient temperature)

RX1A...25

Load Current (A)	Thermal Resistance [K/W]						Power Dissipation (W)
25.0	1.61	1.30	0.98	0.51	0.05	-	**32**
22.5	2.10	1.74	1.38	0.87	0.33	-	**28**
20.0	2.73	2.31	1.89	1.33	0.68	0.06	**24**
17.5	3.55	3.05	2.56	1.95	1.16	0.41	**20**
15.0	4.66	4.06	3.46	2.83	1.83	0.89	**17**
12.5	6.24	5.49	4.74	3.98	2.83	1.59	**13**
10.0	8.65	7.67	6.68	5.70	4.46	2.72	**10**
7.5	12.7	11.3	9.97	8.60	7.23	4.79	**7**
5.0	-	18.8	16.6	14.5	12.3	9.8	**5**
2.5	-	-	-	-	-	-	**2**
	20	**30**	**40**	**50**	**60**	**70**	

Surrounding Ambient temperature (°C)

RX1A...50

Load Current (A)	Thermal Resistance [K/W]						Power Dissipation (W)
50	0.99	0.74	0.49	0.25	-	-	**66**
45	1.25	0.96	0.68	0.39	0.11	-	**58**
40	1.59	1.25	0.91	1.58	0.25	-	**50**
35	2.04	1.63	1.22	0.82	0.43	0.04	**42**
30	3.08	2.65	2.15	1.65	1.16	0.68	**35**
25	4.01	3.56	2.9	2.26	1.64	1.03	**28**
20	5.42	4.84	4.09	3.22	2.39	1.58	**21**
15	7.8	6.99	6.18	4.93	3.7	2.52	**15**
10	12.6	11.3	10.1	8.8	6.57	4.55	**10**
5	-	-	-	19.2	16.5	11.8	**5**
	20	**30**	**40**	**50**	**60**	**70**	

Surrounding Ambient temperature (°C)

RX1A...51

Load Current (A)	Thermal Resistance [K/W]						Power Dissipation (W)
50	1.6	1.38	1.15	0.93	0.71	0.48	**48**
45	1.88	1.62	1.37	1.11	0.86	0.6	**43**
40	2.22	1.93	1.63	1.34	1.05	0.75	**37**
35	2.67	2.33	1.98	1.64	1.29	0.95	**32**
30	3.27	2.86	2.45	2.03	1.62	1.21	**27**
25	4.13	3.62	3.11	2.6	2.09	1.59	**22**
20	5.43	4.76	4.11	3.45	2.8	2.15	**17**
15	7.63	6.71	5.8	4.89	3.99	3.1	**12**
10	12.2	10.7	9.26	7.83	6.42	5.03	**8**
5	26.8	23.5	20.2	11.1	14	11	**4**
	20	**30**	**40**	**50**	**60**	**70**	

Surrounding Ambient temperature (°C)

Notes:

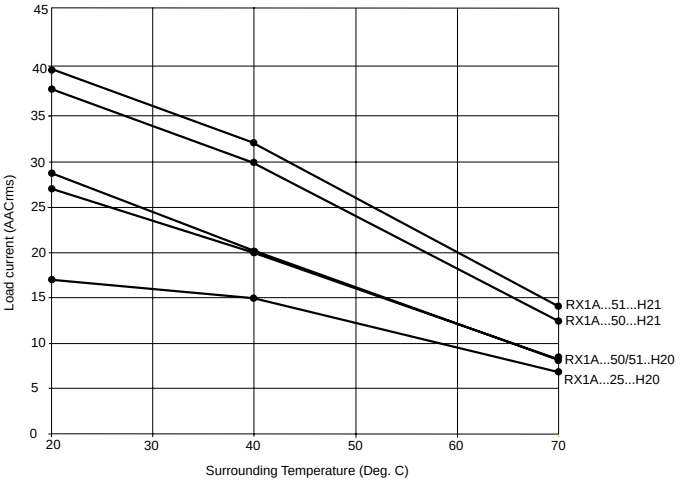
1. Device must be mounted on a heatsink or plate with both mounting screws fastened for correct operation.

2. Thermal resistance values indicated above are valid for assemblies using thermal paste Electrolube HTS or thermal pad Graftech HT010A, i.e., Rth_{cs}=0.16K/W. For thermal paste/pads with a higher Rth, manufacturer should be consulted for selection of appropriate heatsinking.

Derating Curves (RX assembled to heatsink types RHS23x)

RX1A....H20

RX1A....H21



Solid State Relays
Industrial, 1-Phase ZS w. LED
Types RS 23, RS 40, RS 48

- **Zero switching AC Solid State Relay**
- **Direct copper bonding (DCB) technology**
- **LED indication**
- **Clip-on IP 20 protection cover**
- **Self-lifting terminals**
- **Housing free of moulding mass**
- **2 input ranges: 4-32 VDC and 18-36 VAC/VDC**
- **Operational ratings up to 40 AACrms and 480 VAC**
- **Blocking voltage: Up to 1200 V_p**
- **Opto-isolation: > 4000 VACrms**
- **Integrated snubber network in 25 A and 40 A types**

Product Description

The zero switching relay with triac (10 A) or alternistor output (25 A, 40 A) is an inexpensive solution for resistive loads. The zero switching relay switches ON when the sinusoidal voltage crosses zero and switches OFF when the current crosses zero. The LED indicates the status of the control input. The clip-on cover is securing touch protection to IP 20. Output terminals can handle cables up to 16 mm^2.

Ordering Key

RS 1 A 23 D 25

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

Type Selection

Switching mode	Rated operational voltage	Rated operational current	Control voltage
A: Zero Switching	23: 230 VACrms 40: 400 VACrms 48: 480 VACrms	10: 10 AACrms 25: 25 AACrms 40: 40 AACrms	LA: 18 to 36 VAC/VDC D: 3 to 32 VDC* *4 to 32 VDC for 400 VAC and 480VAC types

Selection Guide

Rated operational voltage	Non-rep. voltage	Control voltage	Rated operational current 10 A	25 A	40 A
230 VACrms	650 V_p	3-32 VDC	**RS1A23D10**	**RS1A23D25**	**RS1A23D40**
		18-36 VAC/DC	**RS1A23LA10**	**RS1A23LA25**	**RS1A23LA40**
400 VACrms	850 V_p	4-32 VDC	**RS1A40D10**	**RS1A40D25**	**RS1A40D40**
		18-36 VAC/DC	**RS1A40LA10**	**RS1A40LA25**	**RS1A40LA40**
480 VACrms	1200 V_p	4-32 VDC	**RS1A48D10**	**RS1A48D25**	**RS1A48D40**
		18-36 VAC/DC	**RS1A48LA10**	**RS1A48LA25**	**RS1A48LA40**

General Specifications

	RS1A23...	RS1A40...	RS1A48...
Operational voltage range	42 to 265 VACrms	42 to 440 VACrms	42 to 530 VACrms
Blocking voltage	≥ 650 V_p	≥ 850 V_p	≥ 1200 V_p
Zero voltage turn-on	≤ 15 V	≤ 15 V	≤ 15 V
Operational frequency range	45 to 65 Hz	45 to 65 Hz	45 to 65 Hz
Power factor	≥ 0.95 @ 230 VACrms	≥ 0.95 @ 400 VACrms	≥ 0.95 @ 480 VACrms
Approvals	UL, cUL, CSA	UL, cUL, CSA	UL, cUL, CSA
CE-marking	Yes	Yes	Yes

Input Specifications

	RS1A..D..	RS1A..LA...
Control voltage		18-36 VAC/DC
RS1.23..,	3-32 VDC	
RS1.40.., RS1.48..	4-32 VDC	
Pick-up voltage		≤ 18 VAC/DC
RS1.23..,	≤ 2.75 VDC	
RS1.40.., RS1.48..	≤ 3.75 VDC	
Reverse voltage	≤ 32 VDC	-
Drop out voltage	≥ 1.2 VDC	≥ 5 VAC/DC
Input current @ max input voltage	≤ 12 mA	≤ 15 mA
Response time pick-up	≤ 1/2 cycle	≤ 1 cycle
Response time drop-out	≤ 1/2 cycle	≤ 2 cycles

Output Specifications

	RS1A...10	RS1A...25	RS1A...40
Rated operational current			
AC51 @ Ta=25°C	10 Arms	25 Arms	40 Arms
Min. operational current	150 mA	150 mA	150 mA
Rep. overload current t=1 s	< 12 AACrms	< 37 AACrms	< 60 AACrms
Non-rep. surge current t=10 ms	100 A_p	300 A_p	390 A_p
Off-state leakage current @ rated voltage and frequency	< 3 mArms	< 3 mArms	< 3 mArms
I^2t for fusing t=10 ms	≤ 50 A^2s	≤ 450A^2s	≤ 760 A^2s
On-state voltage drop @ rated current	≤ 1.6 Vrms	≤ 1.6 Vrms	≤ 1.6 Vrms
Critical dV/dt off-state	≥ 500V/µs	≥ 500 V/µs	≥ 500 V/µs

Thermal Specifications

	RS1A...10	RS1A...25	RS1A...40
Operating temperature	-20° to 70°C	-20° to 70°C	-20° to 70°C
Storage temperature	-40° to 100°C	-40° to 100°C	-40° to 100°C

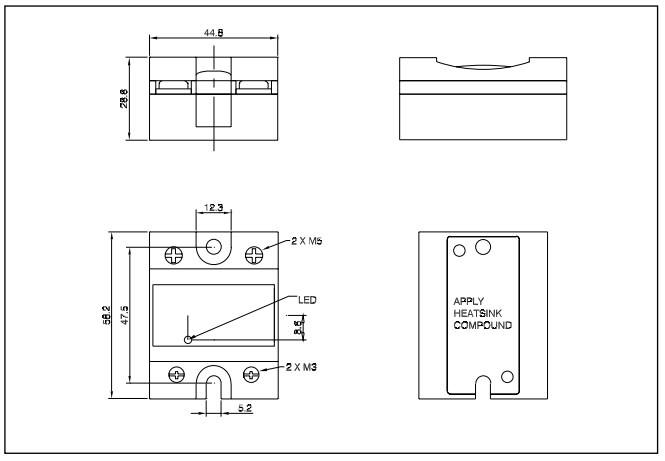
Housing Specifications

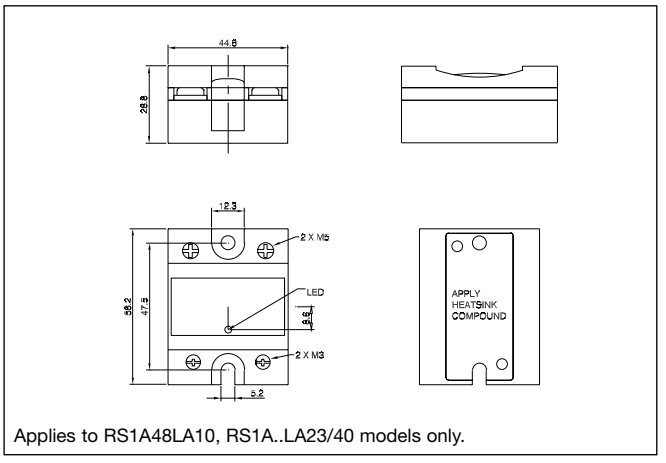
Weight	Approx. 60 g
Housing material	Noryl GFN 1, black
Baseplate	Aluminium
Potting compound	None
Relay	
Mounting screws	M5
Mounting torque	1.5-2.0 Nm
Control terminal	
Mounting screws	M3 x 9
Mounting torque	0.5 Nm
Power terminal	
Mounting screws	M5 x 9
Mounting torque	2.4 Nm

Isolation

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

Dimensions

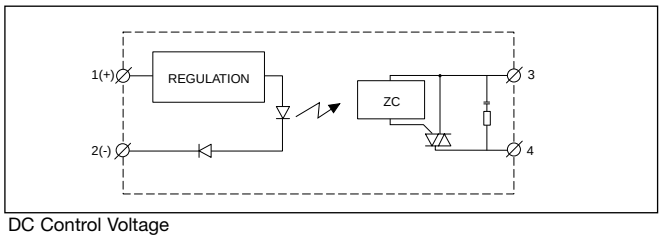




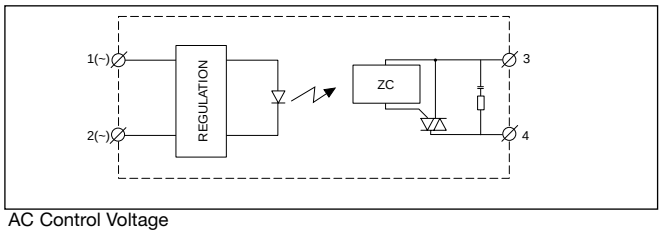
Applies to RS1A48LA10, RS1A..LA23/40 models only.

All dimensions in mm.

Functional Diagram



DC Control Voltage



AC Control Voltage

Heatsink Dimensions (load current versus ambient temperature)

RS10.

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
10.0	3.34	2.58	1.81	1.04	0.27	-	13.0
9.0	4.25	3.37	2.49	1.61	0.73	-	11.3
8.0	5.41	4.38	3.36	2.33	1.31	0.28	9.7
7.0	6.92	5.70	4.49	3.27	2.06	0.84	8.2
6.0	8.96	7.49	6.02	4.55	3.08	1.61	6.8
5.0	11.9	10.0	8.19	6.36	4.53	2.69	5.5
4.0	16.2	13.9	11.5	9.10	6.72	4.34	4.2
3.0	23.7	20.3	17.0	13.7	10.4	7.12	3.0
2.0	38.6	33.4	28.3	23.1	17.9	12.7	1.9
1.0	-	-	-	-	-	29.7	0.9
	20	30	40	50	60	70	

T_A Ambient temp. [°C]

Junction to ambient thermal resistance, $R_{th\ j\text{-}a}$	< 40.0	K/W
Junction to BTB tab thermal resistance, $R_{th\ j\text{-}t}$	< 2.00	K/W
BTB tab to case thermal resistance, $R_{th\ t\text{-}s}$	< 2.60	K/W
Case to heatsink thermal resistance, $R_{th\ c\text{-}s}$	< 0.20	K/W
Maximum allowable BTB case temperature	100	deg.C
Maximum allowable junction temperature	100	deg.C

RS25.

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
25.0	2.31	1.96	1.62	1.28	0.93	0.59	29
22.5	2.85	2.45	2.06	1.66	1.27	0.87	25
20.0	3.49	3.03	2.56	2.10	1.64	1.18	22
17.5	4.17	3.63	3.08	2.53	1.99	1.44	18
15.0	5.11	4.44	3.78	3.12	2.45	1.79	15
12.5	6.43	5.60	4.77	3.95	3.12	2.29	12
10.0	8.45	7.37	6.29	5.21	4.12	3.04	9
7.5	11.85	10.35	8.84	7.33	5.83	4.32	7
5.0	18.7	16.4	14.0	11.63	9.27	6.90	4
2.5	-	-	-	24.6	19.7	14.7	2
	20	30	40	50	60	70	

T_A Ambient temp. [°C]

Junction to ambient thermal resistance, $R_{th\ j\text{-}a}$	< 20.0	K/W
Junction to case thermal resistance, $R_{th\ j\text{-}c}$	< 1.10	K/W
Case to heatsink thermal resistance, $R_{th\ c\text{-}s}$	< 0.20	K/W
Maximum allowable case temperature	100	deg.C
Maximum allowable junction temperature	125	deg.C

Heatsink Dimensions (cont.)

RS40..

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
40.0	1.25	1.04	0.82	0.61	0.39	0.18	47
36.0	1.59	1.35	1.10	0.85	0.60	0.36	41
32.0	2.02	1.74	1.45	1.16	0.87	0.58	35
28.0	2.53	2.19	1.85	1.51	1.17	0.83	29
24.0	3.12	2.70	2.29	1.87	1.46	1.04	24
20.0	3.95	3.43	2.91	2.39	1.87	1.35	19
16.0	5.21	4.53	3.85	3.18	2.50	1.83	15
12.0	7.33	6.39	5.45	4.51	3.57	2.62	11
8.0	11.63	10.16	8.68	7.20	5.72	4.24	7
4.0	24.6	21.5	18.4	15.3	12.2	9.12	3
	20	30	40	50	60	70	

T_A Ambient temp. [°C]

Junction to ambient thermal resistance, $R_{th\ j\text{-}a}$	< 20.0	K/W
Junction to case thermal resistance, $R_{th\ j\text{-}c}$	< 0.80	K/W
Case to heatsink thermal resistance, $R_{th\ c\text{-}s}$	< 0.20	K/W
Maximum allowable case temperature	100	deg.C
Maximum allowable junction temperature	125	deg.C

Heatsink Selection

Carlo Gavazzi Heatsink (see Accessories)	Thermal resistance...	...for power dissipation
No heatsink required	---	N/A
RHS 300	5.00 K/W	> 0 W
RHS 100	3.00 K/W	> 25 W
RHS 45C	2.70 K/W	> 60 W
RHS 45B	2.00 K/W	> 60 W
RHS 90A	1.35 K/W	> 60 W
RHS 45C plus fan	1.25 K/W	> 0 W
RHS 45B plus fan	1.20 K/W	> 0 W
RHS 112A	1.10 K/W	> 100 W
RHS 301	0.80 K/W	> 70 W
RHS 90A plus fan	0.45 K/W	> 0 W
RHS 112A plus fan	0.40 K/W	> 0 W
RHS 301 plus fan	0.25 K/W	> 0 W
Consult your distribution	> 0.25 K/W	N/A
Infinite heatsink - No solution	---	N/A

Faston terminals

- Fast-on tabs
- Tab dimensions according to DIN 46342 part 1
- Pure tin-plated brass

Ordering Key

Screw mounted Faston terminals — **RS1A48D25 | F 4***

RS, RM Solid State Relay
Faston terminals
Tab orientation

Input Tab width: 4.8mm
Output Tab width: 6.3mm

Faston terminals in packs of 20 — **RM48** | **F4***

RS, RM Solid State Relay
Tab orientation

*** 0: Flat (0º)**
4: Angled (45º)

**** 48: 4.8mm faston for input**
63: 6.3mm faston for output

Other Accessories

- Heatsinks and fans
- Type RHS....
- 0.25 to 5.00 k/W
- Single and dual relay types

- Touch safety cover
- Type RMIP20
- IP20 protection degree
- Pack size: 20 pieces

All accessories can be ordered pre-assembled with Solid State Relays.
Other accessories include DIN rail adaptors, fuses, varistors and spacers.
For futher information refer to Accessories datasheets.

Solid State Relays
Industrial, 1-Phase ZS w. LED
Types RS 23 A, RS 40 A

- Zero switching AC Solid State Relay
- Direct copper bonding (DCB) technology
- Alternistor power unit
- LED indication
- Clip-on IP 20 protection cover
- Self-lifting terminals
- Housing free of moulding mass
- Fixed AC control input
- Operational ratings up to 40 AACrms and 400 VAC
- Blocking voltage: Up to 850 V_p
- Opto-isolation: > 4000 VACrms

Product Description

The zero switching relay with alternistor output is an inexpensive solution for resistive loads. The zero switching relay switches ON when the sinusoidal curve crosses zero and switches OFF when the current crosses zero. The LED indicates the status of the control input. The clip-on cover is securing touch protection (IP 20). Output terminals can handle cables up to 16 mm^2.

Ordering Key

RS 1 A 23 A2- 25

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

Type Selection

Switching mode	Rated operational voltage	Rated operational current	Control voltage
A: Zero Switching	23: 230 VACrms 40: 400 VACrms	25: 25 AACrms 40: 40 AACrms	A1: 110VAC ± 15% A2: 230VAC ± 15% A4: 400VAC ± 15%

Selection Guide

Rated operational voltage	Blocking voltage	Control voltage	Rated operational current 25 A	40 A
230 VACrms	650V_p	110 VAC ± 15%	**RS1A23A1-25**	**RS1A23A1-40**
		230 VAC ± 15%	**RS1A23A2-25**	**RS1A23A2-40**
		400 VAC ± 15%	**RS1A23A4-25**	**RS1A23A4-40**
400 VACrms	850V_p	230 VAC ± 15%	**RS1A40A2-25**	**RS1A40A2-40**
		400 VAC ± 15%	**RS1A40A4-25**	**RS1A40A4-40**

General Specifications

	RS1A23...	RS1A40...
Operational voltage range	42 to 265 VACrms	42 to 440 VACrms
Blocking voltage	≥ 650 V_p	≥ 850 V_p
Zero voltage turn-on	≤ 15 V	≤ 15 V
Operational frequency range	45 to 65 Hz	45 to 65 Hz
Power factor	≥ 0.95 @ 230 VACrms	≥ 0.95 @ 400 VACrms
Approvals	UL, cUL, CSA	UL, cUL, CSA
CE-marking	Yes	Yes

Input Specifications

	RS1A..A1	RS1A..A2	RS1A..A4
Control voltage	80 to 130VAC	200 to 260 VAC	360 to 440 VAC
Control frequency	50Hz / 60Hz	50Hz / 60Hz	50Hz / 60Hz
Pick-up voltage	70VAC	190VAC	350VAC
Drop out voltage	30VAC	70VAC	160VAC
Input current @ max input voltage	13mA	13mA	13mA
Typical response time pick-up	20ms	20ms	20ms
Typical response time drop-out	20ms	20ms	20ms

Output Specifications

	RS1A...25	RS1A...40
Rated operational current AC51 @ Ta=25°C	25 Arms	40 Arms
Min. operational current	150 mA	150 mA
Rep. overload current t=1 s	< 37 AACrms	< 60 AACrms
Non-rep. surge current t=10 ms	300 A_p	390 A_p
Off-state leakage current @ rated voltage and frequency	< 3 mArms	< 3 mArms
I^2t for fusing t=10 ms	≤ 450 A^2s	≤ 760 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

	RS1A...25	RS1A...40
Operating temperature	-30° to 70°C	-30° to 70°C
Storage temperature	-40° to 100°C	-40° to 100°C
Junction temperature	≤ 125°C	≤ 125°C
R_{th} junction to case	≤ 1.10 K/W	≤ 0.8 K/W
R_{th} junction to ambient	≤ 20 K/W	≤ 20 K/W

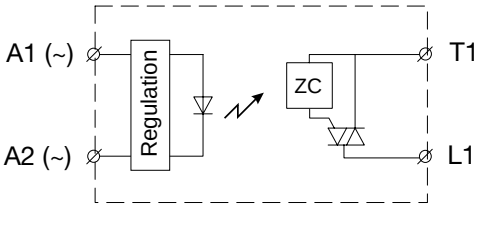
Housing Specifications

Weight	Approx. 60 g
Housing material	Noryl GFN 1, black
Baseplate	Aluminium
Potting compound	None
Relay	
Mounting screws	M5
Mounting torque	1.5-2.0 Nm
Control terminal	
Mounting screws	M3 x 9
Mounting torque	0.5 Nm
Power terminal	
Mounting screws	M5 x 9
Mounting torque	2.4 Nm

Isolation

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

Functional Diagram



Heatsink Dimensions (load current versus ambient temperature)

RS25.

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
25.0	2.31	1.96	1.62	1.28	0.93	0.59	29
22.5	2.85	2.45	2.06	1.66	1.27	0.87	25
20.0	3.49	3.03	2.56	2.10	1.64	1.18	22
17.5	4.17	3.63	3.08	2.53	1.99	1.44	18
15.0	5.11	4.44	3.78	3.12	2.45	1.79	15
12.5	6.43	5.60	4.77	3.95	3.12	2.29	12
10.0	8.45	7.37	6.29	5.21	4.12	3.04	9
7.5	11.85	10.35	8.84	7.33	5.83	4.32	7
5.0	18.7	16.4	14.0	11.63	9.27	6.90	4
2.5	-	-	-	24.6	19.7	14.7	2
	20	30	40	50	60	70	T_A Ambient temp. [°C]

Junction to ambient thermal resistance, $R_{th\ j\text{-}a}$	< 20.0	K/W
Junction to case thermal resistance, $R_{th\ j\text{-}c}$	< 1.10	K/W
Case to heatsink thermal resistance, $R_{th\ c\text{-}s}$	< 0.20	K/W
Maximum allowable case temperature	100	deg.C
Maximum allowable junction temperature	125	deg.C

RS40..

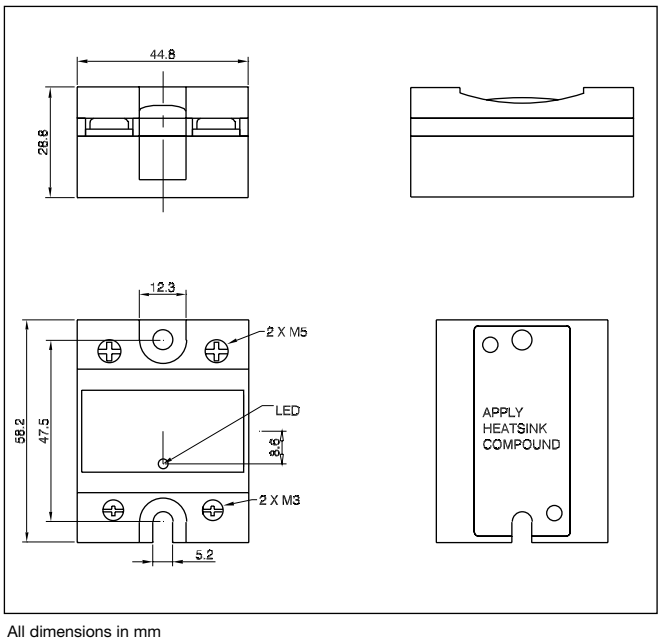
Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
40.0	1.25	1.04	0.82	0.61	0.39	0.18	47
36.0	1.59	1.35	1.10	0.85	0.60	0.36	41
32.0	2.02	1.74	1.45	1.16	0.87	0.58	35
28.0	2.53	2.19	1.85	1.51	1.17	0.83	29
24.0	3.12	2.70	2.29	1.87	1.46	1.04	24
20.0	3.95	3.43	2.91	2.39	1.87	1.35	19
16.0	5.21	4.53	3.85	3.18	2.50	1.83	15
12.0	7.33	6.39	5.45	4.51	3.57	2.62	11
8.0	11.63	10.16	8.68	7.20	5.72	4.24	7
4.0	24.6	21.5	18.4	15.3	12.2	9.12	3
	20	30	40	50	60	70	T_A Ambient temp. [°C]

Junction to ambient thermal resistance, $R_{th\ j\text{-}a}$	< 20.0	K/W
Junction to case thermal resistance, $R_{th\ j\text{-}c}$	< 0.80	K/W
Case to heatsink thermal resistance, $R_{th\ c\text{-}s}$	< 0.20	K/W
Maximum allowable case temperature	100	deg.C
Maximum allowable junction temperature	125	deg.C

Heatsink Selection

Carlo Gavazzi Heatsink (see Accessories)	Thermal resistance...	...for power dissipation
No heatsink required	---	N/A
RHS 300	5.00 K/W	> 0 W
RHS 100	3.00 K/W	> 25 W
RHS 45C	2.70 K/W	> 60 W
RHS 45B	2.00 K/W	> 60 W
RHS 90A	1.35 K/W	> 60 W
RHS 45C plus fan	1.25 K/W	> 0 W
RHS 45B plus fan	1.20 K/W	> 0 W
RHS 112A	1.10 K/W	> 100 W
RHS 301	0.80 K/W	> 70 W
RHS 90A plus fan	0.45 K/W	> 0 W
RHS 112A plus fan	0.40 K/W	> 0 W
RHS 301 plus fan	0.25 K/W	> 0 W
Consult your distribution	> 0.25 K/W	N/A
Infinite heatsink - No solution	---	N/A

Dimensions



All dimensions in mm

CARLO GAVAZZI

Faston terminals

- Fast-on tabs
- Tab dimensions according to DIN 46342 part 1
- Pure tin-plated brass

Ordering Key

Screw mounted Faston terminals — **RS1A23A2-25 | F 4***

RS, RM Solid State Relay
Faston terminals
Tab orientation

Input Tab width: 4.8mm
Output Tab width: 6.3mm

Faston terminals in packs of 20 — **RM48** | **F4***

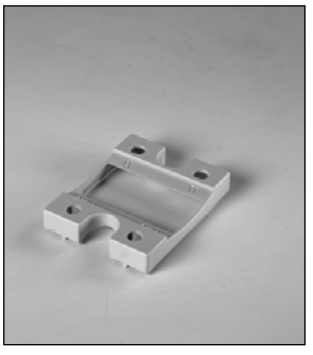
RS, RM Solid State Relay
Tab orientation

*** 0: Flat (0º)**
4: Angled (45º)

**** 48: 4.8mm faston for input**
63: 6.3mm faston for output

Other Accessories

- Heatsinks and fans
- Type RHS....
- 0.25 to 5.00 k/W
- Single and dual relay types



- Touch safety cover
- Type RMIP20
- IP20 protection degree
- Pack size: 20 pieces

All accessories can be ordered pre-assembled with Solid State Relays.
Other accessories include DIN rail adaptors, fuses, varistors and spacers.
For futher information refer to Accessories datasheets.

Solid State Relays
Industrial, 1-Phase ZS (IO) w. LED and Built-in Varistor
Types RM 23, RM 40, RM 48, RM 60

- **Zero switching (RM1A) or instant-on switching (RM1B) AC Solid State Relay**
- **Direct copper bonding (DCB) technology**
- **LED indication**
- **Built-in varistor 230, 400, 480, 600V**
- **Clip-on IP 20 protection cover**
- **Self-lifting terminals**
- **Housing free of moulding mass**
- **2 input ranges: 3-32* VDC and 20-280VAC/22-48VDC**
- **Operational ratings: Up to 100AACrms and 600VACrms**
- **Blocking voltage: Up to 1400V_p**
- **Opto-isolation: > 4000VACrms**

Product Description

The industrial, 1-phase relay with antiparallel thyristor output is the most widely used industrial SSR due to its multiple application possibilities. The relay can be used for resistive, inductive and capacitive loads. The zero switching relay switches ON when the sinusoidal curve crosses zero and switches OFF when the current crosses zero. The instant-on relay with DC control input can be used for phase control. The built-in varistor secures transient protection for the heavy industrial applications, and the LED indicates the status of the control input. The clip-on cover is securing touch protection to IP 20. Protected output terminals can handle cables up to 16mm^2.

Ordering Key

RM 1 A 23 D 25

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

Type Selection

Switching mode	Rated operational voltage	Control voltage	Rated operational current
A: Zero Switching	23: 230VACrms	A: 20-280VAC/22-48VDC	25: 25AACrms
B: Instant-on switching (DC Control only)	40: 400VACrms	D: 3-32VDC*	50: 50AACrms
	48: 480VACrms	*4 to 32VDC for 400, 480 and 600VAC types	75: 75AACrms
	60: 600VACrms	*4 to 32VDC for RM1B types	100: 100AACrms

Selection Guide

Rated operational voltage	Blocking voltage	Control voltage	Rated operational current 25A	50A	75A	100A
230VACrms	650V_p	3 - 32VDC	**RM1A23D25**	**RM1A23D50**	**RM1A23D75**	**RM1A23D100**
		20 to 280VAC 22 to 48VDC	**RM1A23A25**	**RM1A23A50**	**RM1A23A75**	**RM1A23A100**
400VACrms	850V_p	4 - 32VDC	**RM1A40D25**	**RM1A40D50**	**RM1A40D75**	**RM1A40D100**
		20 to 280VAC 22 to 48VDC	**RM1A40A25**	**RM1A40A50**	**RM1A40A75**	**RM1A40A100**
480VACrms	1200V_p	4 - 32VDC	**RM1A48D25**	**RM1A48D50**	**RM1A48D75**	**RM1A48D100**
		20 to 280 VAC 22 to 48VDC	**RM1A48A25**	**RM1A48A50**	**RM1A48A75**	**RM1A48A100**
600VACrms	1400V_p	4 - 32VDC	**RM1A60D25**	**RM1A60D50**	**RM1A60D75**	**RM1A60D100**
		20 to 280VAC 22 to 48VDC	**RM1A60A25**	**RM1A60A50**	**RM1A60A75**	**RM1A60A100**

General Specifications

	RM1.23...	RM1.40...	RM1.48...	RM1.60...
Operational voltage range				
RM1A...	24 to 265VACrms	42 to 440VACrms	42 to 530VACrms	42 to 660VACrms
RM1B...	42 to 265VACrms	42 to 440VACrms	42 to 530VACrms	42 to 660VACrms
Blocking voltage	≥ 650V_p	≥ 850V_p	≥ 1200V_p	≥ 1400V_p
Zero voltage turn-on	≤ 10V	≤ 10V	≤ 10V	≤ 10V
Operational frequency range	45 to 65Hz	45 to 65Hz	45 to 65Hz	45 to 65Hz
Power factor	> 0.5 @ 230VACrms	> 0.5 @ 400VACrms	> 0.5 @ 480VACrms	> 0.5 @ 600VACrms
Approvals	UL, cUL, CSA	UL, cUL, CSA	UL, cUL, CSA	UL, cUL, CSA
CE-marking	Yes	Yes	Yes	Yes *

* Heatsink must be connected to ground

Input Specifications

	RM1...D..	RM1...A..
Control voltage range		
RM1A23...	3 - 32VDC	20 - 280VAC, 22 - 48VDC
RM1A40... RM1A48... RM1A60...	4 - 32VDC	20 - 280VAC, 22 - 48VDC
RM1B...	4 - 32VDC	-
Pick-up voltage @ Ta = 25°C		
RM1A23...	2.5VDC	18VAC/DC
RM1A40... RM1A48... RM1A60...	3.5VDC	18VAC/DC
RM1B ...	3.5VDC	-
Reverse voltage	32VDC	-
Drop out voltage	1.2VDC	6VAC/DC
Input current @ max input voltage		
RM1A	≤12 mA	≤ 20mA
RM1B	≤15 mA	-
Response time pick-up		
RM1A	≤1/2 cycle	≤ 12ms
RM1B	≤0.1ms	-
Response time drop-out	≤1/2 cycle	≤ 40ms

Output Specifications

	RM1....25	RM....50	RM1....75	RM1....100
Rated operational current				
AC51 @ Ta=25°C	25Arms	50Arms	75Arms	100Arms
AC53a @ Ta=25°C	5Arms	15Arms	20Arms	30Arms
Min. operational current	150mA	250mA	400mA	500mA
Rep. overload current t=1 s	< 55AACrms	< 125AACrms	< 150AACrms	< 200AACrms
Non-rep. surge current t=10 ms	325A_p	600A_p	1150A_p	1900A_p
Off-state leakage current @ rated voltage and frequency	< 3mArms	< 3mArms	< 3mArms	< 3mArms
I^2t for fusing t=10 ms	< 525A^2s	< 1800A^2s	< 6600A^2s	< 18000A^2s
On-state voltage drop @ rated current	1.6Vrms	1.6Vrms	1.6Vrms	1.6Vrms
Critical dV/dt off-state min.	1000V/µs	1000V/µs	1000V/µs	1000V/µs

Thermal Specifications

	RM1....25	RM1....50	RM1.60.50	RM1....75	RM1....100
Operating temperature range	-20° to 70°C	-20° to 70°C	-20° to 70°C	-20° to 70°C	-20° to 70°C
Storage temperature range	-40° to 100°C	-40° to 100°C	-40° to 100°C	-40° to 100°C	-40° to 100°C
Junction temperature	≤ 125°C	≤ 125°C	≤ 125°C	≤ 125°C	≤ 125°C
R_{th} junction to case	≤ 0.80K/W	≤ 0.50K/W	≤ 0.72K/W	≤ 0.35K/W	≤ 0.30K/W
R_{th} junction to ambient	≤ 20.0K/W	≤ 20.0K/W	≤ 20.0K/W	≤ 20.0K/W	≤ 20.0K/W

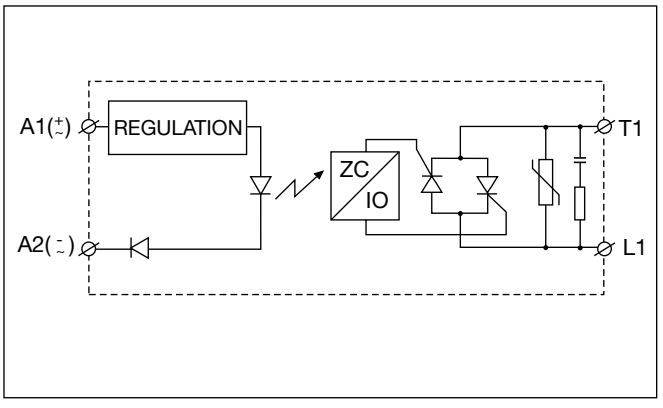
Housing Specifications

Weight	
25A, 50A	Approx. 60g
75A, 100A	Approx. 100g
Housing material	Noryl GFN 1, black
Baseplate	
25A, 50A	Aluminium
75A, 100A	Copper, nickel-plated
Potting compound	None

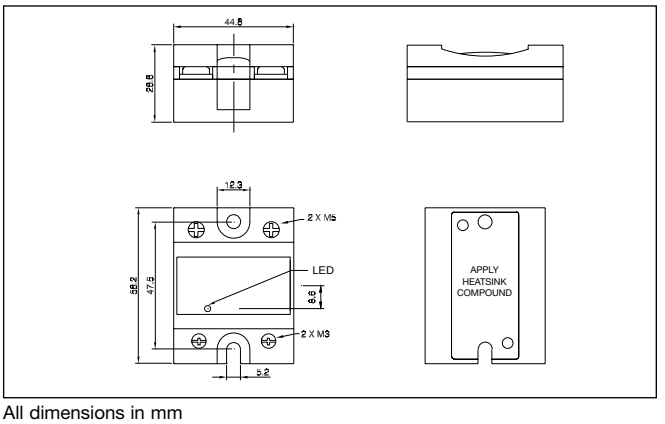
Housing Specifications (Cont.)

Relay	
Mounting screws	M5
Mounting torque	1.5-2.0Nm
Control terminal	
Mounting screws	M3 x 9
Mounting torque	0.5Nm
Power terminal	
Mounting screws	M5 x 9
Mounting torque	2.4Nm

Functional Diagram



Dimensions



All dimensions in mm

Heatsink Selection

Carlo Gavazzi Heatsink (see Accessories)	Thermal resistance...	...for power dissipation
No heatsink required	---	N/A
RHS 300	5.00K/W	> 0W
RHS 100	3.00K/W	> 25W
RHS 45C	2.70K/W	> 60W
RHS 45B	2.00K/W	> 60W
RHS 90A	1.35K/W	> 60W
RHS 45C plus fan	1.25K/W	> 0W
RHS 45B plus fan	1.20K/W	> 0W
RHS 112A	1.10K/W	> 100W
RHS 301	0.80K/W	> 70W
RHS 90A plus fan	0.45K/W	> 0W
RHS 112A plus fan	0.40K/W	> 0W
RHS 301 plus fan	0.25K/W	> 0W
Consult your distribution	> 0.25K/W	N/A
Infinite heatsink - No solution	---	N/A

Isolation

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

CARLO GAVAZZI

Heatsink Dimensions (load current versus ambient temperature)

RM....25

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
25.0	2.70	2.34	1.98	1.61	1.25	0.89	28
22.5	3.10	2.69	2.28	1.86	1.45	1.04	24
20.0	3.61	3.13	2.65	2.18	1.70	1.23	21
17.5	4.26	3.70	3.14	2.59	2.03	1.47	18
15.0	5.14	4.47	3.80	3.14	2.47	1.80	15
12.5	6.38	5.56	4.73	3.91	3.09	2.27	12
10.0	8.25	7.19	6.14	5.08	4.02	2.97	9
7.5	11.4	9.94	8.49	7.04	5.59	4.14	7
5.0	17.7	15.4	13.2	11.0	8.74	6.51	4
2.5	-	-	-	-	18.2	13.6	2
	20	30	40	50	60	70	T_A Ambient temp. [°C]

Junction to ambient thermal resistance, $R_{th\ j\text{-}a}$	< 20.0	K/W
Junction to case thermal resistance, $R_{th\ j\text{-}c}$	< 0.80	K/W
Case to heatsink thermal resistance, $R_{th\ c\text{-}s}$	< 0.20	K/W
Maximum allowable case temperature	100	deg.C
Maximum allowable junction temperature	125	deg.C

RM....50

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
50.0	1.03	0.86	0.70	0.53	0.37	0.20	61
45.0	1.27	1.09	0.90	0.71	0.52	0.33	53
40.0	1.54	1.32	1.10	0.89	0.67	0.45	46
35.0	1.85	1.59	1.34	1.08	0.82	0.57	39
30.0	2.26	1.95	1.65	1.34	1.03	0.72	33
25.0	2.85	2.47	2.08	1.70	1.32	0.94	26
20.0	3.73	3.24	2.75	2.26	1.77	1.27	20
15.0	5.22	4.54	3.86	3.19	2.51	1.83	15
10.0	8.21	7.16	6.11	5.05	4.00	2.95	10
5.0	17.2	15.0	12.9	10.7	8.51	6.33	5
	20	30	40	50	60	70	T_A Ambient temp. [°C]

Junction to ambient thermal resistance, $R_{th\ j\text{-}a}$	< 20.0	K/W
Junction to case thermal resistance, $R_{th\ j\text{-}c}$	< 0.50	K/W
Case to heatsink thermal resistance, $R_{th\ c\text{-}s}$	< 0.20	K/W
Maximum allowable case temperature	100	deg.C
Maximum allowable junction temperature	125	deg.C

RM1.60..50

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
50.0	0.99	0.81	0.63	0.44	0.26	0.08	55
45.0	1.28	1.07	0.86	0.65	0.44	0.23	48
40.0	1.64	1.40	1.15	0.91	0.67	0.42	41
35.0	2.11	1.82	1.54	1.25	0.96	0.67	35
30.0	2.60	2.25	1.90	1.55	1.20	0.85	29
25.0	3.30	2.86	2.43	1.99	1.55	1.11	23
20.0	4.36	3.79	3.22	2.65	2.08	1.51	18
15.0	6.1	5.4	4.6	3.77	2.97	2.18	13
10.0	9.76	8.52	7.3	6.0	4.8	3.54	8
5.0	--	--	15.47	12.85	10.24	7.6	4
	20	30	40	50	60	70	T_A Ambient temp. [°C]

Junction to ambient thermal resistance, $R_{th\ j\text{-}a}$	< 20.0	K/W
Junction to baseplate case thermal resistance, $R_{th\ j\text{-}c}$	< 0.72	K/W
Case to heatsink thermal resistance, $R_{th\ c\text{-}s}$	< 0.20	K/W
Maximum allowable heatsink temperature	100	deg.C
Maximum allowable junction temperature	125	deg.C

RM....75

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
75.0	0.91	0.78	0.65	0.52	0.39	0.26	77
67.5	1.10	0.96	0.81	0.66	0.51	0.36	68
60.0	1.34	1.17	1.00	0.83	0.66	0.49	59
52.5	1.60	1.40	1.20	1.00	0.80	0.60	50
45.0	1.93	1.68	1.44	1.20	0.96	0.72	42
37.5	2.38	2.08	1.78	1.49	1.19	0.89	34
30.0	3.06	2.68	2.30	1.91	1.53	1.15	26
22.5	4.21	3.68	3.16	2.63	2.10	1.58	19
15.0	6.51	5.70	4.88	4.07	3.26	2.44	12
7.5	13.5	11.77	10.09	8.41	6.73	5.04	6
	20	30	40	50	60	70	T_A Ambient temp. [°C]

Junction to ambient thermal resistance, $R_{th\ j\text{-}a}$	< 20.0	K/W
Junction to case thermal resistance, $R_{th\ j\text{-}c}$	< 0.35	K/W
Case to heatsink thermal resistance, $R_{th\ c\text{-}s}$	< 0.10	K/W
Maximum allowable heatsink temperature	100	deg.C
Maximum allowable junction temperature	125	deg.C

Heatsink Dimensions (load current versus ambient temperature) cont.

RM....100

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
100.0	0.54	0.45	0.36	0.27	0.18	0.09	111
90.0	0.68	0.58	0.47	0.37	0.27	0.17	97
80.0	0.86	0.74	0.62	0.50	0.38	0.26	84
70.0	1.08	0.94	0.80	0.66	0.52	0.38	71
60.0	1.37	1.20	1.03	0.85	0.68	0.51	59
50.0	1.70	1.49	1.28	1.06	0.85	0.64	47
40.0	2.21	1.93	1.66	1.38	1.10	0.83	36
30.0	3.06	2.68	2.30	1.91	1.53	1.15	26
20.0	4.78	4.18	3.59	2.99	2.39	1.79	17
10.0	9.98	8.73	7.49	6.24	4.99	3.74	8
	20	30	40	50	60	70	T_A

Ambient temp. [°C]

Junction to ambient thermal resistance, $R_{th\ j\text{-}a}$	< 20.0	K/W
Junction to case thermal resistance, $R_{th\ j\text{-}c}$	< 0.30	K/W
Case to heatsink thermal resistance, $R_{th\ c\text{-}s}$	< 0.10	K/W
Maximum allowable heatsink temperature	100	deg.C
Maximum allowable junction temperature	125	deg.C

FASTON terminals

- Faston tabs
- Tab dimensions according to DIN 46342 part 1
- Pure tin-plated brass

Ordering Key

Screw mounted Faston terminals **RM1A48D25 | F 4***

RS, RM Solid State Relay
Faston terminals
Tab orientation

Input Tab width: 4.8mm
Output Tab width: 6.3mm

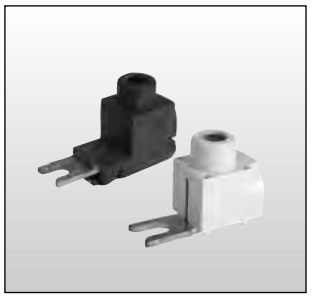
Faston terminals in packs of 20 **RM48** | **F4***

RS, RM Solid State Relay
Tab orientation

*** 0: Flat (0º)**
4: Angled (45º)

**** 48: 4.8mm faston for input**
63: 6.3mm faston for output

Fork Terminals



- Terminal adaptors for 35mm^2 cable
- Type RM635FK
- Pack size: 10 pieces

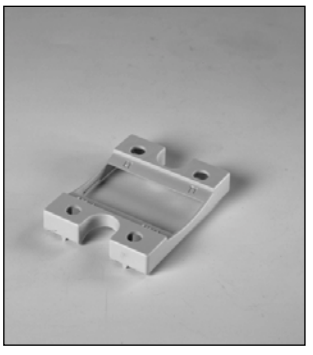
Ordering Key

RM635FK	P

RM terminal adaptor
Touch protected (optional)

Other Accessories

- Heatsinks and fans
- Type RHS....
- 0.25 to 5.00 k/W
- Single and dual relay types



- Touch safety cover
- Type RMIP20
- IP20 protection degree
- Pack size: 20 pieces

All accessories can be ordered pre-assembled with Solid State Relays.
Other accessories include DIN rail adaptors, fuses, varistors and spacers.
For futher information refer to Accessories datasheets.

Solid State Relays
Low Voltage AC/DC Control: 5 to 24 V
Types RM 23M, RM 40M, RM 48M, RM 60M

- **Zero switching AC Solid State Relay**
- **Low voltage AC/DC control: 5 to 24 V**
- **Direct copper bonding (DCB) technology**
- **LED indication**
- **Built-in varistor**
- **Clip-on IP 20 protection cover**
- **Self-lifting terminals**
- **Housing free of moulding mass**
- **Operational ratings: Up to 100AACrms and 600VACrms**
- **Opto-isolation: > 4000VACrms**

Product Description

The industrial, 1-phase relay with antiparallel thyristor output is the most widely used SSR due to its multiple application possibilities. This relay has been designed to interface low voltage AC or DC control systems with high voltage resistive, inductive and capacitive loads. The zero switching relay switches ON when the sinusoidal curve crosses zero and switches OFF when the current crosses zero. The built-in varistor secures transient protection for the heavy industrial applications, and the LED indicates the status of the control input. The clip-on cover is securing touch safety to IP 20. Protected output terminals can take cables up to 16 mm^2.

Ordering Key

RM 1 A 23 M 25

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

Type Selection

Switching mode	Rated operational voltage	Control voltage	Rated operational current
A: Zero Switching	23: 230VACrms 40: 400VACrms 48: 480VACrms 60: 600VACrms	M: 5 to 24VDC/AC	25: 25AACrms 50: 50AACrms 75: 75AACrms 100: 100AACrms

Selection Guide

Rated operational voltage	Blocking voltage	Control voltage	Rated operational current 25 AACrms	50 AACrms	75 AACrms	100 AACrms
230VACrms	650V_p	5 to 24VDC/AC	**RM1A23M25**	**RM1A23M50**	**RM1A23M75**	**RM1A23M100**
400VACrms	850V_p	5 to 24VDC/AC	**RM1A40M25**	**RM1A40M50**	**RM1A40M75**	**RM1A40M100**
480VACrms	1200V_p	5 to 24VDC/AC	**RM1A48M25**	**RM1A48M50**	**RM1A48M75**	**RM1A48M100**
600VACrms	1400V_p	5 to 24VDC/AC	**RM1A60M25**	**RM1A60M50**	**RM1A60M75**	**RM1A60M100**

General Specifications

	RM1A23M	RM1A40M	RM1A48M	RM1A60M
Operational voltage range	24 to 265VACrms	42 to 440VACrms	42 to 530VACrms	42 to 660VACrms
Blocking voltage	≥ 650V_p	≥ 850V_p	≥ 1200V_p	≥ 1400V_p
Zero voltage turn-on	≤ 15V	≤ 15V	≤ 15V	≤ 15V
Operational frequency range	45 to 65Hz	45 to 65Hz	45 to 65Hz	45 to 65Hz
Power factor	> 0.5 @ 230VACrms	> 0.5 @ 400VACrms	> 0.5 @ 480VACrms	> 0.5 @ 600VACrms
Approvals	UL, CSA	UL, CSA	UL, CSA	UL, CSA
CE-marking	Yes	Yes	Yes	Yes *

* Heatsink must be connected to ground.

Input Specifications

Absolute max. input voltage	37VDC 28VAC
Pick-up voltage	4.0VDC 4.0VAC
Drop out voltage	2.0VDC 2.0VAC
Input current @ 5 VAC @ 24 VAC @ 5 VDC @ 24 VDC	 ≤ 10mA ≤ 18mA ≤ 9mA ≤ 12mA
Response time pick-up	≤ 1 cycle
Response time drop-out	≤ 2.5 cycles

Isolation

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

Housing Specifications

Weight 25 A, 50 A 75 A, 100 A	 Approx. 60g Approx. 100g
Housing material	Noryl GFN 1, black
Baseplate 25 A, 50 A 75 A, 100 A	 Aluminium Copper, nickel-plated
Potting compound	None
Relay Mounting screws Mounting torque	 M5 1.5-2.0Nm
Control terminal Mounting screws Mounting torque	 M3 x 9 0.5Nm
Power terminal Mounting screws Mounting torque	 M5 x 9 2.4Nm

Thermal Specifications

	RM1...M25	RM1...M50	RM1.60M50	RM1...M75	RM1...M100
Operating temperature range	-20° to 70°C	-20° to 70°C	-20° to 70°C	-20° to 70°C	-20° to 70°C
Storage temperature range	-40° to 100°C	-40° to 100°C	-40° to 100°C	-40° to 100°C	-40° to 100°C
Junction temperature	≤ 125°C	≤ 125°C	≤ 125°C	≤ 125°C	≤ 125°C
R_{th} junction to case	≤ 0.80K/W	≤ 0.50K/W	≤ 0.72K/W	≤ 0.35K/W	≤ 0.30K/W
R_{th} junction to ambient	≤ 20.0K/W	≤ 20.0K/W	≤ 20.0K/W	≤ 20.0K/W	≤ 20.0K/W

Output Specifications

	RM1A..M25	RM1A..M50	RM1A..M75	RM1A..M100
Rated operational current AC51 @ Ta=25°C AC53a @ Ta=25°C	 25Arms 5Arms	 50Arms 15Arms	 75Arms 20Arms	 100Arms 30Arms
Min. operational current	150mA	250mA	400mA	500mA
Rep. overload current t=1 s	< 55AACrms	< 125AACrms	< 150AACrms	< 200AACrms
Non-rep. surge current t=10ms	325Ap	600Ap	1150Ap	1900Ap
Off-state leakage current @ rated voltage and frequency	< 3mArms	< 3mArms	< 3mArms	< 3mArms
I^2t for fusing t=10ms	< 525A^2s	< 1800A^2s	< 6600A^2s	< 18000A^2s
On-state voltage drop @ rated current	1.6Vrms	1.6Vrms	1.6Vrms	1.6Vrms
Critical dV/dt off-state min.	500V/µs	500V/µs	500V/µs	500V/µs
Zero crossing detection	Yes	Yes	Yes	Yes

CARLO GAVAZZI

Heatsink Dimensions (load current versus ambient temperature)

RM1...M25

Load current [A]	Thermal resistance [K/W] 20	30	40	50	60	70	Power dissipation [W]
25.0	2.70	2.34	1.98	1.61	1.25	0.89	28
22.5	3.10	2.69	2.28	1.86	1.45	1.04	24
20.0	3.61	3.13	2.65	2.18	1.70	1.23	21
17.5	4.26	3.70	3.14	2.59	2.03	1.47	18
15.0	5.14	4.47	3.80	3.14	2.47	1.80	15
12.5	6.38	5.56	4.73	3.91	3.09	2.27	12
10.0	8.25	7.19	6.14	5.08	4.02	2.97	9
7.5	11.4	9.94	8.49	7.04	5.59	4.14	7
5.0	17.7	15.4	13.2	11.0	8.74	6.51	4
2.5	-	-	-	-	18.2	13.6	2

Ambient temp. [°C] T_A

Junction to ambient thermal resistance, $R_{th\ j\text{-}a}$	< 20.0	K/W
Junction to case thermal resistance, $R_{th\ j\text{-}c}$	< 0.80	K/W
Case to heatsink thermal resistance, $R_{th\ c\text{-}s}$	< 0.20	K/W
Maximum allowable case temperature	100	deg.C
Maximum allowable junction temperature	125	deg.C

RM1...M50

Load current [A]	Thermal resistance [K/W] 20	30	40	50	60	70	Power dissipation [W]
50.0	1.03	0.86	0.70	0.53	0.37	0.20	61
45.0	1.27	1.09	0.90	0.71	0.52	0.33	53
40.0	1.54	1.32	1.10	0.89	0.67	0.45	46
35.0	1.85	1.59	1.34	1.08	0.82	0.57	39
30.0	2.26	1.95	1.65	1.34	1.03	0.72	33
25.0	2.85	2.47	2.08	1.70	1.32	0.94	26
20.0	3.73	3.24	2.75	2.26	1.77	1.27	20
15.0	5.22	4.54	3.86	3.19	2.51	1.83	15
10.0	8.21	7.16	6.11	5.05	4.00	2.95	10
5.0	17.2	15.0	12.9	10.7	8.51	6.33	5

Ambient temp. [°C] T_A

Junction to ambient thermal resistance, $R_{th\ j\text{-}a}$	< 20.0	K/W
Junction to case thermal resistance, $R_{th\ j\text{-}c}$	< 0.50	K/W
Case to heatsink thermal resistance, $R_{th\ c\text{-}s}$	< 0.20	K/W
Maximum allowable case temperature	100	deg.C
Maximum allowable junction temperature	125	deg.C

RM1.60..50

Load current [A]	Thermal resistance [K/W] 20	30	40	50	60	70	Power dissipation [W]
50.0	0.99	0.81	0.63	0.44	0.26	0.08	55
45.0	1.28	1.07	0.86	0.65	0.44	0.23	48
40.0	1.64	1.40	1.15	0.91	0.67	0.42	41
35.0	2.11	1.82	1.54	1.25	0.96	0.67	35
30.0	2.60	2.25	1.90	1.55	1.20	0.85	29
25.0	3.30	2.86	2.43	1.99	1.55	1.11	23
20.0	4.36	3.79	3.22	2.65	2.08	1.51	18
15.0	6.1	5.4	4.6	3.77	2.97	2.18	13
10.0	9.76	8.52	7.3	6.0	4.8	3.54	8
5.0	--	--	15.47	12.85	10.24	7.6	4

Ambient temp. [°C] T_A

Junction to ambient thermal resistance, $R_{th\ j\text{-}a}$	< 20.0	K/W
Junction to baseplate case thermal resistance, $R_{th\ j\text{-}c}$	< 0.72	K/W
Case to heatsink thermal resistance, $R_{th\ c\text{-}s}$	< 0.20	K/W
Maximum allowable heatsink temperature	100	deg.C
Maximum allowable junction temperature	125	deg.C

RM1...M75

Load current [A]	Thermal resistance [K/W] 20	30	40	50	60	70	Power dissipation [W]
75.0	0.91	0.78	0.65	0.52	0.39	0.26	77
67.5	1.10	0.96	0.81	0.66	0.51	0.36	68
60.0	1.34	1.17	1.00	0.83	0.66	0.49	59
52.5	1.60	1.40	1.20	1.00	0.80	0.60	50
45.0	1.93	1.68	1.44	1.20	0.96	0.72	42
37.5	2.38	2.08	1.78	1.49	1.19	0.89	34
30.0	3.06	2.68	2.30	1.91	1.53	1.15	26
22.5	4.21	3.68	3.16	2.63	2.10	1.58	19
15.0	6.51	5.70	4.88	4.07	3.26	2.44	12
7.5	13.5	11.77	10.09	8.41	6.73	5.04	6

Ambient temp. [°C] T_A

Junction to ambient thermal resistance, $R_{th\ j\text{-}a}$	< 20.0	K/W
Junction to case thermal resistance, $R_{th\ j\text{-}c}$	< 0.35	K/W
Case to heatsink thermal resistance, $R_{th\ c\text{-}s}$	< 0.10	K/W
Maximum allowable heatsink temperature	100	deg.C
Maximum allowable junction temperature	125	deg.C

Heatsink Dimensions

(load current versus ambient temperature) cont.d

RM1...M100

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
100.0	0.54	0.45	0.36	0.27	0.18	0.09	**111**
90.0	0.68	0.58	0.47	0.37	0.27	0.17	**97**
80.0	0.86	0.74	0.62	0.50	0.38	0.26	**84**
70.0	1.08	0.94	0.80	0.66	0.52	0.38	**71**
60.0	1.37	1.20	1.03	0.85	0.68	0.51	**59**
50.0	1.70	1.49	1.28	1.06	0.85	0.64	**47**
40.0	2.21	1.93	1.66	1.38	1.10	0.83	**36**
30.0	3.06	2.68	2.30	1.91	1.53	1.15	**26**
20.0	4.78	4.18	3.59	2.99	2.39	1.79	**17**
10.0	9.98	8.73	7.49	6.24	4.99	3.74	**8**
	20	**30**	**40**	**50**	**60**	**70**	T_A

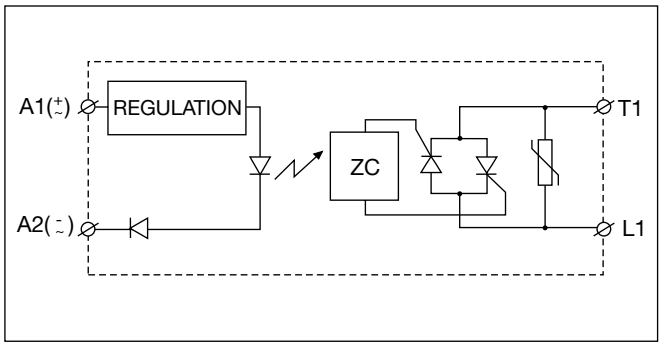
Ambient temp. [°C]

Junction to ambient thermal resistance, $R_{th\ j\text{-}a}$	< 20.0	K/W
Junction to case thermal resistance, $R_{th\ j\text{-}c}$	< 0.30	K/W
Case to heatsink thermal resistance, $R_{th\ c\text{-}s}$	< 0.10	K/W
Maximum allowable heatsink temperature	100	deg.C
Maximum allowable junction temperature	125	deg.C

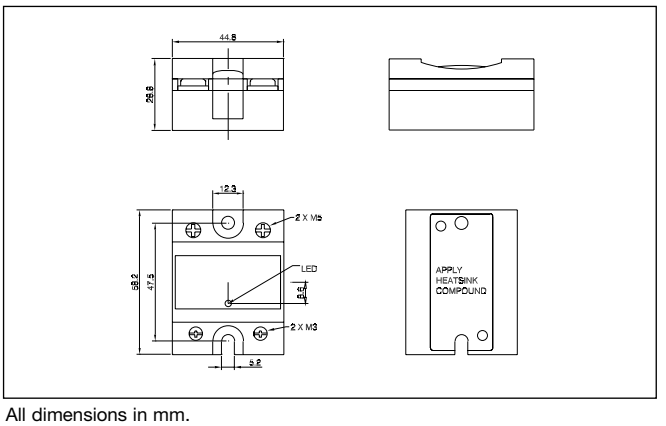
Heatsink Selection

Carlo Gavazzi Heatsink (see Accessories)	Thermal resistance...	...for power dissipation
No heatsink required	---	N/A
RHS 300	5.00 K/W	> 0 W
RHS 100	3.00 K/W	> 25 W
RHS 45C	2.70 K/W	> 60 W
RHS 45B	2.00 K/W	> 60 W
RHS 90A	1.35 K/W	> 60 W
RHS 45C plus fan	1.25 K/W	> 0 W
RHS 45B plus fan	1.20 K/W	> 0 W
RHS 112A	1.10 K/W	> 100 W
RHS 301	0.80 K/W	> 70 W
RHS 90A plus fan	0.45 K/W	> 0 W
RHS 112A plus fan	0.40 K/W	> 0 W
RHS 301 plus fan	0.25 K/W	> 0 W
Consult your distribution	> 0.25 K/W	N/A
Infinite heatsink - No solution	---	N/A

Functional Diagram



Dimensions



All dimensions in mm.

Faston terminals

- Fast-on tabs
- Tab dimensions according to DIN 46342 part 1
- Pure tin-plated brass

Ordering Key

Screw mounted Faston terminals — **RM1A48M25 | F 4***

RS, RM Solid State Relay
Faston terminals
Tab orientation

Input Tab width: 4.8mm
Output Tab width: 6.3mm

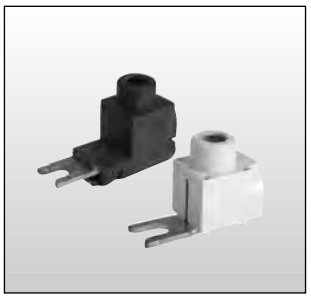
Faston terminals in packs of 20 — **RM48** | **F4***

RS, RM Solid State Relay
Tab orientation

*** 0: Flat (0º)**
4: Angled (45º)

**** 48: 4.8mm faston for input**
63: 6.3mm faston for output

Fork Terminals



- Terminal adaptors for 35mm^2 cable
- Type RM635FK
- Pack size: 10 pieces

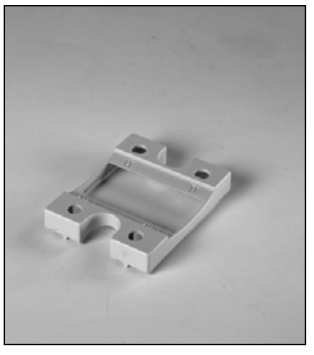
Ordering Key

RM635FK | P

RM terminal adaptor
Touch protected (optional)

Other Accessories

- Heatsinks and fans
- Type RHS....
- 0.25 to 5.00 k/W
- Single and dual relay types



- Touch safety cover
- Type RMIP20
- IP20 protection degree
- Pack size: 20 pieces

All accessories can be ordered pre-assembled with Solid State Relays.
Other accessories include DIN rail adaptors, fuses, varistors and spacers.
For futher information refer to Accessories datasheets.

Solid State Relays
Industrial, 1Phase Peak Switching
Type RM1C

- **Ideal for switching of transformers and other highly inductive loads**
- **Direct copper bonding (DCB) technology**
- **Thyristor power units**
- **LED indication**
- **Clip-on IP20 protection cover**
- **Housing free of moulding mass**
- **Self lifting terminals**
- **Operational ratings up to 100AACrms and 600VACrms**
- **Blocking voltage up to 1400Vp**
- **Opto isolation: 4000 VACrms**

Product Description

The peak switching SSR is primarily used for transformer applications. By applying DC control voltage, the output semiconductor is activated at the peak of the line voltage.

The semiconductor switches OFF, when load current crosses zero, upon removal of the control voltage. The LED indicates when the output is activated.

Ordering Key

RM 1 C 60 D 50

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

Type Selection

Switching mode	Rated operational voltage	Control voltage	Rated operational current
C: Peak Switching	40: 400 VACrms 60: 600 VACrms	D: 4.25 - 32 VDC	25: 25 AACrms 50: 50 AACrms 75: 75 AACrms 100: 100 AACrms

Selection Guide

Rated operational voltage	Blocking voltage	Control voltage	Rated operational current 25 AACrms	50 AACrms	75AACrms	100 AACrms
400 VACrms	850 V_p	4.25 - 32 VDC	**RM1C40D25**	**RM1C40D50**	**RM1C40D75**	-
600 VACrms	1400 V_p	4.25 - 32 VDC	**RM1C60D25**	**RM1C60D50**	-	**RM1C60D100**

General Specifications

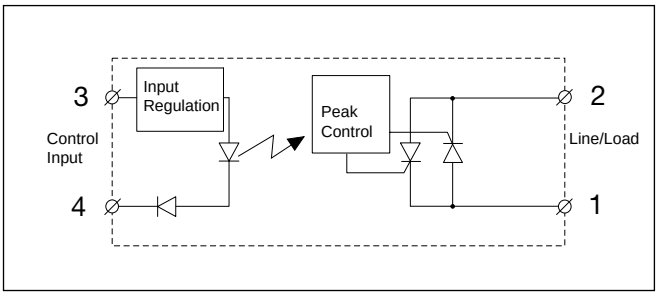
	RM1C40D..	RM1C60D..
Operational voltage range	90 to 440 VACrms	150 to 660 VACrms
Blocking voltage	850 V_p	1400 V_p
Zero voltage turn-on	< 10 V	< 10 V
Operational frequency range	45 to 65 Hz	45 to 65 Hz
Approvals	UL, cUL, CSA	UL, cUL, CSA
CE-marking	Yes	Yes*

* Heatsink must be connected to ground for 600V types

Input Specifications

Control voltage	4.25 - 32 VDC
Pick up voltage	4.0 VDC
Drop out voltage	1.0 VDC
Max. input current	18 mA
Response time pick up Power output	≤ 20 ms
Response time drop out Power output	≤10 ms

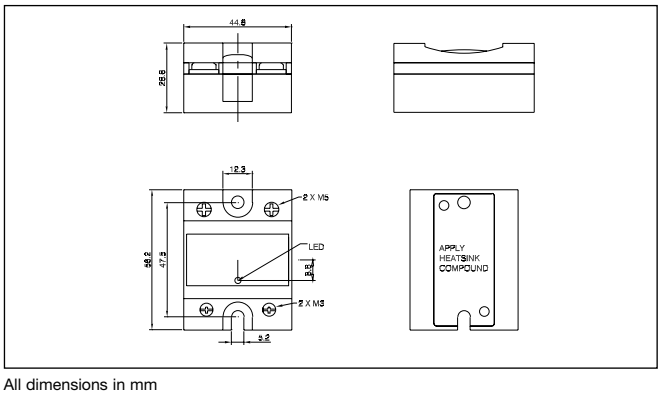
Functional Diagram



Output Specifications

	RM1C...25	RM1C...50	RM1C...75	RM1C...100
Rated operational current				
AC51 @ Ta=25°C	25 Arms	50 Arms	75 Arms	100 Arms
AC56a @ Ta=25°C	10 Arms	20 Arms	25 Arms	30 Arms
Min. operational current	150 mA	250 mA	400 mA	500 mA
Rep. overload current t=1 s	55 Arms	125 Arms	150 Arms	200 Arms
Non-rep. surge current t=10 ms	325 A_p	600 A_p	1150 A_p	1900 A_p
Off-state leakage current @ rated voltage and frequency	< 3 mA	< 3 mA	< 3 mA	< 3 mA
I^2t for fusing t=10 ms	< 525 A^2s	< 1800 A^2s	< 6600 A^2s	< 18000 A^2s
On-state voltage drop @ rated current	1.4 Vrms	1.4 Vrms	1.4 Vrms	1.4 Vrms
Critical dV/dt off-state min.	1000 V/µs	1000 V/µs	1000 V/µs	1000 V/µs

Dimensions



All dimensions in mm

Isolation

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

Thermal Specifications

Operating temperature range	-30° to +80°C
Storage temperature range	-40° to +100°C
Junction temperature	< 125°C

Housing Specifications

Weight	
25A, 50A	Approx. 60g
75A, 100A	Approx. 100g
Housing material	Noryl GFN 1, black
Baseplate	
25A, 50A	Aluminium
75A, 100A	Copper, nickel-plated
Potting compound	None

Relay	
Mounting screws	M5
Mounting torque	1.5-2.0Nm
Control terminal	
Mounting screws	M3 x 9
Mounting torque	0.5Nm
Power terminal	
Mounting screws	M5 x 9
Mounting torque	2.4Nm

Heatsink Dimensions (load current versus ambient temperature)

RM1C...25

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
25.0	2.70	2.34	1.98	1.61	1.25	0.89	28
22.5	3.10	2.69	2.28	1.86	1.45	1.04	24
20.0	3.61	3.13	2.65	2.18	1.70	1.23	21
17.5	4.26	3.70	3.14	2.59	2.03	1.47	18
15.0	5.14	4.47	3.80	3.14	2.47	1.80	15
12.5	6.38	5.56	4.73	3.91	3.09	2.27	12
10.0	8.25	7.19	6.14	5.08	4.02	2.97	9
7.5	11.4	9.94	8.49	7.04	5.59	4.14	7
5.0	17.7	15.4	13.2	11.0	8.74	6.51	4
2.5	-	-	-	-	18.2	13.6	2
	20	30	40	50	60	70	T_A Ambient temp. [°C]

Junction to ambient thermal resistance, $R_{th\ j\text{-}a}$	< 20.0	K/W
Junction to case thermal resistance, $R_{th\ j\text{-}c}$	< 0.80	K/W
Case to heatsink thermal resistance, $R_{th\ c\text{-}s}$	< 0.20	K/W
Maximum allowable case temperature	100	deg.C
Maximum allowable junction temperature	125	deg.C

RM1C...50

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
50.0	1.03	0.86	0.70	0.53	0.37	0.20	61
45.0	1.27	1.09	0.90	0.71	0.52	0.33	53
40.0	1.54	1.32	1.10	0.89	0.67	0.45	46
35.0	1.85	1.59	1.34	1.08	0.82	0.57	39
30.0	2.26	1.95	1.65	1.34	1.03	0.72	33
25.0	2.85	2.47	2.08	1.70	1.32	0.94	26
20.0	3.73	3.24	2.75	2.26	1.77	1.27	20
15.0	5.22	4.54	3.86	3.19	2.51	1.83	15
10.0	8.21	7.16	6.11	5.05	4.00	2.95	10
5.0	17.2	15.0	12.9	10.7	8.51	6.33	5
	20	30	40	50	60	70	T_A Ambient temp. [°C]

Junction to ambient thermal resistance, $R_{th\ j\text{-}a}$	< 20.0	K/W
Junction to case thermal resistance, $R_{th\ j\text{-}c}$	< 0.50	K/W
Case to heatsink thermal resistance, $R_{th\ c\text{-}s}$	< 0.20	K/W
Maximum allowable case temperature	100	deg.C
Maximum allowable junction temperature	125	deg.C

RM1.60..50

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
50.0	0.99	0.81	0.63	0.44	0.26	0.08	55
45.0	1.28	1.07	0.86	0.65	0.44	0.23	48
40.0	1.64	1.40	1.15	0.91	0.67	0.42	41
35.0	2.11	1.82	1.54	1.25	0.96	0.67	35
30.0	2.60	2.25	1.90	1.55	1.20	0.85	29
25.0	3.30	2.86	2.43	1.99	1.55	1.11	23
20.0	4.36	3.79	3.22	2.65	2.08	1.51	18
15.0	6.1	5.4	4.6	3.77	2.97	2.18	13
10.0	9.76	8.52	7.3	6.0	4.8	3.54	8
5.0	--	--	15.47	12.85	10.24	7.6	4
	20	30	40	50	60	70	T_A Ambient temp. [°C]

Junction to ambient thermal resistance, $R_{th\ j\text{-}a}$	< 20.0	K/W
Junction to baseplate case thermal resistance, $R_{th\ j\text{-}c}$	< 0.72	K/W
Case to heatsink thermal resistance, $R_{th\ c\text{-}s}$	< 0.20	K/W
Maximum allowable heatsink temperature	100	deg.C
Maximum allowable junction temperature	125	deg.C

RM1C...75

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
75.0	0.91	0.78	0.65	0.52	0.39	0.26	77
67.5	1.10	0.96	0.81	0.66	0.51	0.36	68
60.0	1.34	1.17	1.00	0.83	0.66	0.49	59
52.5	1.60	1.40	1.20	1.00	0.80	0.60	50
45.0	1.93	1.68	1.44	1.20	0.96	0.72	42
37.5	2.38	2.08	1.78	1.49	1.19	0.89	34
30.0	3.06	2.68	2.30	1.91	1.53	1.15	26
22.5	4.21	3.68	3.16	2.63	2.10	1.58	19
15.0	6.51	5.70	4.88	4.07	3.26	2.44	12
7.5	13.5	11.77	10.09	8.41	6.73	5.04	6
	20	30	40	50	60	70	T_A Ambient temp. [°C]

Junction to ambient thermal resistance, $R_{th\ j\text{-}a}$	< 20.0	K/W
Junction to case thermal resistance, $R_{th\ j\text{-}c}$	< 0.35	K/W
Case to heatsink thermal resistance, $R_{th\ c\text{-}s}$	< 0.10	K/W
Maximum allowable heatsink temperature	100	deg.C
Maximum allowable junction temperature	125	deg.C

Heatsink Dimensions
(load current versus ambient temperature) cont.

RM1C...100

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
100.0	0.54	0.45	0.36	0.27	0.18	0.09	111
90.0	0.68	0.58	0.47	0.37	0.27	0.17	97
80.0	0.86	0.74	0.62	0.50	0.38	0.26	84
70.0	1.08	0.94	0.80	0.66	0.52	0.38	71
60.0	1.37	1.20	1.03	0.85	0.68	0.51	59
50.0	1.70	1.49	1.28	1.06	0.85	0.64	47
40.0	2.21	1.93	1.66	1.38	1.10	0.83	36
30.0	3.06	2.68	2.30	1.91	1.53	1.15	26
20.0	4.78	4.18	3.59	2.99	2.39	1.79	17
10.0	9.98	8.73	7.49	6.24	4.99	3.74	8
	20	30	40	50	60	70	T_A

Ambient temp. [°C]

Junction to ambient thermal resistance, $R_{th\ j\text{-}a}$	< 20.0	K/W
Junction to case thermal resistance, $R_{th\ j\text{-}c}$	< 0.30	K/W
Case to heatsink thermal resistance, $R_{th\ c\text{-}s}$	< 0.10	K/W
Maximum allowable heatsink temperature	100	deg.C
Maximum allowable junction temperature	125	deg.C

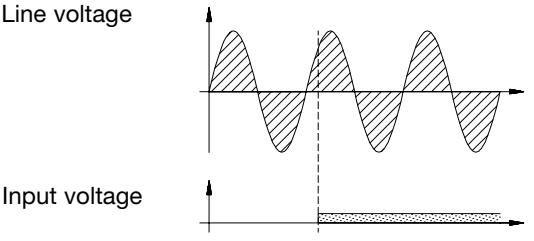
Heatsink Selection

Carlo Gavazzi Heatsink (see Accessories)	**Thermal resistance...**	**...for power dissipation**
No heatsink required	---	N/A
RHS 300	5.00 K/W	> 0 W
RHS 100	3.00 K/W	> 25 W
RHS 45C	2.70 K/W	> 60 W
RHS 45B	2.00 K/W	> 60 W
RHS 90A	1.35 K/W	> 60 W
RHS 45C plus fan	1.25 K/W	> 0 W
RHS 45B plus fan	1.20 K/W	> 0 W
RHS 112A	1.10 K/W	> 100 W
RHS 301	0.80 K/W	> 70 W
RHS 90A plus fan	0.45 K/W	> 0 W
RHS 112A plus fan	0.40 K/W	> 0 W
RHS 301 plus fan	0.25 K/W	> 0 W
Consult your distribution	> 0.25 K/W	N/A
Infinite heatsink - No solution	---	N/A

Applications

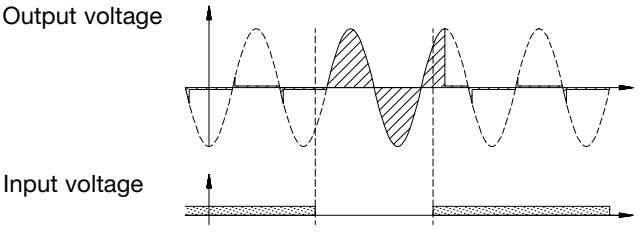
Timing

Initial turn-on
The line voltage must be present at least 1 period before the input voltage is applied.



Min. 1 period

Repetitive turn-on
The input voltage must be lower than the drop out voltage limit at least 1 period before it is reapplied.

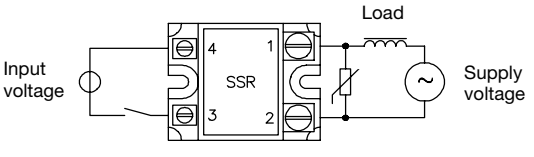


Min. 1 period

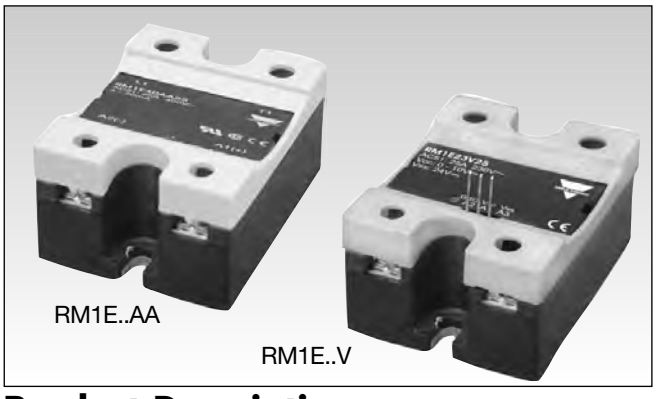
Overvoltage protection

As transformers can have varying stray inductances and stray capacitances, it is always advisable to use external overvoltage protection.

Varistor diameter: ≤ 20 mm
Varistor voltage for 400 V SSR: 460 VAC (RV 02)
Varistor voltage for 600V SSR: 680 VAC (RV 05)



Solid State Relays
Industrial, 1-Phase Analog Switching
Type RM1E



- **AC Solid State Relay**
- **Analog switching (phase-angle control) for resistive and slightly inductive load applications**
- **4 - 20mA or 0 -10V control input**
- **Rated operational current: 25, 50 and 100 AACrms**
- **Rated operational voltage: Up to 600 VACrms**
- **Variable intensity LED-indication according to input current**
- **Integral snubber network**

Product Description

The analog switching relay works in accordance with the phase angle control principle, i.e., the output switching point in the AC sine wave depends on the control input which can be either 4-20mA or 0-10VDC. 4 mA or 0VDC correspond to zero output power whilst 20 mA or 10VDC correspond to full output power (near linear power response). The relay switches off every time the output current crosses zero, and switches ON in accordance with the applied control input.

Ordering Key

RM 1E 60 AA 50

- **Solid State Relay**
- **Number of Poles**
- **Switching mode**
- **Rated operational voltage**
- **Control input**
- **Rated operational current**

Type Selection

Switching mode	Rated operational voltage	Rated operational current	Control input
E: Analog switching	23: 230 VACrms* 40: 400 VACrms 48: 480 VACrms 60: 600 VACrms	25: 25 AACrms 50: 50 AACrms 100: 100 AACrms	AA: 4 - 20 mADC V: 0-10VDC**

* For nominal operational voltage of 110VACrms, use RM1E23...
** RM1E..V.. require an external supply voltage

Selection Guide

Rated operational voltage	Blocking voltage	Control input	Rated operational current 25 A	50 A	100 A
230 VAC	650 V_p	4 - 20 mA	**RM1E23AA25**	**RM1E23AA50**	**RM1E23AA100**
		0-10 VDC	**RM1E23V25**	**RM1E23V50**	**RM1E23V100**
400 VAC	850 V_p	4 - 20 mA	**RM1E40AA25**	**RM1E40AA50**	**RM1E40AA100**
480 VAC	1200 V_p	4 - 20 mA	**RM1E48AA25**	**RM1E48AA50**	**RM1E48AA100**
		0-10 VDC	**RM1E48V25**	**RM1E48V50**	**RM1E48V100**
600 VAC	1400 V_p	4 - 20 mA	**RM1E60AA25**	**RM1E60AA50**	**RM1E60AA100**
		0-10 VDC	**RM1E60V25**	**RM1E60V50**	**RM1E60V100**

General Specifications

	RM 1E 23 ...	RM 1E 40 ...	RM 1E 48 ...	RM 1E 60 ...
Operational voltage range				
RM1E..AA..	90 to 280 VAC	340 to 460 VAC	90 to 550 VAC	410 to 660 VAC
RM1E..V..	90 to 265 VAC	-	200 to 550 VAC	410 to 660 VAC
Blocking voltage	650 V_p	850 V_p	1200 V_p	1400 V_p
Operational frequency range	45 to 65 Hz	45 to 65 Hz	45 to 65 Hz	45 to 65 Hz
Power factor	> 0.75	> 0.75	> 0.75	> 0.75
Approvals	UL, cUL, CSA*	UL, cUL, CSA*	UL, cUL, CSA*	UL, cUL, CSA*
CE-marking	Yes	Yes	Yes	Yes**

* Approvals pending for RM1E..V...
** Heatsink must be connected to ground for 600V types

Output Specifications

	RM1E...25	RM1E...50	RM1E...100
Rated operational current			
AC51 Ta=25 ˚C	25 AACrms	50 AACrms	100 AACrms
AC53a Ta=25 ˚C	5 AACrms	15 AACrms	20 AACrms
Minimum operational current	150 mA	250 mA	400 mA
Rep. overload current t=1s	55 AACrms	125 AACrms	150 AACrms
Non-rep. surge current t=10ms	325 A_p	600 A_p	1150 A_p
Off-state leakage current	< 3 mA	< 3 mA	< 3 mA
I^2t for fusing t= 10 ms	525 A^2s	1800 A^2s	6600 A^2s
Critical dV/dt off-state min.	1000 V/µs	1000 V/µs	1000 V/µs

Input Specifications

Current controlled input	RM1E..AA..
Control current range (A1-A2)	4-20 mADC
Pick up current	4.2 mADC
Drop out current	4.1 mADC
Response time (input to output)	≤ 20 ms
Voltage drop	< 10 VDC @ 20 mA
Dynamic impedance	≥ 330 Ω
Max. allowable input current	50 mA
Reverse polarity protected	Yes

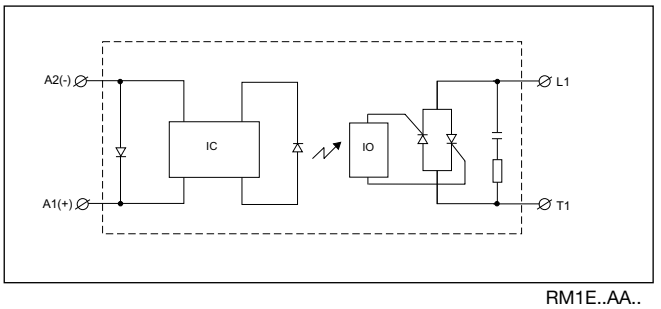
Voltage controlled input	RM1E..V..
Supply voltage, Vss (A3-A2)	24 VDC ±20%
Max. supply current	15 mA @ 19.2 VDC 20 mA @ 30 VDC
Control voltage, Vcc (A1-A2)	0-10VDC
Pick up voltage	0.2 VDC
Drop out voltage	0.1VDC
Control input current	0.15 mA @10 VDC
Response time (input to output)	≤ 20 ms
Supply reverse protected	Yes

Note: The use of twisted pair cable for the control input is recommended

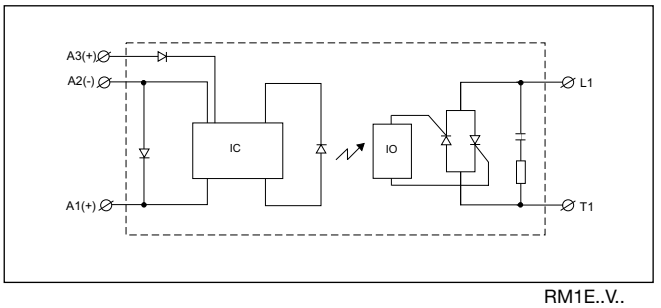
Housing Specifications

Weight	
25 A, 50 A	Approx. 60 g
100 A	Approx. 100 g
Housing material	Noryl, black
Baseplate	
25 A, 50 A	Aluminium
100 A	Copper, nickel-plated
Relay	
Mounting screws	M5
Mounting torque	1.5-2.0 Nm
Power terminal	
Mounting screws	M5 x 9mm
Mounting torque	2.4 Nm
Control terminal (RM1E..AA..)	
Mounting screws	M3 x 9mm
Mounting torque	0.5 Nm
Control terminal (RM1E..V..)	3 pin connector 0.64mm square pin with 2.54mm centre distance, gold plated brass

Functional Diagram



RM1E..AA..



RM1E..V..

Note: The supply circuit in the RM1E..V versions is provided with reverse protection in case the female connector is reversed so as to have a reverse voltage applied to terminals A1-A3. No reverse protection is provided on the control and hence the terminal markings indicated should be respected to avoid any damage to the device.

Thermal Specifications

Operating temperature	-20° to +70°C	(4° to +158 °F)
Storage temperature	-20° to +100°C	(-4° to +212 °F)
Junction temperature	≤125°C	(257 °F)

Isolation

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

Heatsink Dimensions (load current versus ambient temperature)

With the output fully ON (360° conduction angle)

RM1E..25

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
25.0	3.23	2.80	2.37	1.94	1.51	1.09	23
22.5	3.70	3.21	2.73	2.24	1.75	1.26	21
20.0	4.30	3.74	3.17	2.61	2.05	1.49	18
17.5	5.07	4.41	3.76	3.10	2.44	1.78	15
15.0	6.12	5.33	4.54	3.75	2.96	2.17	13
12.5	7.58	6.61	5.64	4.66	3.69	2.72	10
10.0	9.80	8.55	7.30	6.05	4.80	3.55	8
7.5	13.5	11.80	10.09	8.37	6.66	4.94	6
5.0	-	18.3	15.7	13.04	10.39	7.74	4
2.5	-	-	-	-	-	7	2
	20	30	40	50	60	70	T_A

Ambient temp. [°C]

RM1E..50

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
50.0	1.25	1.07	0.88	0.70	0.52	0.34	55
45.0	1.46	1.25	1.04	0.84	0.63	0.42	48
40.0	1.73	1.49	1.25	1.01	0.77	0.52	41
35.0	2.08	1.80	1.51	1.23	0.94	0.66	35
30.0	2.56	2.22	1.87	1.53	1.18	0.84	29
25.0	3.24	2.81	2.38	1.95	1.52	1.09	23
20.0	4.26	3.71	3.15	2.59	2.03	1.47	18
15.0	5.99	5.22	4.45	3.67	2.90	2.12	13
10.0	9.49	8.27	7.06	5.85	4.64	3.43	8
5.0	-	17.5	15.0	12.4	9.91	7.39	4
	20	30	40	50	60	70	T_A

Ambient temp. [°C]

RM1.60..50

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
50.0	0.99	0.81	0.63	0.44	0.26	0.08	55
45.0	1.28	1.07	0.86	0.65	0.44	0.23	48
40.0	1.64	1.40	1.15	0.91	0.67	0.42	41
35.0	2.11	1.82	1.54	1.25	0.96	0.67	35
30.0	2.60	2.25	1.90	1.55	1.20	0.85	29
25.0	3.30	2.86	2.43	1.99	1.55	1.11	23
20.0	4.36	3.79	3.22	2.65	2.08	1.51	18
15.0	6.1	5.4	4.6	3.77	2.97	2.18	13
10.0	9.76	8.52	7.3	6.0	4.8	3.54	8
5.0	--	--	15.47	12.85	10.24	7.6	4
	20	30	40	50	60	70	T_A

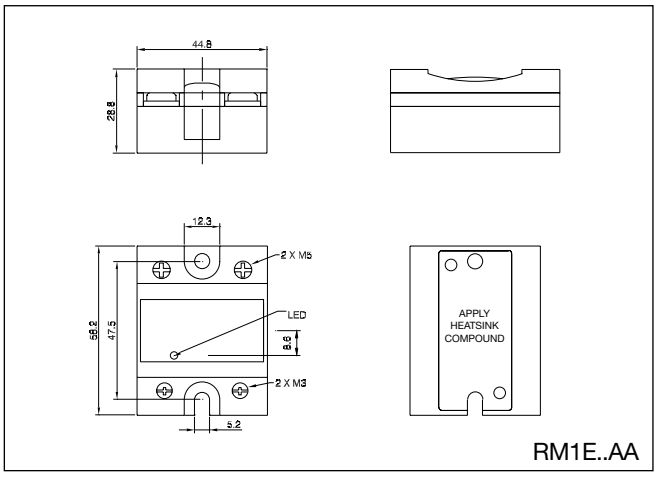
Ambient temp. [°C]

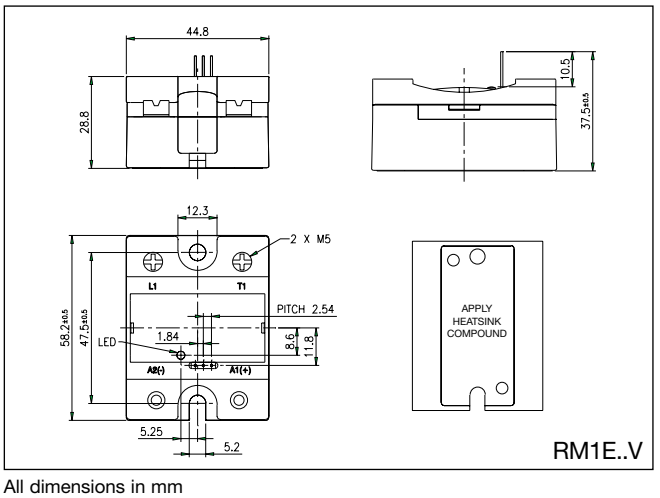
RM1E..100

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
100.0	0.60	0.52	0.43	0.34	0.26	0.17	117
90.0	0.74	0.64	0.54	0.44	0.34	0.24	101
80.0	0.91	0.79	0.68	0.56	0.45	0.33	87
70.0	1.09	0.96	0.82	0.68	0.55	0.41	73
60.0	1.33	1.16	1.00	0.83	0.66	0.50	60
50.0	1.66	1.45	1.24	1.04	0.83	0.62	48
40.0	2.16	1.89	1.62	1.35	1.08	0.81	37
30.0	3.01	2.64	2.26	1.88	1.51	1.13	27
20.0	4.73	4.14	3.55	2.96	2.37	1.78	17
10.0	9.94	8.70	7.45	6.21	4.97	3.73	8
	20	30	40	50	60	70	T_A

Ambient temp. [°C]

Dimensions





All dimensions in mm

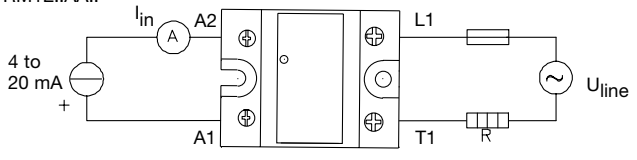
Heatsink Selection

Carlo Gavazzi Heatsink (see Accessories)	**Thermal resistance...**	**..for power dissipation**
No heatsink required	----	N/A
RHS 300	5.00 K/W	> 0 W
RHS 100	3.00 K/W	> 25 W
RHS 45C	2.70 K/W	> 55 W
RHS 45B	2.00 K/W	> 60 W
RHS 90A	1.35 K/W	> 60 W
RHS 45C plus fan	1.25 K/W	> 0 W
RHS 45Bplus fan	1.20 K/W	> 0 W
RHS 112A	1.10 K/W	> 100 W
RHS 301	0.80 K/W	> 80 W
RHS 90A plus fan	0.45 K/W	> 0 W
RHS 112A plus fan	0.40 K/W	> 0 W
RHS 301 plus fan	0.25 K/W	> 0 W
Consult your distributor	< 0.25 K/W	N/A
Infinite heatsink - No solution	---- K/W	N/A

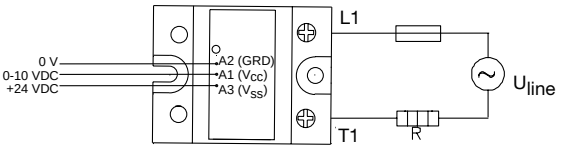
Note: For power dissipation values smaller than those shown above, please refer to the corresponding heatsink curve in the SSR Accessories Section is referred to.

Applications

RM1E..AA..



RM1E..V..



Transfer Characteristics

Output power as a function of control input

Control current (mA)	**Control voltage (VDC)**	**Output power**
4	0	0
8	2.5	25
12	5	50
16	7.5	75
20	10	99

This relay is suitable for control of heaters, lighting and slightly inductive loads such as small fans. The relay can also be used for soft turn-on of high-power incandescent lamps.

Solid State Relays
Industrial, 1-Phase ZS (IO) w. LED
Types RAM1A, RAM1B

- **Zero switching (RAM1A) or instant-on switching (RAM1B) AC Solid State Relay**
- **Direct copper bonding (DCB) technology**
- **LED indication**
- **Clip-on IP 20 protection cover**
- **Self-lifting terminals**
- **Housing free of moulding mass**
- **2 input ranges: 3-32 * and 20-280 VAC/22-48VDC**
- **Operational ratings: Up to 125AACrms and 600VACrms**
- **Blocking voltage: Up to 1600V_p**
- **Opto-isolation: > 4000VACrms**
- **Integrated overvoltage protection by self switching (suffix "Z" option)**

Product Description

The industrial, 1-phase relay with antiparallel thyristor output is the most widely used industrial SSR due to its multiple application possibilities. The relay can be used for resistive, inductive and capacitive loads. The zero switching relay switches ON when the sinusoidal curve crosses zero and switches OFF when the current crosses zero. The instant-on relay with DC control input can be used for phase angle control. The built-in snubber secures transient protection. The LED indicates the status of the control input. The clip-on cover secures touch protection (IP 20). Protected output terminals can handle cables up to 16 mm^2.

Ordering Key

RAM 1 A 60 D 125 Z

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

Type Selection

Switching mode	Rated operational voltage	Control voltage	Rated operational current	Options
A: Zero Switching B: Instant-on switching (DC Control only)	23: 230VACrms 60: 600VACrms 69: 690VACrms	A: 20-280 VAC/22-48VDC D: 3 - 32VDC* * 4 to 32VDC for RAM1A60..., RAM1A69... * 4 to 32VDC for RAM1B types	25 : 25AACrms 50 : 50AACrms 75 : 75AACrms 100:100AACrms 125:125AACrms	Z: Overvoltage protection (self-switching)

Selection Guide

Rated operational voltage	Blocking voltage	Control voltage	Rated operational current 25A	50A	75A	100A	125A
230VACrms	650V_p	3 - 32VDC	**RAM1A23D25**	**RAM1A23D50**	**RAM1A23D75**	**RAM1A23D100**	**RAM1A23D125**
		20-280VAC/22-48VDC	**RAM1A23A25**	**RAM1A23A50**	**RAM1A23A75**	**RAM1A23A100**	**RAM1A23A125**
600VACrms	1200V_p	4 - 32VDC	**RAM1A60D25**	**RAM1A60D50**	**RAM1A60D75**	**RAM1A60D100**	**RAM1A60D125**
		20-280VAC/22-48VDC	**RAM1A60A25**	**RAM1A60A50**	**RAM1A60A75**	**RAM1A60A100**	**RAM1A60A125**
690VACrms	1600V_p	4-32VDC	-	-	**RAM1A69D75**	**RAM1A69D100**	**RAM1A69D125**
		20-280VAC/ 22-48VDC	-	-	**RAM1A69A75**	**RAM1A69A100**	**RAM1A69A125**

Options

1 Overvoltage protection by self-switching: add suffix Z to include. Example: RAM1A60D25Z. Not applicable for 690V version.

General Specifications

	RAM1.23..	RAM1.60..	RAM1.69..
Operational voltage range			
RAM1A...	24 to 265VACrms	42 to 660VACrms	42 to 760VACrms
RAM1B...	42 to 265VACrms	42 to 660VACrms	42 to 760VACrms
Blocking voltage	≥ 650V_p	≥ 1200V_p	≥ 1600V_p
Zero voltage turn-on	≤ 10V	≤ 10V	≤ 10V
Operational frequency range	45 to 65Hz	45 to 65Hz	45 to 65Hz
Power factor	> 0.5 @ 230VACrms	> 0.5 @ 600VACrms	> 0.5 @ 690VACrms
Approvals	UL, cUL, CSA, VDE*	UL, cUL, CSA, VDE*	-
CE-marking	Yes	Yes**	Yes**

* VDE0805

** Heatsink must be conected to ground

Input Specifications

	RAM1...D..	RAM1...A..
Control voltage range		
RAM1A23...	3-32VDC	20-280VAC, 22-48VDC
RAM1A60..., RAM1A69...	4-32VDC	20-280VAC, 22-48VDC
RAM1B...	4-32VDC	-
Pick-up voltage @ Ta = 25°C		
RAM1A23...	2.5VDC	18VAC/DC
RAM1A60..., RAM1A69...	3.5VDC	18VAC/DC
RAM1B...	3.5VDC	-
Reverse voltage	32VDC	-
Drop out voltage	1.2VDC	6VAC/DC
Input current @ max input voltage		
RAM1A	≤ 12mA	≤ 20mA
RAM1B	≤ 15mA	-
Response time pick-up		
RAM1A	≤ 1/2 cycle	≤ 12ms
RAM1B	≤ 0.1ms	-
Response time drop-out	≤ 1/2 cycle	≤ 40ms

Output Specifications

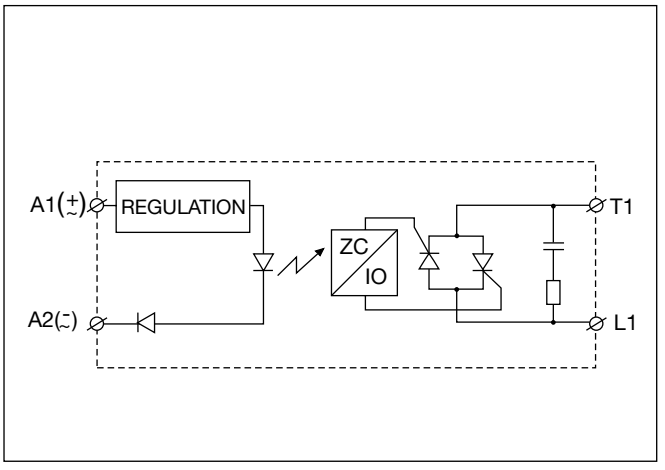
	RAM1...25	RAM...50	RAM1...75	RAM1...100	RAM...125
Rated operational current					
AC51 @ Ta=25°C	25Arms	50Arms	75Arms	100Arms	125Arms
AC53a @ Ta=25°C	5Arms	15Arms	17Arms	20Arms	30Arms
Min. operational current	150mA	250mA	400mA	400mA	500mA
Rep. overload current t=1 s	< 55AACrms	< 125AACrms	< 130 AACrms	< 150 AACrms	< 200AACrms
Non-rep. surge current t=10 ms	325A_p	600A_p	800A_p	1150A_p	1900A_p
Off-state leakage current @ rated voltage and frequency	< 3mArms	< 3mArms	< 3mArms	< 3mArms	< 3mArms
I^2t for fusing t= 10 ms	< 520A^2s	< 1800A^2s	< 3200A^2s	< 6600A^2s	<18000A^2s
On-state voltage drop	≤ 1.6Vrms	≤ 1.6Vrms	≤ 1.6Vrms	≤ 1.6Vrms	≤ 1.6Vrms
Critical dV/dt off-state min.	1000V/µs	1000V/µs	1000V/µs	1000V/µs	1000V/µs

Housing Specifications

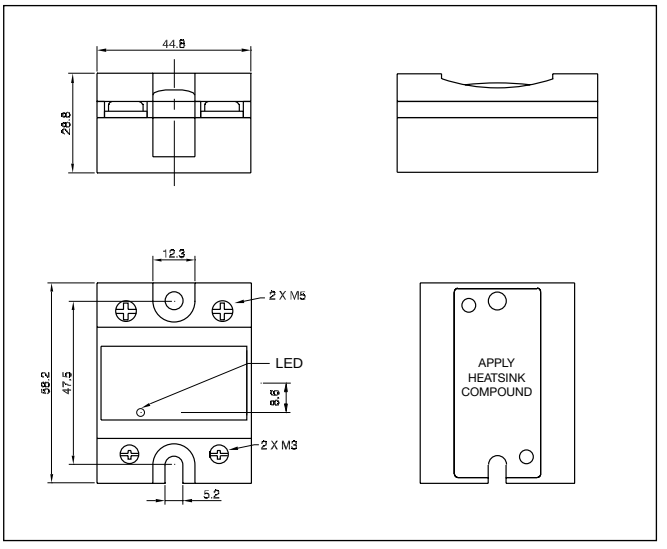
Weight	
25A, 50A	Approx. 60g
75A, 100A, 125A	Approx. 100g
Housing material	Noryl, black
Baseplate	
25A, 50A	Aluminium
75A, 100A, 125A	Copper, nickel-plated

Relay	
Mounting screws	M5
Mounting torque	1.5-2.0Nm
Control terminal	
Mounting screws	M3 x 9
Mounting torque	0.5Nm
Power terminal	
Mounting screws	M5 x 9
Mounting torque	2.4Nm

Functional Diagram



Dimensions



All dimensions in mm.

Heatsink Dimensions (load current versus ambient temperature)

RAM..25

Load current [A]	Thermal resistance [K/W]							Power dissipation [W]
25.0	3.23	2.80	2.37	1.94	1.51	1.09	0.66	23
22.5	3.70	3.21	2.73	2.24	1.75	1.26	0.78	21
20.0	4.30	3.74	3.17	2.61	2.05	1.49	0.92	18
17.5	5.07	4.41	3.76	3.10	2.44	1.78	1.12	15
15.0	6.12	5.33	4.54	3.75	2.96	2.17	1.38	13
12.5	7.58	6.61	5.64	4.66	3.69	2.72	1.75	10
10.0	9.80	8.55	7.30	6.05	4.80	3.55	2.30	8
7.5	13.5	11.80	10.09	8.37	6.66	4.94	3.23	6
5.0	-	18.3	15.7	13.04	10.39	7.74	5.09	4
2.5	-	-	-	-	-	16.2	10.7	2
	20	30	40	50	60	70	80	T_A

Ambient temp. [°C]

RAM..50

Load current [A]	Thermal resistance [K/W]							Power dissipation [W]
50.0	1.25	1.07	0.88	0.70	0.52	0.34	0.16	55
45.0	1.46	1.25	1.04	0.84	0.63	0.42	0.21	48
40.0	1.73	1.49	1.25	1.01	0.77	0.52	0.28	41
35.0	2.08	1.80	1.51	1.23	0.94	0.66	0.37	35
30.0	2.56	2.22	1.87	1.53	1.18	0.84	0.49	29
25.0	3.24	2.81	2.38	1.95	1.52	1.09	0.66	23
20.0	4.26	3.71	3.15	2.59	2.03	1.47	0.92	18
15.0	5.99	5.22	4.45	3.67	2.90	2.12	1.35	13
10.0	9.49	8.27	7.06	5.85	4.64	3.43	2.22	8
5.0	-	17.5	15.0	12.4	9.91	7.39	4.86	4
	20	30	40	50	60	70	80	T_A

Ambient temp. [°C]

Heatsink Dimensions (cont.)

RAM..75

Load current [A]	Thermal resistance [K/W]							Power dissipation [W]
75.0	0.94	0.82	0.70	0.58	0.47	0.35	0.23	85
67.5	1.10	0.96	0.82	0.69	0.55	0.41	0.27	73
60.0	1.30	1.14	0.98	0.81	0.65	0.49	0.33	61
52.5	1.57	1.38	1.18	0.98	0.79	0.59	0.39	51
45.0	1.95	1.70	1.46	1.22	0.97	0.73	0.49	41
37.5	2.48	2.17	1.86	1.55	1.24	0.93	0.62	32
30.0	3.32	2.90	2.49	2.07	1.66	1.24	0.83	24
22.5	4.75	4.15	3.56	2.97	2.37	1.78	1.19	17
15.0	7.68	6.72	5.76	4.80	3.84	2.88	1.92	10
7.5	-	14.59	12.50	10.42	8.34	6.25	4.17	5
	20	30	40	50	60	70	80	T_A

Ambient temp. [°C]

RAM..100

Load current [A]	Thermal resistance [K/W]							Power dissipation [W]
100.0	0.60	0.52	0.43	0.34	0.26	0.17	0.09	117
90.0	0.74	0.64	0.54	0.44	0.34	0.24	0.14	101
80.0	0.91	0.79	0.68	0.56	0.45	0.33	0.22	87
70.0	1.09	0.96	0.82	0.68	0.55	0.41	0.27	73
60.0	1.33	1.16	1.00	0.83	0.66	0.50	0.33	60
50.0	1.66	1.45	1.24	1.04	0.83	0.62	0.41	48
40.0	2.16	1.89	1.62	1.35	1.08	0.81	0.54	37
30.0	3.01	2.64	2.26	1.88	1.51	1.13	0.75	27
20.0	4.73	4.14	3.55	2.96	2.37	1.78	1.18	17
10.0	9.94	8.70	7.45	6.21	4.97	3.73	2.48	8
	20	30	40	50	60	70	80	T_A

Ambient temp. [°C]

RAM..125

Load current [A]	Thermal resistance [K/W]							Power dissipation [W]
125.0	0.63	0.55	0.47	0.40	0.32	0.24	0.16	126
112.5	0.73	0.64	0.54	0.45	0.36	0.27	0.18	110
100.0	0.84	0.74	0.63	0.53	0.42	0.32	0.21	95
87.5	0.99	0.87	0.74	0.62	0.50	0.37	0.25	81
75.0	1.20	1.05	0.90	0.75	0.60	0.45	0.30	67
62.5	1.48	1.30	1.11	0.93	0.74	0.56	0.37	54
50.0	1.92	1.68	1.44	1.20	0.96	0.72	0.48	42
37.5	2.65	2.32	1.98	1.65	1.32	0.99	0.66	30
25.0	4.12	3.60	3.09	2.57	2.06	1.54	1.03	19
12.5	8.55	7.48	6.41	5.34	4.27	3.21	2.14	9
	20	30	40	50	60	70	80	T_A

Ambient temp. [°C]

Heatsink Selection

Carlo Gavazzi Heatsink (see Accessories)	Thermal resistance...	for power dissipation
No heatsink required	---	N/A
RHS 300	5.00 K/W	> 0 W
RHS 100	3.00 K/W	> 25 W
RHS 45C	2.70 K/W	> 55 W
RHS 45B	2.00 K/W	> 60 W
RHS 90A	1.35 K/W	> 60 W
RHS 45C plus fan	1.25 K/W	> 0 W
RHS 45B plus fan	1.20 K/W	> 0 W
RHS 112A	1.10 K/W	> 100 W
RHS 301	0.80 K/W	> 80 W
RHS 90A plus fan	0.45 K/W	> 0 W
RHS 112A plus fan	0.40 K/W	> 0 W
RHS 301 plus fa	0.25 K/W	> 0 W
Consult your distribution	> 0.25 K/W	N/A
Infinite heatsink - No solution	---	N/A

Thermal Specifications

Operating temperature	-40° to +80°C (-40° to +176°F)
Storage temperature	-40° to +100°C (-40° to +212°F)
Junction temperature	≤ 125°C (257°F)

Isolation

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

Faston terminals

- Faston tabs
- Tab dimensions according to DIN 46342 part 1
- Pure tin-plated brass

Ordering Key

Screw mounted Faston terminals — **RAM1A60D25 | F 4***

- RAM Solid State Relay
- Faston terminals
- Tab orientation

Input Tab width: 4.8mm
Output Tab width: 6.3mm

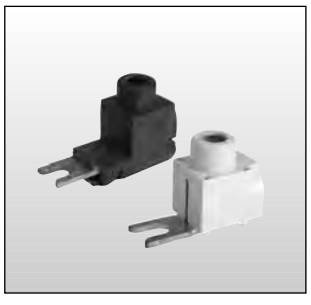
Faston terminals in packs of 20 — **RM48** | **F4***

- RS, RM Solid State Relay
- Tab orientation

*** 0: Flat (0º)**
4: Angled (45º)

**** 48: 4.8mm faston for input**
63: 6.3mm faston for output

Fork Terminals



- Terminal adaptors for 35mm^2 cable
- Type RM635FK
- Pack size: 10 pieces

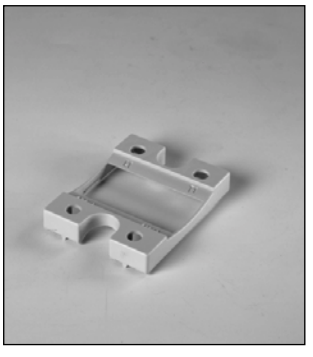
Ordering Key

RM635FK | P

- RM terminal adaptor
- Touch protected (optional)

Other Accessories

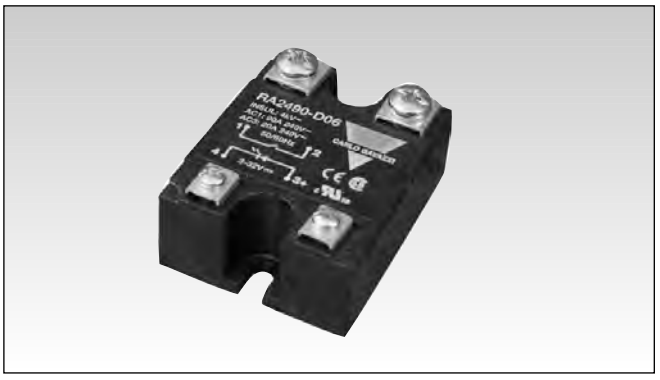
- Heatsinks and fans
- Type RHS....
- 0.25 to 5.00 k/W
- Single and dual relay types



- Touch safety cover
- Type RMIP20
- IP20 protection degree
- Pack size: 20 pieces

All accessories can be ordered pre-assembled with Solid State Relays.
Other accessories include DIN rail adaptors, fuses, varistors and spacers.
For futher information refer to Accessories datasheets.

Solid State Relays
Industrial, 1-Phase ZS, Standard Range
Types RA 24.. .. 06/RA 44.. .. 08/RA 48.. .. 12



- **AC Solid State Relay**
- **Zero switching**
- **Direct copper bonding technology**
- **Rated operational current: 10, 25, 50 and 90 AACrms**
- **Blocking voltage: Up to 1200 V_p**
- **Rated operational voltage: Up to 480 VACrms**
- **3 input ranges: 3 to 32 VDC, 10 to 90 VAC/DC and 90 to 280 VAC/DC**
- **Isolation: OPTO (input-output) 4000 VACrms**

Product Description

The zero switching relay with antiparallel thyristor output is the most widely used industrial SSR due to its multiple application possibilities. The relay can be used for resistive, inductive and capacitive loads. The zero switching relay switches ON when the sine curve just crosses zero and switches OFF when the current crosses zero.

Ordering Key

RA 24 10 LA 06

- **Solid State Relay**
- **Switching mode**
- **Rated operational voltage**
- **Rated operational current**
- **Control voltage**
- **Blocking voltage**

Type Selection

Switching mode	Rated operational voltage	Rated operational current	Control voltage	Blocking voltage
A: Zero switching	24: 230 VACrms 44: 400 VACrms 48: 480 VACrms	10: 10 AACrms 25: 25 AACrms 50: 50 AACrms 90: 90 AACrms	-D: 3 to 32 VDC LA: 10 to 90 VAC/DC HA: 90 to 280 VAC/DC	06: 650 V_p 08: 850 V_p 12: 1200 V_p

Selection Guide

Rated operational voltage	Blocking voltage	Control voltage	Rated operational current 10 AACrms	25 AACrms	50 AACrms	90 AACrms
230 VACrms	650 V_p	3 to 32 VDC	**RA 2410 -D 06**	**RA 2425 -D 06**	**RA 2450 -D 06**	**RA 2490 -D 06**
		10 to 90 VAC/DC	**RA 2410 LA 06**	**RA 2425 LA 06**	**RA 2450 LA 06**	**RA 2490 LA 06**
		90 to 280 VAC/DC	**RA 2410 HA 06**	**RA 2425 HA 06**	**RA 2450 HA 06**	**RA 2490 HA 06**
400 VACrms	850 V_p	3 to 32 VDC	**RA 4410 -D 08**	**RA 4425 -D 08**	**RA 4450 -D 08**	**RA 4490 -D 08**
		10 to 90 VAC/DC	**RA 4410 LA 08**	**RA 4425 LA 08**	**RA 4450 LA 08**	**RA 4490 LA 08**
		90 to 280 VAC/DC	**RA 4410 HA 08**	**RA 4425 HA 08**	**RA 4450 HA 08**	**RA 4490 HA 08**
480 VACrms	1200 V_p	3 to 32 VDC	**RA 4810 -D 12**	**RA 4825 -D 12**	**RA 4850 -D 12**	**RA 4890 -D 12**
		10 to 90 VAC/DC	**RA 4810 LA 12**	**RA 4825 LA 12**	**RA 4850 LA 12**	**RA 4890 LA 12**
		90 to 280 VAC/DC	**RA 4810 HA 12**	**RA 4825 HA 12**	**RA 4850 HA 12**	**RA 4890 HA 12**

General Specifications

	RA 24.. .. 06	RA 44.. .. 08	RA 48.. .. 12
Operational voltage range	24 to 280 VACrms	42 to 480 VACrms	42 to 530 VACrms
Blocking voltage	≥ 650 V_p	≥ 850 V_p	≥ 1200 V_p
Zero voltage turn-on	≤ 20 V	≤ 40 V	≤ 40 V
Operational frequency range	45 to 65 Hz	45 to 65 Hz	45 to 65 Hz
Power factor	≥ 0.5 @ 230 VACrms	≥ 0.5 @ 400 VACrms	≥ 0.5 @ 480 VACrms
Approvals	UL, CSA	UL, CSA	UL, CSA

Input Specifications

	RA .... -D ..	RA .... LA ..	RA .... HA ..
Control voltage range	3 to 32 VDC	10 to 90 VAC/DC	90 to 280 VAC/DC
Pick-up voltage	≤ 3 VDC	≤ 10 VAC/DC	≤ 90 VAC/DC
Drop-out voltage	≥ 1 VDC	≥ 1 VAC/DC	≥ 10 VAC/DC
Reverse voltage	≤ 32 VDC		
Input impedance	1.5 kΩ	5.4 kΩ	44 kΩ
Response time pick-up	≤ 1/2 cycle	≤ 1 cycle	≤ 1 cycle
Control pulse width	≥ 0.5 ms	≥ 0.5 ms	≥ 0.5 ms
Response time drop-out	≤ 1/2 cycle	≤ 1/2 cycle	≤ 1/2 cycle

Output Specifications

	RA ..10	RA ..25	RA ..50	RA ..90 .. ..
Rated operational current Arms	AC 51	16 Arms	25 Arms	50 Arms 90
AC 53a	3 Arms	5 Arms	15 Arms	20 Arms
Minimum operational current	150 mArms	150 mArms	250 mArms	400 mArms
Rep. overload current t=1 s	≤ 35 Arms	≤ 55 Arms	≤ 125 Arms	≤ 150 Arms
Non-rep. surge current t=10 ms	160 A_p	325 A_p	600 A_p	1150 A_p
Off-state leakage current @ rated voltage and frequency	≤ 2.5 mArms	≤ 3 mArms	≤ 3 mArms	≤ 3 mArms
I^2t for fusing t=10 ms	≤ 130 A^2s	≤ 525 A^2s	≤ 1800 A^2s	≤ 6600 A^2s
On-state voltage drop @ rated current	≤ 1.6 Vrms	≤ 1.6 Vrms	≤ 1.6 Vrms	≤ 1.6 Vrms
Critical dV/dt commutating	≥ 500 V/µs	≥ 500 V/µs	≥ 500 V/µs	≥ 500 V/µs
Critical dV/dt off-state	≥ 500 V/µs	≥ 500 V/µs	≥ 500 V/µs	≥ 500 V/µs

Thermal Specifications

	RA ..10	RA ..25	RA ..50	RA ..90 .. ..
Operating temperature	-20° to +70°C (-4° to +158°F)	-20° to +70°C (-4° to +158°F)	-20° to +70°C (-4° to +158°F)	-20° to +70°C (-4° to +158°F)
Storage temperature	-40° to +100°C (-40° to +212°F)	-40° to +100°C (-40° to +212°F)	-40° to +100°C (-40° to +212°F)	-40° to +100°C (-40° to +212°F)
Junction temperature	≤ 125°C (≤ 257°F)	≤ 125°C (≤ 257°F)	≤ 125°C (≤ 257°F)	≤ 125°C (≤ 257°F)
R_{th} junction to case	≤ 2.0 K/W	≤ 1.25 K/W	≤ 0.65 K/W	≤ 0.3 K/W
R_{th} junction to ambient	≤ 12.5 K/W	≤ 12 K/W	≤ 12 K/W	≤ 12 K/W

Isolation

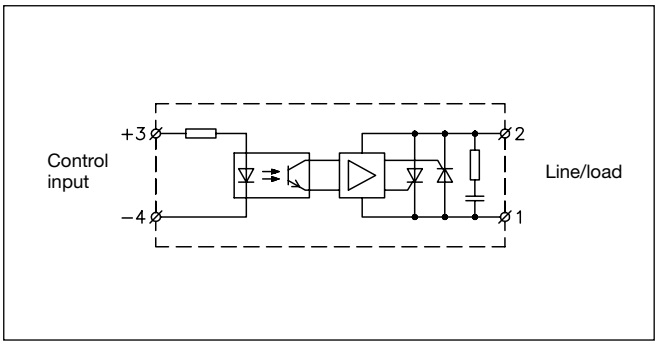
Rated isolation voltage Input to output	≥ 4000 VACrms
Rated isolation voltage Output to case	≥ 4000 VACrms
Insulation resistance Input to output	≥ 10^{10} Ω
Insulation resistance Ouput to case	≥ 10^{10} Ω
Insulation capacitance Input to output	≤ 8 pF
Insulation capacitance Output to case	≤ 100 pF

Accessories

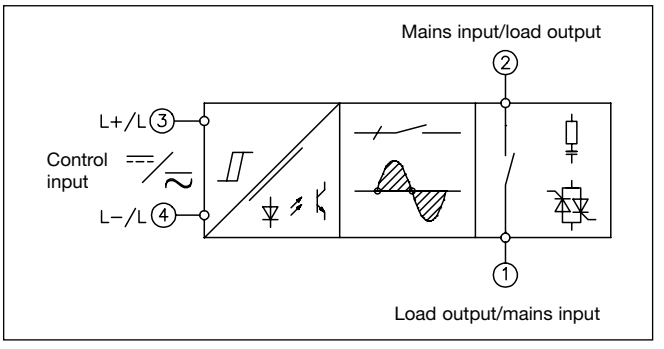
Protection cover
Heatsinks
DIN rail adapter
Varistors
Fuses

For further information refer to "General Accessories".

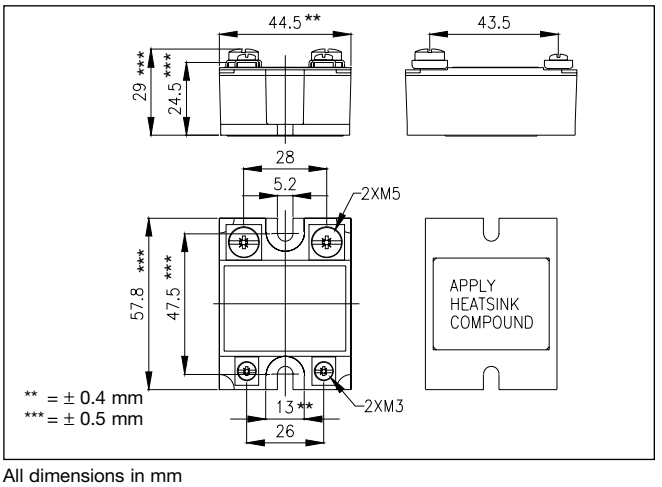
Wiring Diagram



Functional Diagram



Dimensions



All dimensions in mm

Housing Specifications

Weight		Approx. 110 g
Housing material		Noryl GFN 1, black
Base plate	10, 25, 50 A	Aluminium, nickel-plated
	90 A	Copper, nickel-plated
Potting compound		Polyurethane
Relay		
Mounting screws		M5
Mounting torque		≤ 1.5 Nm
Control terminal		
Mounting screws		M3 x 6
Mounting torque		≤ 0.5 Nm
Power terminal		
Mounting screws		M5 x 6
Mounting torque		≤ 2.4 Nm

Heatsink Dimensions (load current versus ambient temperature)

RA ..10 .. ..

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
16	2.7	2.2	1.8	1.3	0.87	0.41	22
15	3.1	2.6	2.1	1.7	1.2	0.65	20
14	3.7	3,1	2.6	2	1.5	0.92	18
13	4.3	3.7	3.1	2.5	1.9	1.2	16
12	5	4.3	3.7	3	2.3	1.6	15
11	5.9	5.1	4.4	3.6	2.8	2.1	13
10	6.9	6	5.2	4.3	3.5	2.6	12
9	7.9	6.9	5.9	4.9	4	3	10
7	10.8	9.5	8.1	6.8	5.4	4.1	7
5	-	14.2	12.2	10.2	8.1	6.1	5
3	-	-	-	-	14.6	10.9	3
1	-	-	-	-	-	-	1
	20	30	40	50	60	70	T_A

Ambient temp. [°C]

RA ..25 .. ..

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
25	2	1.7	1.4	1	0.71	0.40	32
22.5	2.5	2.1	1.8	1.4	1	0.66	27
20	3.1	2.7	2.3	1.9	1.4	1	23
17.5	4.	3.5	3	2.5	2	1.4	20
15	4.9	4.3	3.7	3.1	2.5	1.9	16
12.5	6.2	5.4	4.6	3.9	3.1	2.3	13
10	8.1	7.1	6.1	5.1	4	3	10
7.5	11.3	9.9	8.5	7.1	5.6	4.2	7
5	-	15.6	13.3	11.1	8.9	6.7	5
2.5	-	-	-	-	18.7	14	2
	20	30	40	50	60	70	T_A

Ambient temp. [°C]

RA ..50 .. ..

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
50	0.92	0.76	0.60	0.45	0.29	-	63
45	1.2	0.99	0.80	0.62	0.44	0.26	55
40	1.5	1.3	1.1	0.85	0.63	0.42	47
35	1.9	1.6	1.4	1.1	0.89	0.63	40
30	2.4	2.1	1.8	1.5	1.2	0.91	33
25	3	2.7	2.3	1.9	1.5	1.1	26
20	3.9	3.5	3	2.5	2	1.5	20
15	5.5	4.8	4.1	3.4	2.7	2.1	15
10	8.6	7.5	6.4	5.4	4.3	3.2	9
5	17.9	15.6	13.4	11.2	8,9	6.7	4
	20	30	40	50	60	70	T_A

Ambient temp. [°C]

RA ..90 .. ..

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
90	0.63	0.53	0.42	0.32	-	-	97
80	0.81	0.69	0.57	0.45	0.33	-	84
70	1	0.89	0.75	0.61	0.47	0.33	71
60	1.3	1.2	1	0.83	0.66	0.49	59
50	1.7	1.5	1.3	1.1	0.85	0.64	47
40	2.2	1.9	1.7	1.4	1.1	0.83	36
30	3.1	2.7	2.3	1.9	1.5	1.2	26
20	4.8	4.2	3.6	3	2.4	1.8	17
10	10	8.8	7.5	6.3	5	3.8	8
	20	30	40	50	60	70	T_A

Ambient temp. [°C]

Heatsink Selection

Carlo Gavazzi Heatsink (see Accessories)	**Thermal resistance**
No heatsink required	$R_{th\ s\text{-}a}$ > 12.5 K/W
RHS 100 Assy	3.0 K/W
RHS 301 Assy	0.8 K/W
RHS 301 F Assy	0.25 K/W
Consult your distributor	< 0.25 K/W

Compare the value found in the current versus temperature chart with the standard heatsink values and select the heatsink with the next lower value.

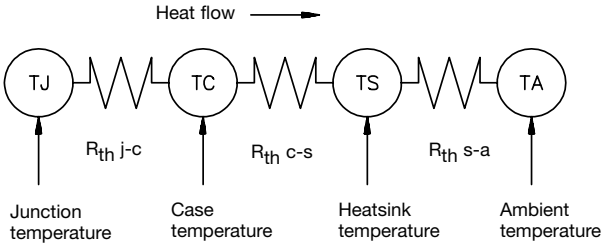
Applications

This relay is designed for use in applications in which it is exposed to high surge conditions. Care must be taken to ensure proper heatsinking when the relay is to be used at high sustained currents. Adequate electrical connection between relay terminals and cable must be ensured.

Thermal characteristics
The thermal design of Solid State Relays is very important.

It is essential that the user makes sure that cooling is adequate and that the maximum junction temperature of the relay is not exceeded.

If the heatsink is placed in a small closed room, control panel or the like, the power dissipation can cause the ambient temperature to rise. The heatsink is to be calculated on the basis of the ambient temperature and the increase in temperature.

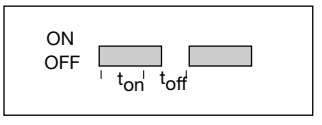


Thermal resistance:
R_{th} j-c = junction to case
R_{th} c-s = case to heatsink
R_{th} s-a = heatsink to ambient

Direct bonding
In the design of the output power semiconductor direct bonding of the copper layer and the ceramic substrate has been applied. This is to ensure uninhibited heat transfer and high thermal fatigue strength.

The relay has been designed for applications requiring large numbers of load cycles.

Power dissipation
The power dissipation for intermittent use is calculated according to the following formula:



$$I_{rms} = \sqrt{\frac{I_{ON}^2 \times t_{ON}}{t_{ON} + t_{OFF}}}$$

Ex: RA 24 50 -D 06:
Load current = 45 A
t_{ON} = 30 s
t_{OFF} = 15 s

$$I_{rms} = \sqrt{\frac{45^2 \times 30}{30 + 15}}$$

The rms current will be 36.7 A.

Solid State Relays
Industrial, 1-Phase ZS, High Volt./Current Range
Types RA 60 50 -D 16, RA .. 90 -D .., RA .. 110 -D..

- **High-current, high-voltage**
- **AC Solid State Relay**
- **Zero switching**
- **Rated operational current: 50, 90 and 110 AACrms**
- **Blocking voltage: U_p to 1600 V_p**
- **Rated operational voltage: Up to 600 VACrms**
- **High surge current capability**
- **Isolation: OPTO (input-output) 4000 VACrms**

Product Description

These high-current, high-voltage solid state relays are designed for ON-OFF or phase controlling of high-power AC applications. High current and high dV/dt capabilities will allow switching of inductive loads e.g. transformers, motors, valves and solenoids as well as all resistive loads. A zero crossing drive circuit will minimize the negative effects of different load types. Optocouplers provide an ideal interface to logic level DC-outputs.

Ordering Key

RA 60 110 -D 16

- **Solid State Relay**
- **Switching mode**
- **Rated operational voltage**
- **Rated operational current**
- **Control voltage**
- **Blocking voltage**

Type Selection

Switching mode	Rated operational voltage	Rated operational current	Control voltage	Blocking voltage
A: Zero switching	24: 230 VACrms	50: 50 AACrms	-D: 4.5 to 32 VDC	06: 650 V_p
Optional:	40: 400 VACrms	90: 90 AACrms		10: 1000 V_p
B. Instant-on switching	48: 480 VACrms	110: 110 AACrms		12: 1200 V_p
	60: 600 VACrms			16: 1600 V_p

Selection Guide

Rated operational voltage	Blocking voltage	Control voltage	Rated operational current 50 AACrms	90 AACrms	110 AACrms
230 VACrms	650 V_p	4.5 to 32 VDC	*	*	**RA 24110-D 06**
400 VACrms	1000 V_p	4.5 to 32 VDC	*	**RA 4090 -D 10**	**RA 40110-D 10**
480 VACrms	1200 V_p	4.5 to 32 VDC	*	*	**RA 48110-D 12**
600 VACrms	1600 V_p	4.5 to 32 VDC	**RA 6050 -D 16**	**RA 6090 -D 16**	**RA 60110-D 16**

* Please refer to standard range, RA-relays.

General Specifications

	RA 24 .. -D 06	RA 40 .. -D 10	RA 48 .. -D 12	RA 60 .. -D 16
Operational voltage range	24 to 280 VACrms	24 to 440 VACrms	24 to 530 VACrms	24 to 690 VACrms
Blocking voltage	≥ 650 V_p	≥ 1000 V_p	≥ 1200 V_p	≥ 1600 V_p
Zero voltage turn-on	≤ 15 V	≤ 15 V	≤ 15 V	≤ 20 V
Operational frequency range	45 to 65 Hz	45 to 65 Hz	45 to 65 Hz	45 to 65 Hz
Power factor	≥ 0.5 @ 400 VACrms	≥ 0.5 @ 400 VACrms	≥ 0.5 @ 480 VACrms	≥ 0.5 @ 690 VACrms
Approvals	CSA, UL	CSA, UL	CSA, UL	CSA (max 600 VAC), UL
CE-marking	Yes	Yes	Yes	Yes

Input Specifications

Control voltage range	4.5 to 32 VDC
Pick-up voltage	≤ 4.5 VDC
Drop-out voltage	≥ 1 VDC
Input current @ max. input voltage	≤ 40 mA
Reverse voltage	≤ 32 VDC
Response time pick-up	≤ 1/2 cycle
Response time drop-out	≤ 1/2 cycle

Isolation

Rated isolation voltage Input to output	≥ 4000 VACrms
Rated isolation voltage Output to case	≥ 4000 VACrms
Insulation resistance Input to output	≥ 10^{10} Ω
Insulation resistance Output to case	≥ 10^{10} Ω
Insulation capacitance Input to output	≤ 16 pF
Insulation capacitance Output to case	≤ 100 pF

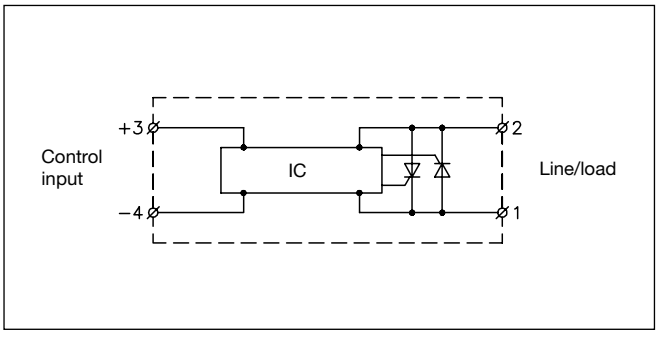
Output Specifications

	RA 60 50 -D 16	RA .. 90 -D ..	RA .. 110 -D ..
Rated operational current AC 51 AC 53a	50 Arms 15 Arms	90 Arms 20 Arms	110 Arms 30 Arms
Minimum operational current	250 mArms	400 mArms	500 mArms
Rep. overload current t=1 s	≤ 125 Arms	≤ 150 Arms	≤ 200 Arms
Non-rep. surge current t=10 ms	600 A_p	1150 A_p	≤1900 A_p
Off-state leakage current @ rated voltage and frequency	≤ 2 mArms	≤ 2 mArms	≤ 5 mArms
I^2t for fusing t=10 ms	≤ 1800 A^2s	≤ 6600 A^2s	≤ 18000 A^2s
On-state voltage drop @ rated current	≤ 1.6 Vrms	≤ 1.6 Vrms	≤ 1.6 Vrms
Critical dV/dt commutating	≥ 500 V/µs	≥ 500 V/µs	≥ 500 V/µs
Critical dV/dt off-state	≥ 500 V/µs	≥ 500 V/µs	≥ 500 V/µs

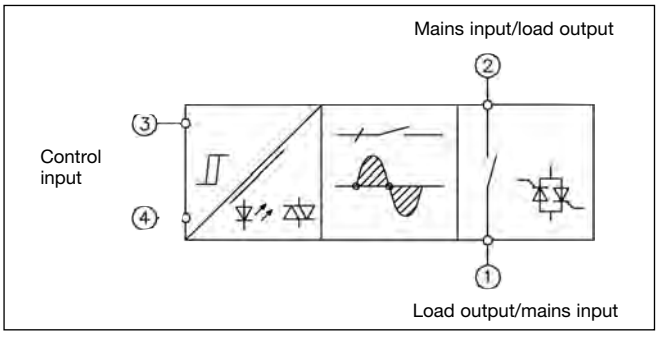
Thermal Specifications

	RA 60 50 -D 16	RA .. 90 -D ..	RA .. 110 -D ..
Operating temperature	-20° to +70°C (-4° to +158°F)	-20° to +70°C (-4° to +158°F)	-20° to +70°C (-4° to +158°F)
Storage temperature	-40° to +100°C (-40° to +212°F)	-40° to +100°C (-40° to +212°F)	-40° to +100°C (-40° to +212°F)
Junction temperature	≤ 125°C (257°F)	≤ 125°C (257°F)	≤ 125°C (257°F)
R_{th} junction to case	≤ 0.65 K/W	≤ 0.35 K/W	≤ 0.3 K/W
R_{th} junction to ambient	≤ 12 K/W	≤ 12 K/W	≤ 12 K/W

Wiring Diagram



Functional Diagram



Heatsink Dimensions (load current versus ambient temperature)

RA 60 50 -D 16

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
50	0.92	0.76	0.60	0.45	0.29	-	63
45	1.2	0.99	0.80	0.62	0.44	0.26	55
40	1.5	1.3	1.1	0.85	0.63	0.42	47
35	1.9	1.6	1.4	1.1	0.89	0.63	40
30	2.4	2.1	1.8	1.5	1.2	0.91	33
25	3	2.7	2.3	1.9	1.5	1.1	26
20	3.9	3.5	3	2.5	2	1.5	20
15	5.5	4.8	4.1	3.4	2.7	2.1	15
10	8.6	7.5	6.4	5.4	4.3	3.2	9
5	17.9	15.6	13.4	11.2	8.9	6.7	4
	20	30	40	50	60	70	T_A

Ambient temp. [°C]

RA .. 90 .. -D ..

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
90	0.63	0.53	0.42	0.32	-	-	97
80	0.81	0.69	0.57	0.45	0.33	-	84
70	1	0.89	0.75	0.61	0.47	0.33	71
60	1.3	1.2	1	0.83	0.66	0.49	59
50	1.7	1.5	1.3	1.1	0.85	0.64	47
40	2.2	1.9	1.7	1.4	1.1	0.83	36
30	3.1	2.7	2.3	1.9	1.5	1.2	26
20	4.8	4.2	3.6	3	2.4	1.8	17
10	10	8.8	7.5	6.3	5	3.8	8
	20	30	40	50	60	70	T_A

Ambient temp. [°C]

RA.. 110-D ..

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
110	0.43	0.35	0.27	-	-	-	126
90	0.63	0.53	0.42	0.32	-	-	97
80	0.81	0.69	0.57	0.45	0.33	-	84
70	1	0.89	0.75	0.61	0.47	0.33	71
60	1.3	1.2	1	0.83	0.66	0.49	59
50	1.7	1.5	1.3	1.1	0.85	0.64	47
40	2.2	1.9	1.7	1.4	1.1	0.83	36
30	3.1	2.7	2.3	1.9	1.5	1.2	26
20	4.8	4.2	3.6	3	2.4	1.8	17
10	10	8.8	7.5	6.3	5	3.8	8
	20	30	40	50	60	70	T_A

Ambient temp. [°C]

Heatsink Selection

Carlo Gavazzi Heatsink (see Accessories)	**Thermal resistance**
No heatsink required	**$R_{th\ s\text{-}a}$** > 12.5 K/W
RHS 100 Assy	3.0 K/W
RHS 301 Assy	0.8 K/W
RHS 301 F Assy	0.25 K/W
Consult your distributor	< 0.25 K/W

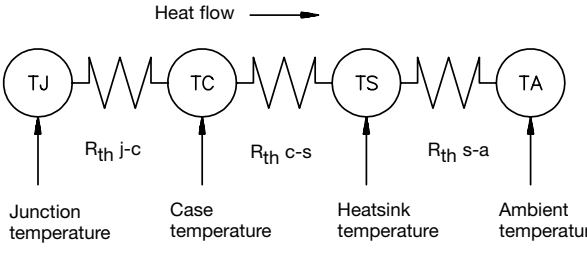
Compare the value found in the load current versus temperature chart with the standard heatsink values and select the heatsink with the next lower value.

Applications

This relay is designed for use in applications in which it is exposed to high surge conditions. Care must be taken to ensure proper heatsinking when the relay is to be used at high sustained currents. Adequate electrical connection between relay terminals and cable must be ensured.

Thermal characteristics
The thermal design of Solid State Relays is very important. It is essential that the user makes sure that cooling is adequate and that the maximum junction temperature of the relay is not exceeded.

If the heatsink is placed in a small closed room, control panel or the like, the power dissipation can cause the ambient temperature to rise. The heatsink is to be calculated on the basis of the ambient temperature and the increase in temperature.



Thermal resistance:
R_{th} j-c = junction to case
R_{th} c-s = case to heatsink
R_{th} s-a = heatsink to ambient

CARLO GAVAZZI

Applications (cont.)

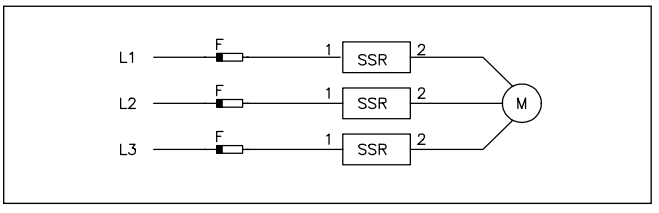
Motor start application (3-phase motors)
Starting time: 5 s max.
Running time/starting time ratio ≥10.

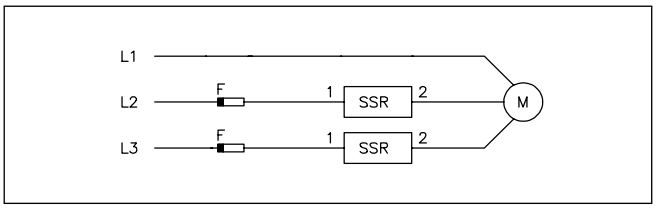
Selection Guide

Motor size [kW]	Mains voltage	Relay type	Varistor voltage[1)]	Heatsink[2)]	Full load current	Fuse type
11 kW	230/400 VAC	RA 40 90 -D 10	440 V	1 K/W	24 A	6.921 CP GRC 22x58/80
18.5 kW	230/400 VAC	RA 40 110 -D 10	440 V	0.5 K/W	39 A	6.921 CP GRC 22x58/100
22 kW	280/480 VAC	RA 48 110 -D 12	550 V	0.5 K/W	34 A	6.921 CP GRC 22x58/100
7.5 kW	400/600 VAC	RA 60 50 -D 16	680 V	3 K/W	11 A	6.921 CP GRC 22x58/50
18.5 kW	400/600 VAC	RA 60 90 -D 16	680 V	1 K/W	25 A	6.921 CP GRC 22x58/80
30 kW	400/600 VAC	RA 60 110 -D 16	680 V	0.5 K/W	39 A	6.921 CP GRC 22x58/100

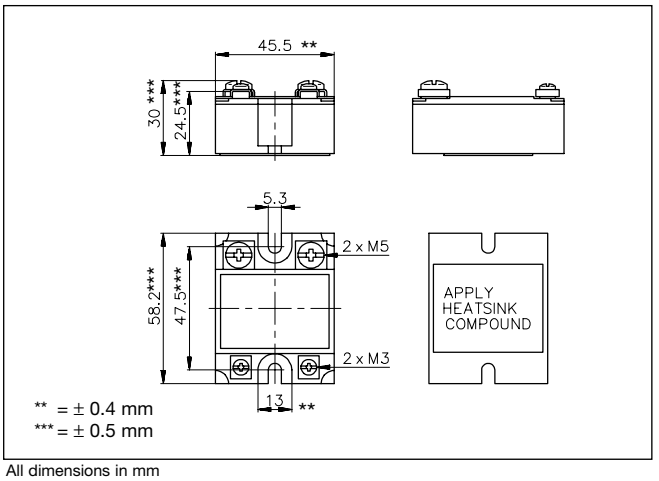
1) Varistor diameter min. 20 mm
2) Max. ambient temperature 50°C (one relay per heatsink)

3-phase switching circuit or 2-phase switching circuit





Dimensions



All dimensions in mm

Housing Specifications

Weight	Approx. 110 g
Housing material	Noryl GFN 1, black
Base plate	
50 A type	Aluminium, nickel-plated
90 and 110 A types	Copper, nickel-plated
Potting compound	Polyurethane
Relay	
Mounting screws	M5
Mounting torque	≤ 1.5 Nm
Control terminal	
Mounting screws	M3 x 6
Mounting torque	≤ 0.5 Nm
Power terminal	
Mounting screws	M5 x 6
Mounting torque	≤ 2.4 Nm

Accessories

Protection cover
Heatsinks
DIN rail adapter
Varistors
Fuses

For further information refer to "General Accessories".

Solid State Relays
Industrial, 1-Phase ZS
Types RA 24.. -D 06 T, RA 24.. -D 06 TF

- **AC Solid State Relay**
- **Zero switching**
- **Low-cost triac type**
- **Rated operational current: 10 and 25 AACrms**
- **Blocking voltage: Up to 650 V_p**
- **Rated operational voltage: 230 VACrms**
- **Input ranges: 3 to 32 VDC**
- **Isolation: OPTO (input-output) 4000 VACrms**
- **Fast-on version available**

Product Description

The triac version of the zero switching relay is an inexpensive solution for resistive loads. The zero switching relay switches ON when the AC sine curve just crosses zero, and switches OFF when the current crosses zero.

Ordering Key

RA 24 10 -D 06 T

- **Solid State Relay**
- **Switching mode**
- **Rated operational voltage**
- **Rated operational current**
- **Control voltage**
- **Blocking voltage**
- **Output**

Type Selection

Switching mode	Rated operational voltage	Rated operational current	Control voltage	Blocking voltage	Output
A: Zero switching	24: 230 VACrms	10: 10 AACrms 25: 25 AACrms	-D: 3 to 32 VDC	06: 650 V_p	T: Triac TF: Triac/Fast-on terminals

Selection Guide

Rated operational voltage	Blocking voltage	Terminal type	Control voltage	Rated operational current 10 AACrms	Rated operational current 25 AACrms
230 VACrms	650 V_p	Rivet terminals	3 to 32 VDC	**RA 2410 -D 06T**	**RA 2425 -D 06T**
		Fast-on terminals	3 to 32 VDC	**RA 2410 -D 06TF**	**RA 2425 -D 06TF**

General Specifications

Operational voltage range	24 to 280 VACrms
Blocking voltage	≥ 650 V_p
Operational frequency range	45 to 65 Hz
Power factor	≥ 0.5 @ 230 VACrms
Approvals	CSA, UL
CE-marking	Yes

Isolation

Rated isolation voltage	
Input to output	≥ 4000 VACrms
Output to case	≥ 4000 VACrms
Insulation resistance	
Input to output	≥ 10^{10} W
Output to case	≥ 10^{10} W
Insulation capacitance	
Input to output	≤ 8 pF
Output to case	≤ 25 pF

Input Specifications

Control voltage range	3 to 32 VDC
Pick-up voltage	≤ 3 V
Drop-out voltage	≥ 1 V
Reverse voltage	≤ 32 VDC
Input impedance	1.5 kΩ
Response time pick-up	≤ 1/2 cycle
Response time drop-out	≤ 1/2 cycle

Housing Specifications

Weight	Approx. 110 g
Housing material	Noryl GFN 1, black
Base plate	Aluminium
Potting compound	Polyurethane
Relay	
Mounting screws	M5
Mounting torque	≤ 1.5 Nm
Control terminal	
Mounting screws/Fast-on	M3 x 6/6.3 x 0.8 mm
Mounting torque	≤ 0.5 Nm
Power terminal	
Mounting screws/Fast-on	M5 x 6/6.3 x 0.8 mm
Mounting torque	≤ 2.4 Nm

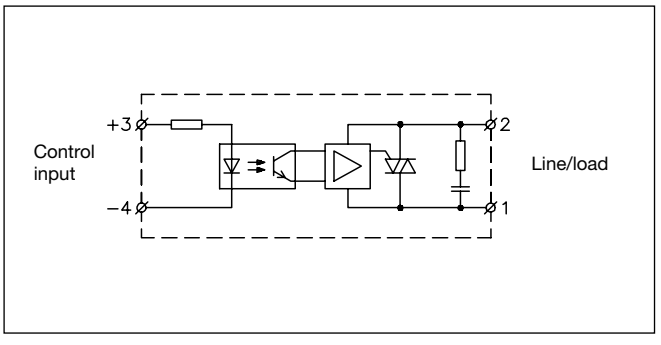
Output Specifications

	RA 2410 -D 06 T/F	RA 2425 -D 06 T/F
Rated operational current AC 51	10 Arms	25 Arms
Minimum operational current	20 mArms	20 mArms
Rep. overload current t=1 s	≤ 30 A_p	≤ 50 A_p
Non-rep. surge current t=20 ms	90 A_p	200 A_p
Off-state leakage current @ rated voltage and frequency	≤ 5 mArms	≤ 5 mArms
I^2t for fusing t=10 ms	≤ 40 A^2s	≤ 200 A^2s
Critical dI/dt	≥ 10 A/µs	≥ 10 A/µs
On-state voltage drop @ rated current	≤ 1.6 Vrms	≤ 1.6 Vrms
Critical dV/dt commutating	≥ 10 V/µs	≥ 10 V/µs
Critical dV/dt off-state	≥ 250 V/µs	≥ 250 V/µs

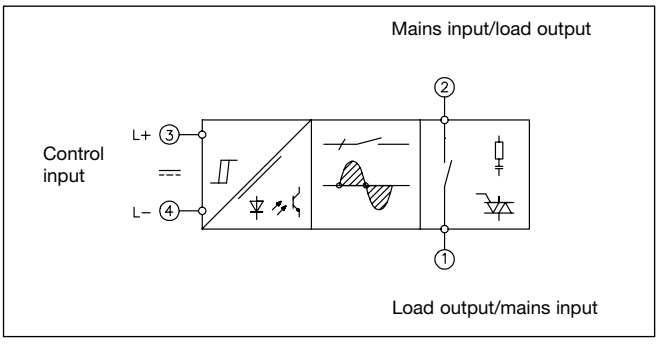
Thermal Specifications

	RA 2410 -D 06 T/TF	RA 2425 -D 06 T/TF
Operating temperature	-20° to +70°C (-4° to +158°F)	-20° to +70°C (-4° to +158°F)
Storage temperature	-40° to +100°C (-40° to +212°F)	-40° to +100°C (-40° to +212°F)
Junction temperature	≤ 125°C (≤ 257°F)	≤ 125°C (≤ 257°F)
R_{th} junction to case	≤ 2.5 K/W	≤ 1.8 K/W
R_{th} junction to ambient	≤ 12.5 K/W	≤ 12.5 K/W

Wiring Diagram



Functional Diagram



Heatsink Dimensions (load current versus ambient temperature)

RA 24 10 .. .. T/F

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
10	6.5	5.6	4.7	3.9	3	2.1	12
9	7.8	6.8	5.8	4.8	3.8	2.8	10
8	9.2	8	6.9	5.7	4.6	3.4	9
7	10.8	9.5	8.1	6.8	5.4	4.1	7
6	-	11.4	9.8	8.2	6.5	4.9	6
5	-	-	12.2	10.2	8.1	6.1	5
4	-	-	-	-	10.5	7.9	4
3	-	-	-	-	-	10.9	3
2	-	-	-	-	-	-	2
1	-	-	-	-	-	-	1
	20	30	40	50	60	70	T_A

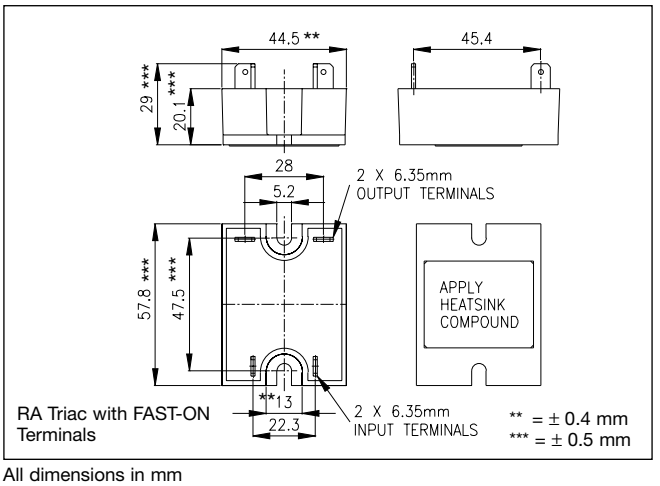
Ambient temp. [°C]

RA 24 25 .. .. T/F

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
25	1.4	1.1	0.77	0.45	-	-	32
23	1.9	1.5	1.2	0.79	0.43	-	28
20	2.5	2.1	1.6	1.2	0.81	0.39	24
18	3.3	2.8	2.3	1.8	1.3	0.8	20
15	4.3	3.7	3.1	2.5	2	1.4	17
13	5.8	5.1	4.4	3.6	2.8	2.2	14
10	7.6	6.7	5.7	4.8	3.8	2.9	11
8	10.5	9.2	7.9	6.6	5.3	4	8
5	-	14.4	12.3	10.3	8.2	6.2	5
3	-	-	-	-	17.1	12.8	3
	20	30	40	50	60	70	T_A

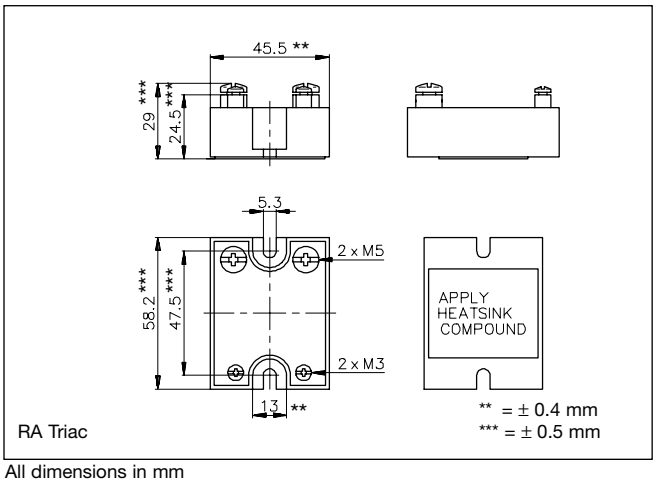
Ambient temp. [°C]

Dimensions



RA Triac with FAST-ON Terminals

All dimensions in mm



RA Triac

All dimensions in mm

Accessories

Protection cover
Heatsinks
DIN rail adapter
Varistors
Fuses

For further information refer to "General Accessories".

Terminals RA 24.. -D 06 TF

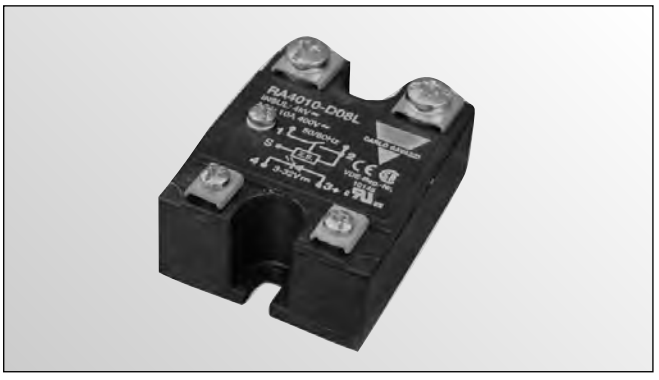
Control terminal (Fast-on)	6.3 x 0.8 mm
Power terminal (Fast-on)	6.3 x 0.8 mm

Heatsink Selection

Carlo Gavazzi Heatsink (see Accessories)	**Thermal resistance**
No heatsink required	$R_{th\ s\text{-}a}$ > 12.5 K/W
RHS 100 Assy	3.0 K/W
RHS 301 Assy	0.8 K/W
RHS 301 F Assy	0.25 K/W
Consult your distributor	< 0.25 K/W

Compare the value found in the current versus temperature chart with the standard heatsink values and select the heatsink with the next lower value.

Solid State Relays
Low Electromagnetic Noise Emission
Types RA 24.. -D 06 L, RA 40.. -D 08 L



- **AC Solid State Relay**
- **Zero switching**
- **For ohmic load applications**
- **Rated operational current: 10 and 25 AACrms**
- **Rated operational voltage: Up to 400 VACrms**
- **10 A type meets CISPR 22 B requirements**

Product Description

This relay is designed for use in applications where low electromagnetic emission is essential.

Today, household and electrical appliances, information technology- and medical equipment must conform with the latest EN standards. These new EN standards define general and product related requirements for noise immunity and noise emission. The RA24..-D06L and RA40..-D08L are relays for applications where the noise emission must be low and where the customer does not want to relinquish all Solid State Relay features. The relay is available with zero crossing function. It is designed for resistive loads, i.e. power factor = 1.

Predestined applications for this relay are office machines, ovens and cookers for domestic and industrial use, theatre or stage lighting systems, film processing and copying machines or medical equipment.

Ordering Key

RA 24 25 -D 06 L

- **Solid State Relay**
- **Switching mode**
- **Rated operational voltage**
- **Rated operational current**
- **Control voltage**
- **Blocking voltage**
- **Low RFI**

Type Selection

Switching mode	Rated operational voltage	Rated operational current	Control voltage	Blocking voltage	Electromagnetic noise emission
A: Zero switching	24: 230 VACrms 40: 400 VACrms	10: 10 AACrms 25: 25 AACrms	-D: 3 to 32 VDC	06: 650 V_p 08: 850 V_p	L: Low RFI

Selection Guide

Rated operational voltage	Blocking voltage	Electromagnetic noise emission	Control voltage	Rated operational current 10 AACrms	Rated operational current 25 AACrms
230 VACrms	650 V_p	Low RFI	3 to 32 VDC	**RA 2410 -D 06 L**	**RA 2425 -D 06 L**
400 VACrms	850 V_p	Low RFI	3 to 32 VDC	**RA 4010 -D 08 L**	**RA 4025 -D 08 L**

General Specifications

	RA 24.. -D 06 L	RA 40.. -D 08 L
Operational voltage range	180 to 265 VACrms	340 to 530 VACrms
Blocking voltage	≥ 650 V_p	≥ 850 V_p
Operational frequency range	45 to 65 Hz	45 to 65 Hz
Power factor	1	1
Approvals	UL, cUL, CSA, VDE	UL, cUL, CSA, VDE
CE-marking	Yes	Yes

Input Specifications

Control voltage range	3 to 32 VDC
Pick-up voltage	≤ 3 V
Drop-out voltage	≥ 1 V
Reverse voltage	≤ 32 VDC
Input impedance	1 kΩ
Response time	≤ 1/2 cycle

Isolation

Rated isolation voltage Input to output	≥ 4000 VACrms
Rated isolation voltage Output to case	≥ 4000 VACrms
Reference voltage	500 VACrms
Insulation meets VDE 0700 requirements	

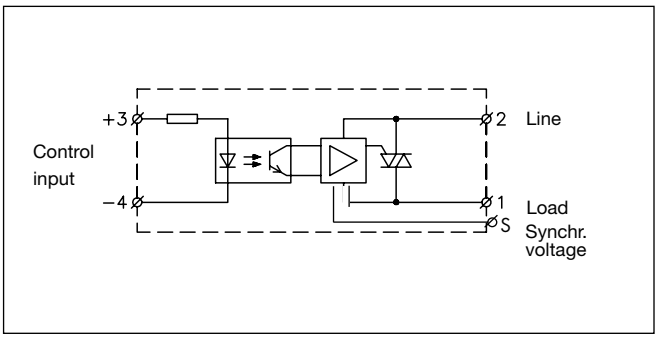
Output Specifications

	RA ..10 -D 0. L	RA ..25 -D 0. L
Rated operational current AC 51	10 Arms	25 Arms
Min. operational current	1 Arms	2 Arms
Rep. overload current t=1 s	≤ 30 A_p	≤ 50 A_p
Non-rep. surge current t=20 ms	90 A_p	200 A_p
Off-state leakage current	≤ 1 mArms	≤ 1 mArms
I^2t for fusing t=10 ms	≤ 120 A^2s	≤ 200 A^2s
On-state voltage drop	≤ 1.2 Vrms	≤ 1.2 Vrms
Critical dV/dt off-state	≥ 250 V/µs	≥ 250 V/µs
Synchronization current	≤ 20 mArms	≤ 20 mArms

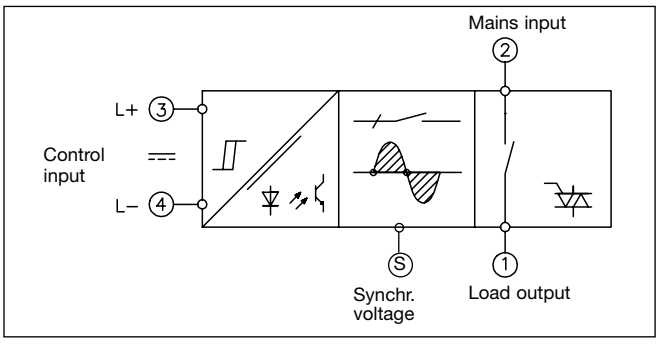
Thermal Specifications

	RA ..10 -D 0. L	RA ..25 -D 0. L
Operating temperature range	-20° to +70°C (-4° to +158°F)	-20° to +70°C (-4° to +158°F)
Storage temperature range	-40° to +100°C (-40° to +212°F)	-40° to +100°C (-40° to +212°F)
Junction temperature	≤ 125°C (257°F)	≤ 125°C (257°F)
R_{th} junction to case	≤ 2.5 K/W	≤ 1.8 K/W

Wiring Diagram



Functional Diagram



Heatsink Dimensions (load current versus ambient temperature)

RA ..10 -D 0. L

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
10	5.7	5.0	4.3	3.6	2.8	2.0	14
9	6.2	5.4	4.6	3.9	3.1	2.2	12
8	7.4	6.4	5.5	4.6	3.7	2.7	11
7	8.5	7.4	6.3	5.3	4.2	3.1	9
6	9.8	8.6	7.4	6.1	4.9	4.9	8
5	-	10.2	8.7	7.2	5.8	6.2	7
4	-	-	10.5	8.7	7.0	5.7	6
3	-	-	-	10.7	8.5	4.7	5
2	-	-	-	-	10.8	8.1	4
1	-	-	-	-	-	10.7	3
	20	30	40	50	60	70	T_A

Ambient temp. [°C]

RA ..25 -D 0. L

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
25	1.0	0.8	0.5	0.25	-	-	38
22.5	1.5	1.1	0.8	0.5	0.26	-	33
20	1.9	1.6	1.2	0.9	0.5	-	29
17.5	2.5	2.1	1.7	1.3	0.9	0.5	25
15	3.3	2.9	2.4	1.9	1.4	1.0	21
12.5	4.4	3.9	3.3	2.7	2.1	1.5	17
10	5.7	5.0	4.3	3.6	2.9	2.1	14
7.5	7.5	6.6	5.6	4.7	3.7	2.8	11
5	10.6	9.3	8.0	6.6	5.3	4.0	8
2.5	-	-	-	10.7	8.5	6.4	5
	20	30	40	50	60	70	T_A

Ambient temp. [°C]

Heatsink Selection

Carlo Gavazzi Heatsink (see Accessories)	**Thermal resistance**
No heatsink required	$R_{th\ s\text{-}a}$ > 12.5 K/W
RHS 100 Assy	3.0 K/W
RHS 301 Assy	0.8 K/W
RHS 301 F Assy	0.25 K/W
Consult your distributor	< 0.25 K/W

Compare the value found in the current versus temperature chart with the standard heatsink values and select the heatsink with the next lower value.

Applications

The very low, wire-conducted RFI feature of this relay is obtained by synchronized firing of the output triac in the zero crossing of the mains voltage. Therefore the relay must have the synchronization input connected to the mains, either to neutral or to the phase depending on how the load is connected.

The relay can only switch resistive loads with a power factor of 1.

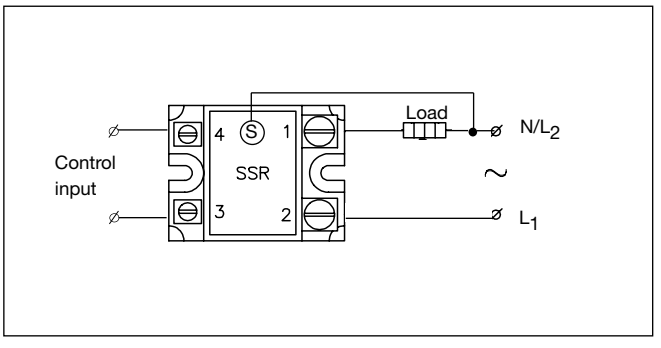
A minimal load current of 1A for the RA ..10 -D 0. L and 2 A for the RA ..25 -D 0. L is required as long as the control input is activated.

Accessories

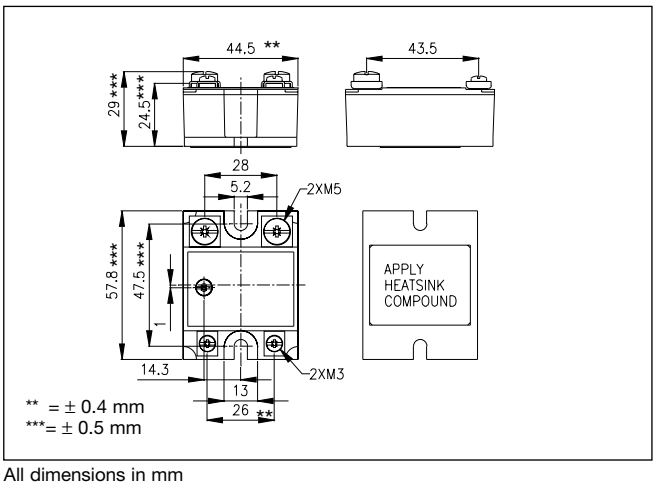
Heatsinks
DIN rail adapter
Varistors
Fuses

For further information refer to "General Accessories".

Connection Diagram



Dimensions



All dimensions in mm

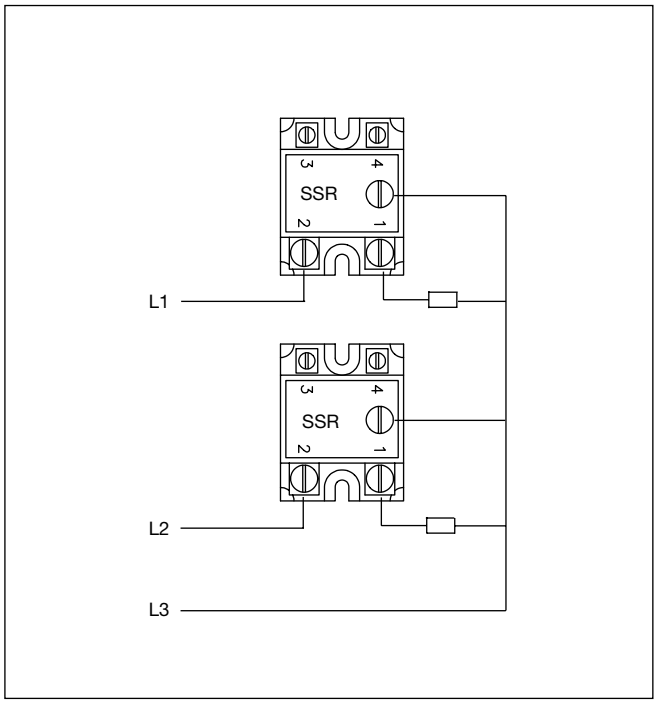
Housing Specifications

Weight	Approx. 110 g
Housing material	Noryl GFN 1, black
Base plate	Aluminium
Potting compound	Polyurethane
Relay	
Mounting screws	M5
Mounting torque	≤ 1.5 Nm
Control and Synchr. terminal	
Mounting screws	M3 x 6
Mounting torque	≤ 0.5 Nm
Power terminal	
Mounting screws	M5 x 6
Mounting torque	≤ 2.4 Nm

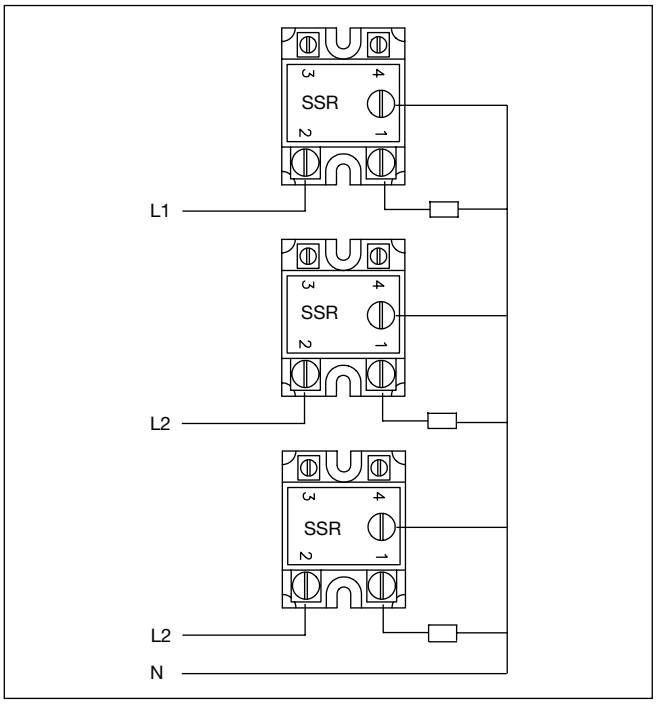
Connection Examples

RA24xx-D06L and RA40xx-D08L

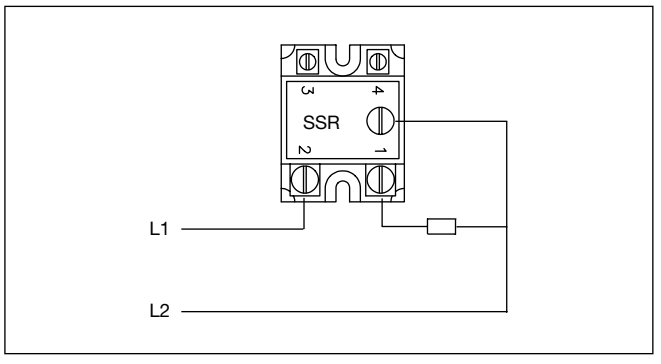
3-phase application with two heat elements without ground.



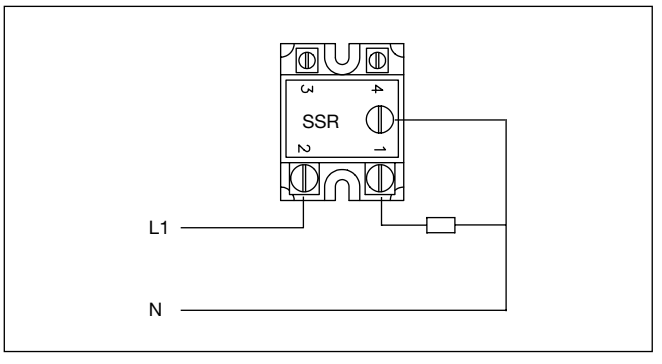
3-phase application with three heat elements.



2-phase application with one heat element.



1-phase application without ground.



Solid State Relays
System Monitoring Relays (Sense Relay)
Type RA.... .....S

- System (line and load) monitoring relay
- Zero switching
- Rated operational current: 25, 50, 90 and 110 AACrms
- Rated operational voltage: 120, 230, 400 and 480 VACrms
- High surge current capability
- Alarm output signal
- LED indication for alarm and supply

Product Description

The system monitoring solid state relay (sense relay) provides an alarm output in the event of a circuit failure.
Internal circuits monitor:
- line voltage/line current
- correct functioning of the SSR
- SSR input status

The relay is designed for applications where immediate fault detection is required.
A red LED indicates an alarm, a green LED indicates DC control supply OK (half LED light intensity) resp. relay switched ON (full LED light intensity).

Ordering Key

RA 23 25 H 06 NO S

- **Solid State Relay**
- **Switching mode**
- **Rated operational voltage**
- **Rated operational current**
- **Control input**
- **Blocking voltage**
- **Alarm output type**
- **Sense SSR**

Type Selection

Switching mode	Rated operational voltage	Rated operational current input	Control voltage	Blocking Voltage	Alarm output
A: Zero switching	12: 120 VACrms	25: 25 AACrms	H: Active high	06: 650 V_p	NO: NPN, NO
	23: 230 VACrms	50: 50 AACrms		10: 1000 V_p	NC: NPN, NC
	40: 400 VACrms	90: 90 AACrms		12: 1200 V_p	PO: PNP, NO
	48: 480 VACrms	110: 110 AACrms			PC: PNP, NC

Selection Guide

Rated op. voltage	Control input	Alarm output type	Rated operational current 25 AACrms	50 AACrms	90 AACrms	110 AACrms
120 VACrms	Active high	NPN, NO	**RA 1225 H06NOS**	**RA 1250 H06NOS**	**RA 1290 H06NOS**	**RA 12110 H06NOS**
		NPN, NC	**RA 1225 H06NCS**	**RA 1250 H06NCS**	**RA 1290 H06NCS**	**RA 12110 H06NCS**
		PNP, NO	**RA 1225 H06POS**	**RA 1250 H06POS**	**RA 1290 H06POS**	**RA 12110 H06POS**
		PNP, NC	**RA 1225 H06PCS**	**RA 1250 H06PCS**	**RA 1290 H06PCS**	**RA 12110 H06PCS**
230 VACrms	Active high	NPN, NO	**RA 2325 H06NOS**	**RA 2350 H06NOS**	**RA 2390 H06NOS**	**RA 23110 H06NOS**
		NPN, NC	**RA 2325 H06NCS**	**RA 2350 H06NCS**	**RA 2390 H06NCS**	**RA 23110 H06NCS**
		PNP, NO	**RA 2325 H06POS**	**RA 2350 H06POS**	**RA 2390 H06POS**	**RA 23110 H06POS**
		PNP, NC	**RA 2325 H06PCS**	**RA 2350 H06PCS**	**RA 2390 H06PCS**	**RA 23110 H06PCS**
400 VACrms	Active high	NPN, NO	**RA 4025 H10NOS**	**RA 4050 H10NOS**	**RA 4090 H10NOS**	**RA 40110 H10NOS**
		NPN, NC	**RA 4025 H10NCS**	**RA 4050 H10NCS**	**RA 4090 H10NCS**	**RA 40110 H10NCS**
		PNP, NO	**RA 4025 H10POS**	**RA 4050 H10POS**	**RA 4090 H10POS**	**RA 40110 H10POS**
		PNP, NC	**RA 4025 H10PCS**	**RA 4050 H10PCS**	**RA 4090 H10PCS**	**RA 40110 H10PCS**
480 VACrms	Active high	NPN, NO	**RA 4825 H12NOS**	**RA 4850 H12NOS**	**RA 4890 H12NOS**	**RA 48110 H12NOS**
		NPN, NC	**RA 4825 H12NCS**	**RA 4850 H12NCS**	**RA 4890 H12NCS**	**RA 48110 H12NCS**
		PNP, NO	**RA 4825 H12POS**	**RA 4850 H12POS**	**RA 4890 H12POS**	**RA 48110 H12POS**
		PNP, NC	**RA 4825 H12PCS**	**RA 4850 H12PCS**	**RA 4890 H12PCS**	**RA 48110 H12PCS**

General Specifications

	RA12...06..S	RA23...06..S	RA40...10..S	RA48...12..S
Operational voltage range	60 to 140 VACrms	170 to 250 VACrms	150 to 440 VACrms	180 to 530 VAC
Blocking voltage	650 V_p	650 V_p	1000 V_p	1200 V_p
Zero voltage turn-on	≤ 15 V	≤ 15 V	≤ 15 V	≤ 25 V
Operational frequency range	45 to 65 Hz	45 to 65 Hz	45 to 65 Hz	45 to 65 Hz
Power factor cos φ	≥ 0.5 @ 120 VACrms	≥ 0.5 @ 230 VACrms	≥ 0.5 @ 400 VACrms	≥ 0.5 @ 480 VACrms
Approvals	UL, CSA	UL, CSA	UL, CSA	UL, CSA
CE-marking	Yes	Yes	Yes	Yes

Control Specifications

Supply voltage range	20 to 32 VDC
Supply current @ 24 VDC	≤ 40 mA DC
Response time pick-up @ 50 Hz	≤ 10 ms
Response time drop-out @ 50 Hz	≤ 10 ms
Active high control input	
Pick-up voltage	Typ. 7 VDC
Drop-out voltage	Typ. 6.8 VDC
Input current (Vc = 32 V)	≤ 4 mA

PNP Alarm output	
Alarm output voltage open	0 VDC
Alarm output voltage @ 100 mA	Vcc - 2 VDC
Alarm output current	≤ 100 mA
NPN Alarm output	
Alarm output voltage open	≤ 32 VDC
Alarm output voltage @ 100 mA	2 VDC
Alarm output current	≤ 100 mA

Output Specifications

	RA..25.06..S	RA..50.06..S	RA..90.10..S	RA..110.12..S
Rated operational current AC 51	≤ 25 Arms	≤ 50 Arms	≤ 90 Arms	≤ 110 Arms
AC 53a	5 Arms	15 Arms	20 Arms	30 Arms
Min. operational load current	≤ 200 mA	≤ 250 mA	≤ 400 mA	≤ 500 mA
Non-rep. surge current t=10 ms	≤ 325 A_p	≤ 600 A_p	≤ 1150 A_p	≤ 1900 A_p
Off-state leakage current @ rated voltage and frequency	≤ 6 mA	≤ 6 mA	≤ 6 mA	≤ 6 mA
I^2t for fusing t=10 ms	≤ 525 A^2s	≤ 1800 A^2s	≤ 6600 A^2s	≤ 18000 A^2s
Critical dv/dt	≥ 500 V/µs	≥ 500 V/µs	≥ 500 V/µs	≥ 500 V/µs

Sense Specifications

	RA12..06..S	RA23..06..S	RA40..10..S	RA48..12..S
Current				
Sensed load current	≥ 50 mA	≥ 50 mA	≥ 50 mA	≥ 50 mA
Non-sensed leakage current	≤ 20 mA	≤ 20 mA	≤ 20 mA	≤ 20 mA
Voltage				
Sensed line voltage	≥ 60 Vrms	≥ 120 Vrms	≥ 150 Vrms	≥ 180 Vrms
Non-sensed line voltage	≤ 30 Vrms	≤ 50 Vrms	≤ 80 Vrms	≤ 100 Vrms
Timing				
Response time from fault to alarm output	≤ 100 ms	≤ 100 ms	≤ 100 ms	≤ 100 ms
Short-circuit of semiconductor	Will be sensed	Will be sensed	Will be sensed	Will be sensed

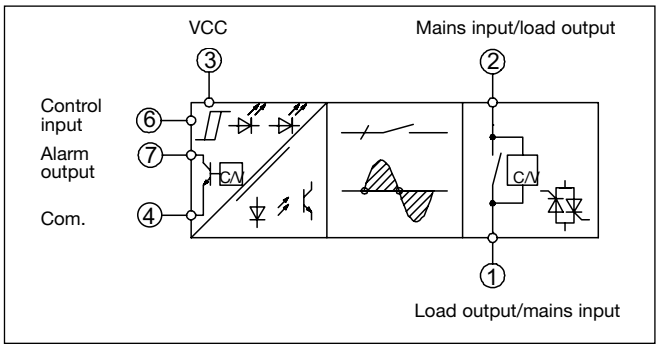
Thermal Specifications

	RA..25.....S	RA..50.....S	RA..90.....S	RA..110.....S
Operating temperature	-20° to +70°C (-4° to +158°F)	-20° to +70°C (-4° to +158°F)	-20° to +70°C (-4° to +158°F)	-20° to +70°C (-4° to +158°F)
Storage temperature	-40° to +100°C (-40° to +212°C)	-40° to +100°C (-40° to +212°C)	-40° to +100°C (-40° to +212°C)	-40° to +100°C (-40° to +212°C)
Junction temperature	≤ 125°C (257°F)	≤ 125°C (257°F)	≤ 125°C (257°F)	≤ 125°C (257°F)
R_{th} junction to case	≤ 1.25 K/W	≤ 0.65 K/W	≤ 0.35 K/W	≤ 0.30 K/W
R_{th} junction to ambient	≤ 12 K/W	≤ 12 K/W	≤ 12 K/W	≤ 12 K/W

Isolation

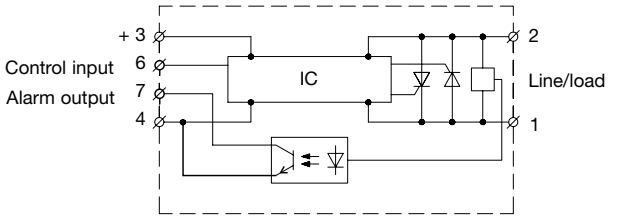
Rated isolation voltage Input to output	≥ 4000 VACrms
Rated isolation voltage Output to case	≥ 4000 VACrms

Functional Diagram

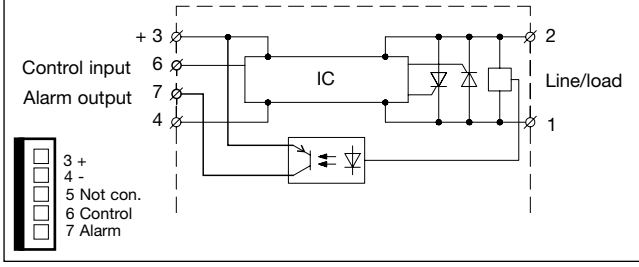


Wiring Diagrams

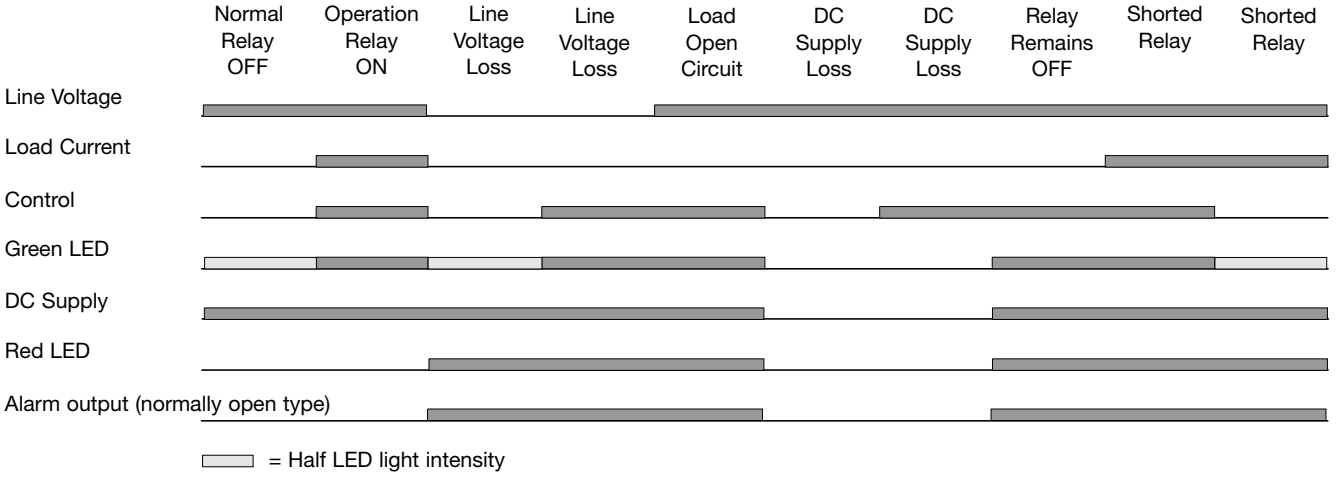
RAxxxxxxNxS



RAxxxxxxPxS



Operation Diagram



Heatsink Dimensions (load current versus ambient temperature)

RA ..25 .....S

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
25	2	1.7	1.4	1	0.71	0.40	32
22.5	2.5	2.1	1.8	1.4	1	0.66	27
20	3.1	2.7	2.3	1.9	1.4	1	23
17.5	4	3.5	3	2.5	2	1.4	20
15	4.9	4.3	3.7	3.1	2.5	1.9	16
12.5	6.2	5.4	4.6	3.9	3.1	2.3	13
10	8.1	7.1	6.1	5.1	4	3	10
7.5	11.3	9.9	8.5	7.1	5.6	4.2	7
5	-	15.6	13.3	11.1	8.9	6.7	5
2.5	-	-	-	-	18.7	14	2
	20	30	40	50	60	70	T_A

Ambient temp. [°C]

RA ..50 .....S

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
50	0.92	0.76	0.60	0.45	0.29	-	63
45	1.2	0.99	0.80	0.62	0.44	0.26	55
40	1.5	1.3	1.1	0.85	0.63	0.42	47
35	1.9	1.6	1.4	1.1	0.89	0.63	40
30	2.4	2.1	1.8	1.5	1.2	0.91	33
25	3	2.7	2.3	1.9	1.5	1.1	26
20	3.9	3.5	3	2.5	2	1.5	20
15	5.5	4.8	4.1	3.4	2.7	2.1	15
10	8.6	7.5	6.4	5.4	4.3	3.2	9
5	17.9	15.6	13.4	11.2	8,9	6.7	4
	20	30	40	50	60	70	T_A

Ambient temp. [°C]

RA ..90 .....S

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
90	0.63	0.53	0.42	0.32	-	-	97
80	0.81	0.69	0.57	0.45	0.33	-	84
70	1	0.89	0.75	0.61	0.47	0.33	71
60	1.3	1.2	1	0.83	0.66	0.49	59
50	1.7	1.5	1.3	1.1	0.85	0.64	47
40	2.2	1.9	1.7	1.4	1.1	0.83	36
30	3.1	2.7	2.3	1.9	1.5	1.2	26
20	4.8	4.2	3.6	3	2.4	1.8	17
10	10	8.8	7.5	6.3	5	3.8	8
	20	30	40	50	60	70	T_A

Ambient temp. [°C]

RA ..110 .....S

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
110	0.43	0.35	0.27	-	-	-	126
90	0.63	0.53	0.42	0.32	-	-	97
80	0.81	0.69	0.57	0.45	0.33	-	84
70	1	0.89	0.75	0.61	0.47	0.33	71
60	1.3	1.2	1	0.83	0.66	0.49	59
50	1.7	1.5	1.3	1.1	0.85	0.64	47
40	2.2	1.9	1.7	1.4	1.1	0.83	36
30	3.1	2.7	2.3	1.9	1.5	1.2	26
20	4.8	4.2	3.6	3	2.4	1.8	17
10	10	8.8	7.5	6.3	5	3.8	8
	20	30	40	50	60	70	T_A

Ambient temp. [°C]

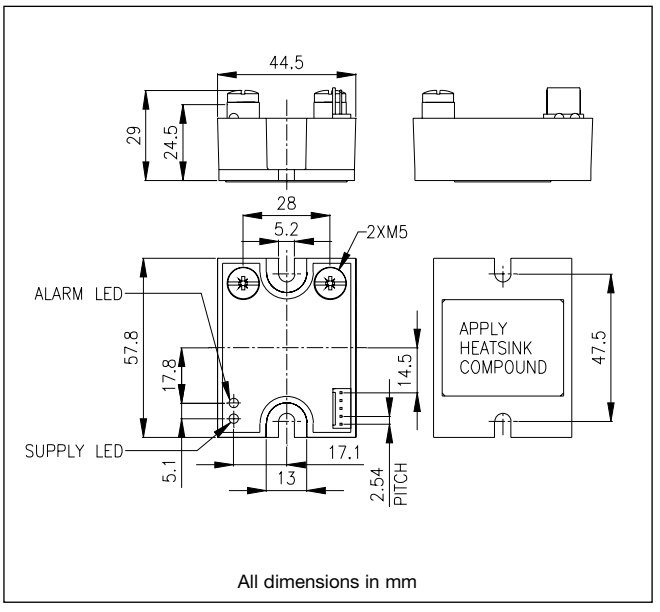
Heatsink Selection

Carlo Gavazzi Heatsink (See "General Accessories")	**Thermal resistance..**	**...for power dissipation**
No heatsink required	---	N/A
RHS 300	5.00 K/W	> 0 W
RHS 100	3.00 K/W	> 25 W
RHS 45C	2.70 K/W	> 60 W
RHS 45B	2.00 K/W	> 60 W
RHS 90A	1.35 K/W	> 60 W
RHS 45C plus fan	1.25 K/W	> 0 W
RHS 45B plus fan	1.20 K/W	> 0 W
RHS 112A	1.10 K/W	> 100 W
RHS 301	0.80 K/W	> 70 W
RHS 90A plus fan	0.45 K/W	> 0 W
RHS 112A plus fan	0.40 K/W	> 0 W
RHS 301 plus fan	0.25 K/W	> 0 W
Consult your distributor	> 0.25 K/W	N/A
Infinite heatsink - No solution	---	N/A

Housing Specifications

Weight	Approx. 110 g
Housing material	Noryl GFN 1, black
Base plate 25, 50 A	Aluminium, nickel-plated
90, 110 A	Coper, nickel-plated
Potting compound	Polyurethane
Relay	
Mounting screws	M5
Mounting torque	≤ 1.5 Nm
Power terminal	
Mounting screws	M5 x 6
Mounting torque	≤ 2.4 Nm
Control connector	5 pole, centre distance 2.54 mm

Dimensions



All dimensions in mm

Accessories

Heatsinks
DIN rail adapter
Varistors
Fuses

Connector for ribbon cable:	Methode 1300-105-424
Header for PCB mounting:	Methode 1100-8-105-01
Ribbon cable:	5 x 0.5 mm^2, centre distance 2.54 mm

Ribbon Cable Selection

RCS 5-200-0*

R-System
Cable sense
5-wire
Cable length in cm

* 0: No connector mounted (Method 1300-105-424)
  1: 1 connector mounted
  2: 2 connectors mounted

Solid State Relays
Industrial, 1-Phase DCS
Types RD 0605 -D, RD 2001 -D, RD 3501 -D

- **DC Solid State Relay**
- **Rated operational current: 1 and 5 ADC**
- **Operational voltage range: Up to 350 VDC**
- **Input range: 3 to 32 VDC**
- **Isolation: OPTO (input-output) 4000 VACrms**

Product Description

The DC switching relay is used in applications in which there is a need for fast switching of small DC loads with a high input/output isolation of more than 4000 VACrms. The DC switching transistor relay always switches ON and OFF in accordance with the applied control voltage.

Ordering Key

RD 06 05 -D

- **Solid State Relay**
- **Switching mode**
- **Rated operational voltage**
- **Rated operational current**
- **Control voltage**

Type Selection

Switching mode	Rated operational voltage	Rated operational current	Control voltage
D: DC switching	06: 60 VDC 20: 200 VDC 35: 350 VDC	01: 1 ADC 05: 5 ADC	-D: 3 to 32 VDC

Selection Guide

Rated operational voltage	Control voltage	Rated operational current 1 ADC	5 ADC
60 VDC	3 to 32 VDC		**RD 0605 -D**
200 VDC	3 to 32 VDC	**RD 2001 -D**	
350 VDC	3 to 32 VDC	**RD 3501 -D**	

General Specifications

	RD 0605 -D	RD 2001 -D	RD 3501 -D
Operational voltage range	3 to 60 VDC	3 to 200 VDC	3 to 350 VDC
Off-state blocking voltage	≥ 60 VDC	≥ 200 VDC	≥ 350 VDC
Approval	CSA	CSA	CSA
CE-marking	Yes	Yes	Yes

Input Specifications

	RD 2001 -D	RD 0605 -D RD 3501 -D
Control voltage range	3 to 32 VDC	3 to 32 VDC
Pick-up voltage	≤ 3 VDC	≤ 3 VDC
Drop-out voltage	≥ 1 VDC	≥ 1 VDC
Reverse voltage	≤ 32 VDC	≤ 32 VDC
Activating frequency	≤ 100 Hz	≤ 100 Hz
Input impedance	1 kΩ	1 kΩ
Response time pick-up @ V in ≥ 5 V	≤ 100 µs	≤ 100 µs
Response time drop-out	≤ 1 ms	≤ 1 ms
Input pulse rise and fall time	≤ 100 µs	no limit

Output Specifications

	RD 2001 -D RD 3501 -D	RD 0605 -D
Rated operational current DC 1	1 A	5 A
Minimum operational current	1 mA	1 mA
Rep. overload current t=1 s	≤ 2 A	≤ 10 A (15A@80ms)
Off-state leakage current @ rated voltage	≤ 1 mA	≤ 1 mA
On-state voltage drop @ rated current	≤ 1.5 V	≤ 1.5 V

Thermal Specifications

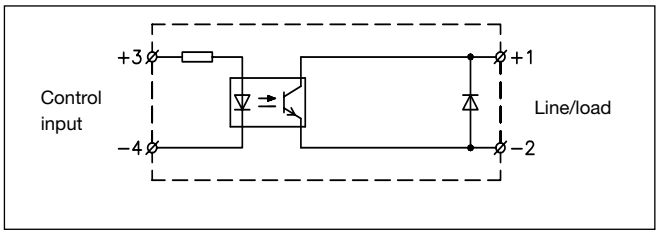
Operating temperature	-20° to +70°C (-4° to +158°F)
Storage temperature	-40° to +100°C (-40° to +212°F)
Junction temperature	≤ +150°C (+302°F)
R_{th} junction to case	≤ 3 K/W
R_{th} junction to ambient	≤ 15 K/W

Isolation

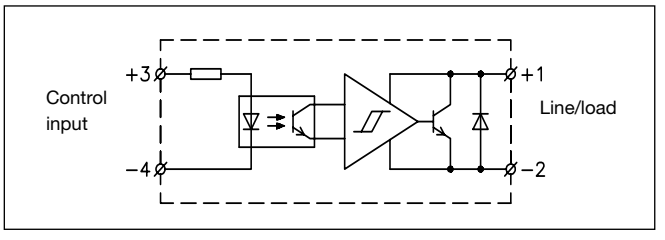
Rated isolation voltage Input to output	≥ 4000 VACrms
Rated isolation voltage Output to case	≥ 4000 VACrms
Insulation resistance Input to output	≥ 10^{10} Ω
Insulation resistance Output to case	≥ 10^{10} Ω
Insulation capacitance Input to output	≤ 8 pF
Insulation capacitance Output to case	≤ 50 pF

Wiring Diagrams

RD 2001-D RD 3501-D

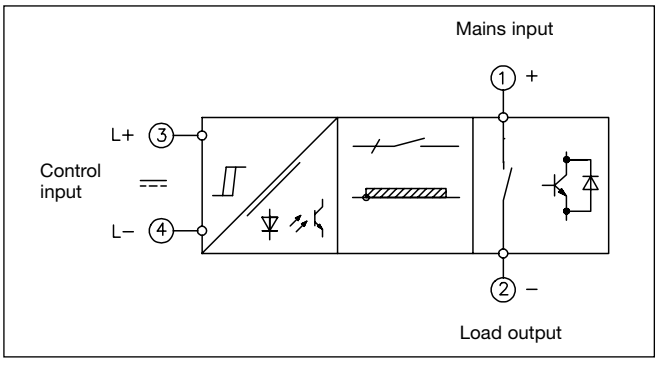


RD 0605 -D

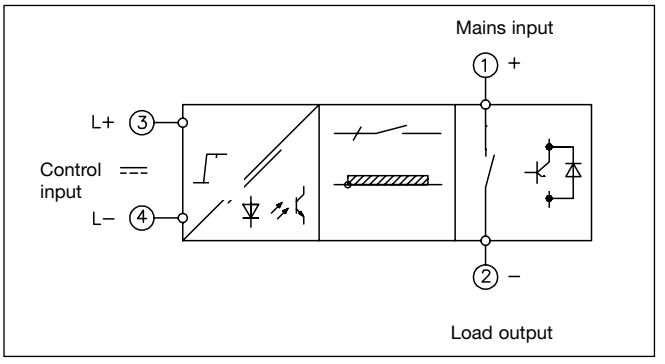


Functional Diagrams

RD 0605-D

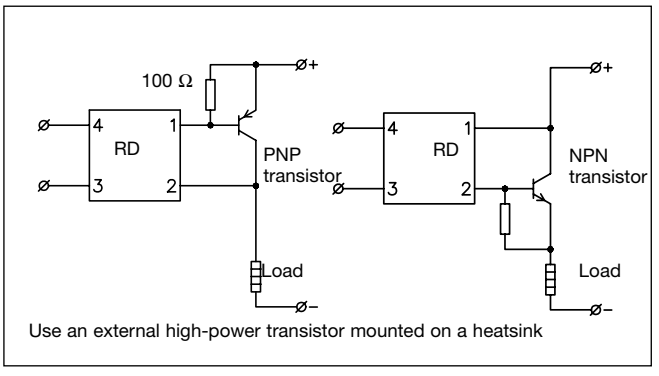


RD 2001-D RD 3501-D



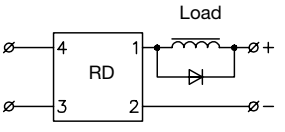
Applications

High-power switching



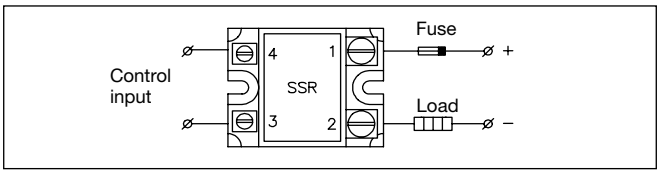
Use an external high-power transistor mounted on a heatsink

Inductive load



An inductive load must be suppressed by a diode.

Fusing



Heatsink Dimensions

RD 0605 -D

Load current [A DC]	Thermal resistance [K/W]					
	20	30	40	50	60	70
5	10.7	9.3	8	6.7	5.3	4
4	13.3	11.7	10	8.3	6.7	5
3	-	-	13.3	11.1	8.8	6.7
2	-	-	-	-	13.3	10
1	-	-	-	-	-	-

T_A Ambient temp. [°C]

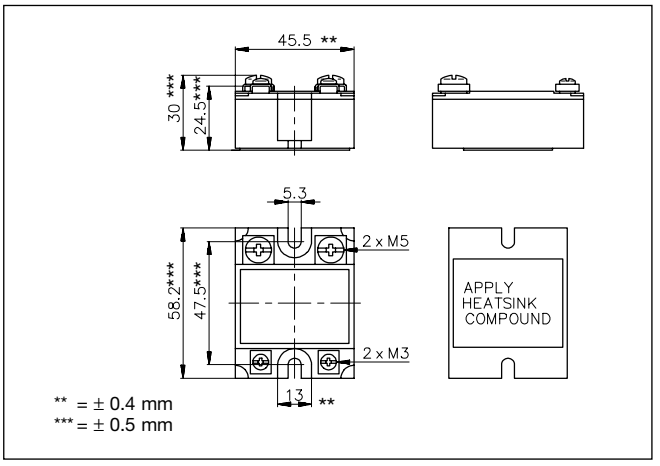
Heatsink Selection

Carlo Gavazzi Heatsink (see Accessories)	**Thermal resistance**
No heatsink required	$R_{th\ s\text{-}a}$ > 12.5 K/W
RHS 100 Assy	3.0 K/W

Compare the value found in the current versus temperature chart with the standard heatsink values and select the heatsink with the next lower value.

Frequency = 0 to 10 Hz.
Types RD 2001-D and RD 3501-D require no heatsinking.

Dimensions



Housing Specifications

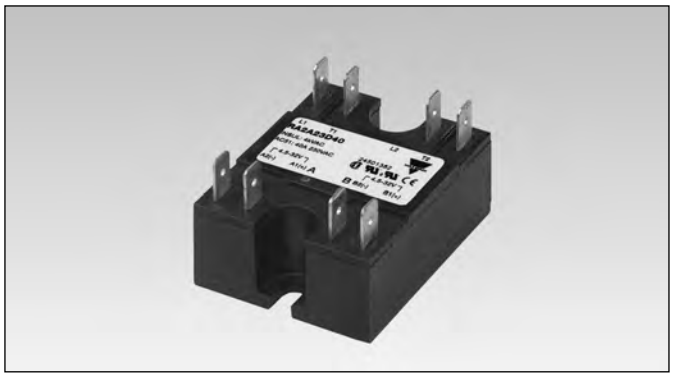
Weight	Approx. 110 g
Housing material	Noryl GFN 1, black
Base plate	Aluminium
Potting compound	Polyurethane
Relay	
Mounting screws	M5
Mounting torque	≤ 1.5 Nm
Control terminal	
Mounting screws	M3 x 6
Mounting torque	≤ 0.5 Nm
Power terminal	
Mounting screws	M5 x 6
Mounting torque	≤ 2.4 Nm

Accessories

Protection cover
Heatsinks
DIN rail adapter
Varistors
Fuses

For further information refer to "General Accessories".

Solid State Relays
Industrial, 2-Pole ZS
Type RA2A



- 2-Pole AC Solid State Relay
- Zero switching
- For resistive and inductive AC loads
- Direct copper bonding (DCB) technology
- LED indication
- Rated operational current: 2 x 25 and 2 x 40AACrms
- Rated operational voltage: 230 - 600VACrms
- Input range: 4.5 - 32VDC
- Blocking voltage: Up to 1200Vp
- Opto-isolation: 4000VACrms

Product Description

This 2-pole industrial relay minimises the space requirements in a control cabinet without compromising performance. By applying an input voltage on control A, the corresponding output semicondcutor is activated at the first zero crossing of the line voltage.The same applies to control B. LEDs indicate the control status of each pole. The optimised design is free of moulding mass to reduce internal mechanical stress.
The RA2A..M types have been specially customised for demanding inductive loads.

Ordering Key

RA 2 A 48 D 25 M

- **Solid State Relay**
- **Number of poles**
- **Zero switching**
- **Rated operational voltage**
- **Control voltage**
- **Rated operational current**
- **Load type**

Type Selection

Switching mode	Rated operational voltage	Rated operational current	Control voltage	Blocking voltage	Load type
A: Zero switching	23: 230VACrms 40: 400VACrms 48: 480VACrms 60: 600VACrms	25: 2 x 25AACrms 40: 2 x 40AACrms	D: 4.5 - 32VDC	23: 650V_p 40: 850V_p 48: 1200V_p 60: 1200V_p	M: Inductive

Selection Guide

Rated operational voltage	Blocking voltage	Control voltage	Rated operational current 2 x 25AACrms	2 x 40AACrms
230VACrms	650V_p	4.5 - 32VDC	**RA2A23D25**	**RA2A23D40**
			RA2A23D25M	**RA2A23D40M**
400VACrms	850V_p	4.5 - 32VDC	**RA2A40D25**	**RA2A40D40**
			RA2A40D25M	**RA2A40D40M**
480VACrms	1200V_p	4.5 - 32VDC	**RA2A48D25**	**RA2A48D40**
			RA2A48D25M	**RA2A48D40M**
600VACrms	1200V_p	4.5 - 32VDC	**RA2A60D25**	**RA2A60D40**
			RA2A60D25M	**RA2A60D40M**

Input Specifications

Control voltage range	4.5 - 32VDC
Pick-up voltage	4.25VDC
Drop-out voltage	2VDC
Input current per pole @ max. input voltage	≤10mA
Response time pick-up @ 50 Hz	≤10ms
Response time drop-out @ 50 Hz	≤10ms

Housing Specifications

Weight	Approx. 85g
Housing material	Noryl GFN 1, black
Base plate 25, 40A 40A (M type)	 Aluminium, nickel-plated Copper, nickel-plated
FASTONTerminal size	6.3mm

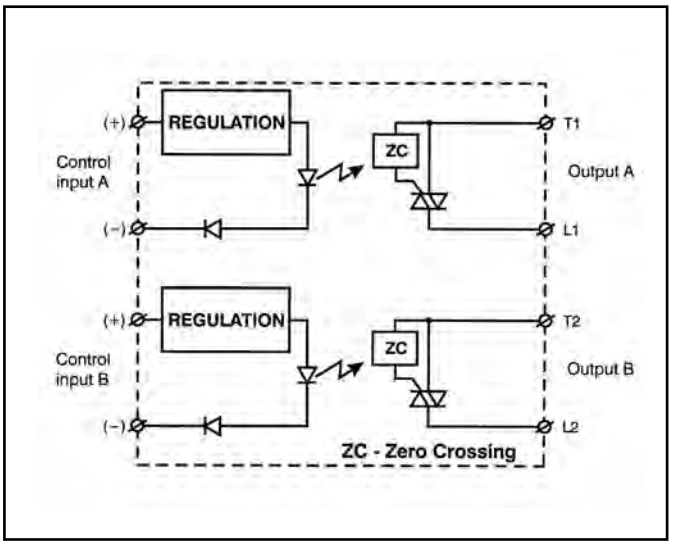
General Specifications

	RA2A23...	RA2A40...	RA2A48...	RA2A60...
Operational voltage range	24 to 265VACrms	42 to 440VACrms	42 to 530VACrms	42 to 660VACrms
Blocking voltage	650V_p	850V_p	1200V_p	1200V_p
Rated isolation input -output/output - heatsink	4kV	4kV	4kV	4kV
Operational frequency range	45 to 65Hz	45 to 65Hz	45 to 65Hz	45 to 65Hz
LED ON indication (x2)	Yes (green)	Yes (green)	Yes (green)	Yes (green)
Power factor RA2A RA2A..M	 ≥ 0.95 @ 230VAC ≥ 0.50 @ 230VAC	 ≥ 0.95 @ 400VAC ≥ 0.50 @ 400VAC	 ≥ 0.95 @ 480VAC ≥ 0.50 @ 480VAC	 ≥ 0.95 @ 600VAC ≥ 0.50 @ 600VAC
Zero voltage turn-on	< 15V	< 15V	< 15V	< 15V
Approvals	UL, cUL, CSA	UL, cUL, CSA	UL, cUL, CSA	UL, cUL, CSA
CE-marking	Yes	Yes	Yes	Yes
Conformance	VDE	VDE	VDE	VDE

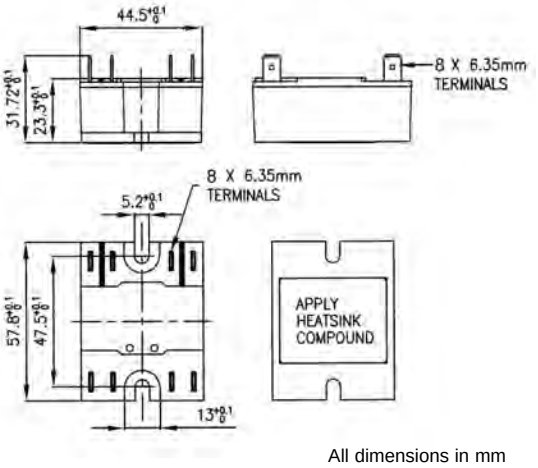
Output Specifications

	RA2A...25	RA2A...40	RA2A..D25M	RA2A..D40M
Rated operational current AC 51 AC 53a	2 x 25AACrms -	2 x 40AACrms -	2 x 25AACrms 2 x 5AACrms	2 x 40AACrms 2 x 15AACrms
Minimum operational current	150mA	250mA	150mA	250mA
Non-rep. surge current t=10 ms	300A_p	390A_p	300A_p	600A_p
Off-state leakage current	< 3mA	< 3mA	< 3mA	< 3mA
I^2t for fusing t=10 ms	450A^2s	760A^2s	450A^2s	1800A^2s
On-state voltage drop @ rated current	≤ 1.6Vrms	≤ 1.6Vrms	≤ 1.6Vrms	≤ 1.6Vrms
Critical dV/dt off-state min.	500V/µs	500V/µs	500V/µs	500V/µs
Zero crossing detection	Yes	Yes	Yes	Yes

Functional Diagram



Dimensions



All dimensions in mm

Heatsink Dimensions (load current versus ambient temperature)

RA 2....25/25M

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
50	1.11	0.94	0.78	0.62	0.46	0.29	62
45	1.36	1.17	0.99	0.80	0.61	0.43	54
40	1.68	1.47	1.25	1.03	0.81	0.60	46
35	2.06	1.80	1.54	1.29	1.03	0.77	39
30	2.5	2.2	1.87	1.56	1.25	0.94	32
25	3.1	2.7	2.3	1.9	1.6	1.17	26
20	4.0	3.5	3.0	2.5	2.0	1.52	20
15	6	5	4	3.5	2.8	2.1	14
10	9	8	7	6	4	3.3	9
5	18	16	14	12	9	7	4
	20	30	40	50	60	70	T_A

Ambient temp. [°C]

RA 2....40

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
80	0.68	0.56	0.44	0.32	0.19	0.07	82
72	0.87	0.73	0.59	0.45	0.31	0.17	72
64	1.10	0.94	0.78	0.62	0.45	0.29	62
56	1.41	1.22	1.03	0.83	0.64	0.45	52
48	1.8	1.6	1.36	1.13	0.90	0.67	43
40	2.3	2.0	1.7	1.4	1.1	0.86	35
32	3.0	2.6	2.2	1.9	1.5	1.11	27
24	4	4	3	2.6	2.0	1.5	20
16	6	6	5	4	3	2.4	13
8	13	12	10	8	7	5	6
	20	30	40	50	60	70	T_A

Ambient temp. [°C]

RA 2....40M

Load current [A]	Thermal resistance [K/W]						Power dissipation [W]
100	0.41	0.32	0.23	0.13	0.04	-	108
90	0.55	0.44	0.34	0.23	0.13	0.02	95
80	0.72	0.60	0.48	0.35	0.23	0.11	82
70	0.95	0.80	0.66	0.52	0.37	0.23	70
60	1.25	1.08	0.90	0.73	0.56	0.39	58
50	1.7	1.5	1.25	1.04	0.83	0.61	47
40	2.2	1.9	1.6	1.4	1.1	0.82	36
30	3	2.7	2.3	1.9	1.5	1.14	26
20	5	4	4	2.9	2.3	1.8	17
10	10	9	7	6	5	3.6	8
5	20	17	15	12	10	7	4
	20	30	40	50	60	70	T_A

Ambient temp. [°C]

Heatsink Selection

Carlo Gavazzi Heatsink (see Accessories)	Thermal resistance...	...for power dissipation
No heatsink required	---	N/A
RHS 300	5.00K/W	> 0 W
RHS 100	3.00K/W	> 25 W
RHS 45C	2.70K/W	> 60 W
RHS 45B	2.00K/W	> 60 W
RHS 90A	1.35K/W	> 60 W
RHS 45C plus fan	1.25K/W	> 0 W
RHS 45B plus fan	1.20K/W	> 0 W
RHS 112A	1.10K/W	> 100 W
RHS 301	0.80K/W	> 70 W
RHS 90A plus fan	0.45K/W	> 0 W
RHS 112A plus fan	0.40K/W	> 0 W
RHS 301 plus fan	0.25K/W	> 0 W
Consult your distribution	> 0.25K/W	N/A
Infinite heatsink - No solution	---	N/A

Note: Add the currents of both poles and compare with datasheets for proper heatsink.
Each pole can handle up to the maximum current specified. Example: Each pole of the RA2A23D25 can handle a maximum of 25 A.

Accessories

Heatsinks
DIN rail adapter
Varistors
Fuses

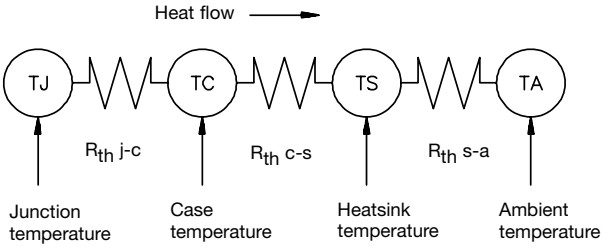
For further information refer to "General Accessories".

Applications

This relay is designed for use in applications in which it is exposed to high surge conditions. Care must be taken to ensure proper heatsinking when the relay is to be used at high sustained currents. Adequate electrical connection between relay terminals and cable must be ensured.

Thermal characteristics
The thermal design of Solid State Relays is very important. It is essential that the user makes sure that cooling is adequate and that the maximum junction temperature of the relay is not exceeded.

If the heatsink is placed in a small closed room, control panel or the like, the power dissipation can cause the ambient temperature to rise. The heatsink is to be calculated on the basis of the ambient temperature and the increase in temperature.



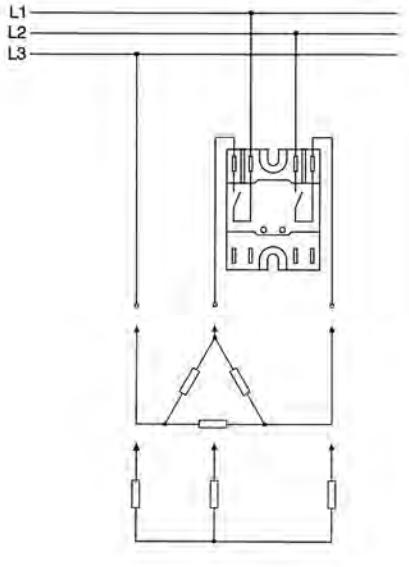
Thermal resistance:
R_{th} j-c = junction to case
R_{th} c-s = case to heatsink
R_{th} s-a = heatsink to ambient

Thermal Specifications

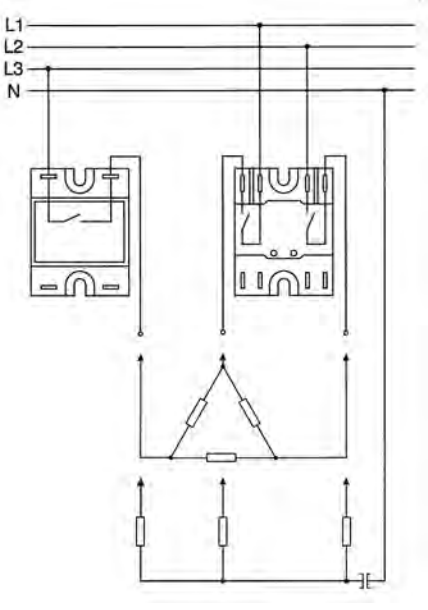
	RA2A...25.	RA2A...40	RA2A...40M
Operating temperature	-20° to 70°C	-20° to 70°C	-20° to 70°C
Storage temperature	-20° to 80°C	-20° to 80°C	-20° to 80°C
Junction temperature	≤ 125°C	≤ 125°C	≤ 125°C
R_{th} junction to case 1 pole 2 pole	 1K/W 0.5K/W	 1K/W 0.5K/W	 0.92K/W 0.46K/W
R_{th} junction to ambient	≤ 20K/W	≤ 20K/W	≤ 20K/W

Applications

A single two pole relay in a three phase application.
Star and Delta (Economy switch)



A two pole relay and a single pole relay connected on a three phase application. Delta, star and star with a neutral point.



Solid State Relays
Industrial, 3-Phase ZS
Type RZ3A

- **3-phase Solid State Relay**
- **Zero switching**
- **Rated operational current: 3 x 25, 55 or 75 A**
- **Rated operational voltage: Up to 600 VAC**
- **Control voltage 5 VDC, 4-32 VDC or 24-275 VAC**
- **Integral snubber network**
- **Over-temperature protection option with alarm output**
- **IP 10 back-of-hand protection**
- **LED indication of control input and over-temperature alarm status**

Product Description

A Solid State Relay family designed to switch various loads such as heating elements, motors and transformers. The relay is capable of switching high voltages up to 600 VACrms.

For higher reliability and load cycle capability three semiconductor power units are soldered directly on to the direct copper bonded (DCB) substrate.

AC- or DC-controlled versions are available. Built-in LED status indication for applied control voltage and over-temperature alarm (optional). A version that can be controlled with 5 VDC @ 15 mA (max) is also available (LD).

The series covers a range of load currents up to 75 AACrms.

Ordering Key

RZ 3 A 60 D 75 P

- **Solid State Relay**
- **Number of poles**
- **Switching mode**
- **Rated opertional voltage**
- **Control voltage**
- **Rated opertional current**
- **Options**

Type Selection

Switching mode	Rated operational voltage	Rated operational current	Control voltage	Option
A: Zero Switching	40: 400 VACrms 60: 600 VACrms	25: 3 x 25 AACrms 55: 3 x 55 AACrms 75: 3 x 75 AACrms	LD: 5 VDC D: 4-32 VDC A: 24-275 VAC/24-50 VDC	P: Over-temperature protection and alarm output (available only for A and D input)

Selection Guide

Rated operational voltage	Control voltage	Rated operational current 3 x 25 A	3 x 55 A	3 x 75 A
400 VACrms	5 VDC	**RZ3A40LD25**	**RZ3A40LD55**	**RZ3A40LD75**
	4-32 VDC	**RZ3A40D25**	**RZ3A40D55**	**RZ3A40D75**
	24-275 VAC/24-50 VDC	**RZ3A40A25**	**RZ3A40A55**	**RZ3A40A75**
600 VACrms	5 VDC	**RZ3A60LD25**	**RZ3A60LD55**	**RZ3A60LD75**
	4-32 VDC	**RZ3A60D25**	**RZ3A60D55**	**RZ3A60D75**
	24-275 VAC/24-50 VDC	**RZ3A60A25**	**RZ3A60A55**	**RZ3A60A75**

Notes
Over-temperature protection and alarm output: add suffix P to include over-temperature protection and alarm output.
Example: RZ3A60D75P. Not available with “LD” type control.

Isolation

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

Thermal Specifications

Operating temperature	-30° to +80°C (-22° to +158° F)
Storage temperature	-40° to +100°C (-40° to + 212° F)
Junction temperature	≤ +125°C (+ 257°F)

General Specifications

	RZ3A40..	RZ3A60..
Operational voltage range	24-440 VAC	42-660 VAC
Blocking voltage	850 V_p	1200 V_p
Operational frequency range	45 to 65 Hz	45 to 65 Hz
Overvoltage category	III	III
Pollution degree	3	3
Approvals	UL, cUL, CSA	UL, cUL,CSA
CE-marking	Yes	Yes

Input Specifications

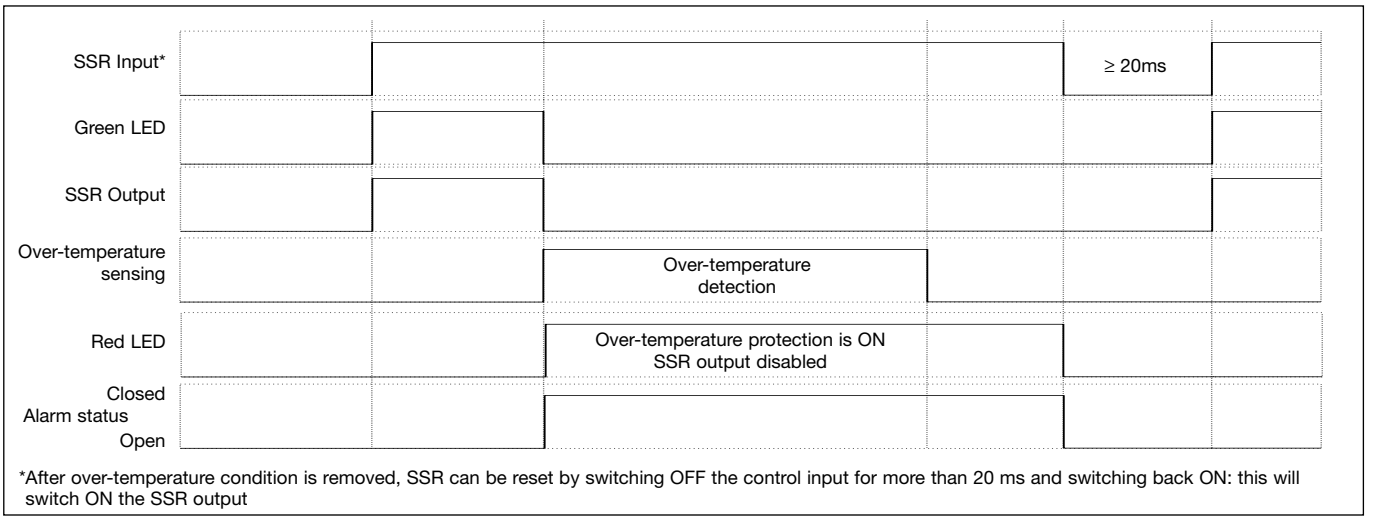
	RZ3A..LD..	RZ3A..D..	RZ3A..A..
Control voltage range	5 VDC	4-32 VDC	24-275 VAC/24-50 VDC
Pick-up voltage	4.5 VDC	3.8 VDC	18 VAC/20 VDC
Drop-out voltage	1.2 VDC	1.2 VDC	9 VAC/DC
Input current	≤ 15 mA	≤ 23 mA	≤ 15 mA
Response time pick-up Power output = 50 Hz	10 ms	10 ms	20 ms
Response time drop-out Power output = 50 Hz	10 ms	10 ms	30 ms

All data specified at Ta=25°C

Output Specifications

	RZ3A..25..	RZ3A..55..	RZ3A..75..
Rated operational current AC51 @ Ta=25°C AC53a @ Ta=25°C	 25 Arms 5 Arms	 55 Arms 15 Arms	 75 Arms 20 Arms
Minimum operational current	150 mArms	250 mArms	400 mArms
Rep. overload current t=1 s	37 Arms	< 125 Arms	< 150 Arms
Non-rep. surge current t = 10 ms	300 A_p	600 A_p	1150 A_p
Off-state leakage current	< 3 mArms	< 3 mArms	< 3 mArms
I^2t for fusing t = 10 ms	450 A^2s	1800 A^2s	6600 A^2s
On-state voltage drop	≤ 1.6 Vrms	≤ 1.6 Vrms	≤ 1.6 Vrms
Critical dV/dt off-state	≥ 500 V/µs	≥ 500 V/µs	≥ 500 V/µs

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

Heatsink Dimensions (load current versus ambient temperature)

RZ3..25

Load current [A]	Thermal resistance [K/W]							Power dissipation [W]
25.0	0.44	0.34	0.23	0.12	0.01	--	--	92
22.5	0.62	0.49	0.37	0.24	0.12	--	--	80
20.0	0.84	0.69	0.54	0.40	0.25	0.10	--	68
17.5	1.12	0.95	0.78	0.60	0.43	0.25	0.08	58
15.0	1.51	1.30	1.09	0.88	0.67	0.46	0.25	47
12.5	2.06	1.80	1.54	1.27	1.01	0.75	0.48	38
10.0	2.75	2.40	2.06	1.72	1.37	1.03	0.69	29
7.5	3.83	3.35	2.87	2.39	1.91	1.43	0.96	21
5.0	6.01	5.26	4.51	3.76	3.01	2.25	1.50	13
2.5	12.62	11.04	9.46	7.89	6.31	4.73	3.15	6
	20	30	40	50	60	70	80	T_A

Ambient temp [°C]

RZ3 ..55

Load current [A]	Thermal resistance [K/W]							Power dissipation [W]
55.0	0.29	0.23	0.17	0.11	0.05	--	--	164
50.0	0.36	0.29	0.22	0.16	0.09	0.02	--	148
45.0	0.44	0.36	0.29	0.21	0.14	0.06	--	133
40.0	0.54	0.46	0.37	0.29	0.20	0.12	0.03	118
35.0	0.67	0.58	0.48	0.38	0.28	0.19	0.09	103
30.0	0.85	0.74	0.62	0.51	0.39	0.28	0.16	87
25.0	1.10	0.96	0.82	0.68	0.55	0.41	0.27	73
20.0	1.38	1.21	1.04	0.87	0.69	0.52	0.35	58
15.0	1.85	1.62	1.39	1.16	0.93	0.70	0.46	43
10.0	2.80	2.45	2.10	1.75	1.40	1.05	0.70	29
5.0	5.62	4.92	4.21	3.51	2.81	2.11	1.40	14
2.5	11.26	9.85	8.45	7.04	5.63	4.22	2.82	7
	20	30	40	50	60	70	80	T_A

Ambient temp [°C]

RZ3 ..75

Load current [A]	Thermal resistance [K/W]							Power dissipation [W]
75.0	0.27	0.22	0.17	0.12	0.07	0.02	--	201
70.0	0.32	0.27	0.21	0.16	0.10	0.05	--	184
65.0	0.38	0.32	0.26	0.20	0.14	0.08	0.02	167
60.0	0.44	0.38	0.31	0.25	0.18	0.11	0.05	151
55.0	0.52	0.45	0.38	0.30	0.23	0.16	0.08	136
50.0	0.62	0.54	0.45	0.37	0.29	0.21	0.12	121
45.0	0.74	0.64	0.55	0.46	0.36	0.27	0.17	106
40.0	0.87	0.76	0.65	0.54	0.43	0.32	0.22	92
35.0	1.01	0.89	0.76	0.63	0.51	0.38	0.25	79
30.0	1.21	1.06	0.91	0.76	0.60	0.45	0.30	66
25.0	1.49	1.30	1.11	0.93	0.74	0.56	0.37	54
20.0	1.90	1.67	1.43	1.19	0.95	0.71	0.48	42
15.0	2.60	2.28	1.95	1.63	1.30	0.98	0.65	31
10.0	4.01	3.51	3.01	2.51	2.01	1.50	1.00	20
5.0	8.24	7.21	6.18	5.15	4.12	3.09	2.06	10
	20	30	40	50	60	70	80	T_A

Ambient temp [°C]

Heatsink Selection

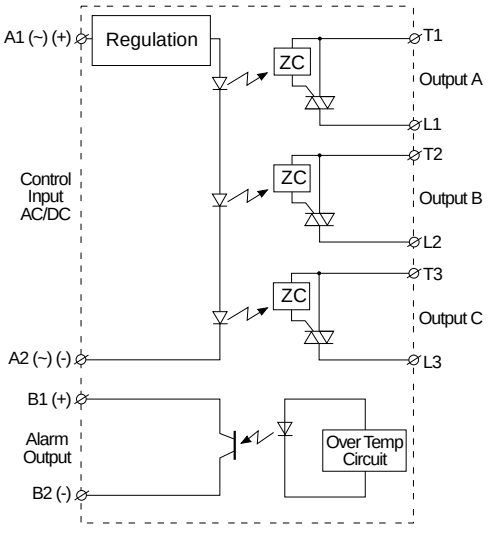
Carlo Gavazzi Heatsink (see Accessories)	**Thermal resistance**
No heatsink required	$R_{th\ s\text{-}a}$ > 8.0 K/W
RHS 300 Assy or backplate	5.0 K/W
RHS 112A Assy	1.1 K/W
RHS 301 Assy	0.8 K/W
RHS 112A F Assy	0.4 K/W
RHS 301 F Assy	0.25 K/W
Consult your distributor	< 0.25 K/W

Alarm Output Specifications

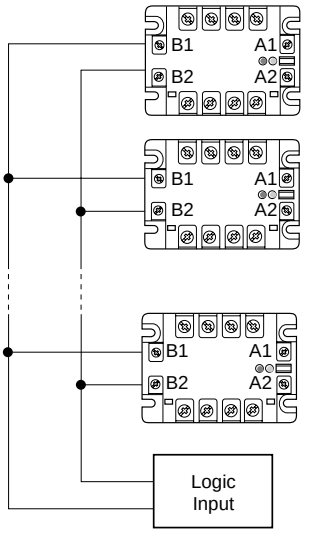
Collector - emitter voltage	35 Vdc
Emitter - collector voltage	6 Vdc
Collector current	50 mA
Delay time on reset	20 ms

Connection Diagrams

Terminal Wiring



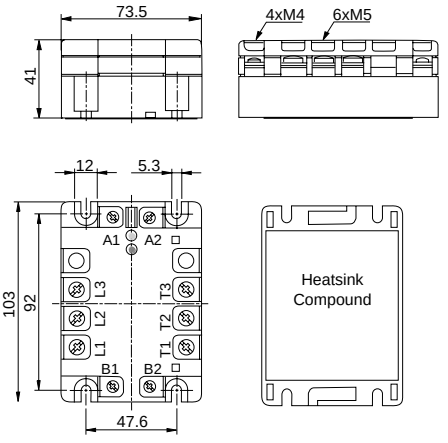
Common Alarm Wiring



Housing Specifications

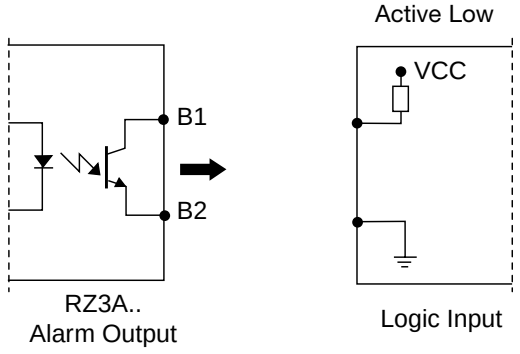
Weight		Approx. 380 g
Material		Noryl
Base plate		
25, 55A		Aluminum, nickel-plated
75A		Copper, nickel-plated
Potting compound		Polyurethane
Relay		
Mounting screws		M5
Mounting torque		≤ 1.5 Nm
Control terminal		
Mounting screws		M4
Mounting torque		≤ 0.5 Nm
Wire size	Max.	2 x 2.5 mm² (AWG14)
	Min.	2 x 1 mm²
Power terminal		
Mounting screws		M5
Mounting torque		≤ 2.5 Nm
Wire size	Max.	2 x 6 mm² (AWG8)
	Min.	2 x 1 mm²

Dimensions



All dimensions in mm

Alarm Output Connection



Forward voltage ≤35 VDC
Reverse voltage ≤6 VDC
Through current ≤50mA

Alarm reset: interrupt control input for more than 20ms

Solid State Relays
Industrial, 1-Phase Hybrid
Type RMD

- **Hybrid relay: Solid State Relay / Electromechanical Relay**
- **Operational ratings up to 230V, 20A ACrms**
- **Integral bypassing of semiconductors**
- **Internal over-temperature protection**
- **Compact 17.5mm wide housing**
- **Standard modular design**
- **DIN rail mounting**
- **No need for external heatsink**
- **Minimum audible noise**
- **Fit and forget: millions of switching cycles**
- **Ideal for switching of single phase loads in residential buildings**

Product Description

The RMD houses semiconductor thyristors and mechanical contacts that compliment each other. On applying the control voltage, thyristors are activated. After a short delay, an electromechanical relay is activated. This switching method protects the contacts of the electromechanical relay and reduces heating of the thyristors. The same principle applies during removal of the control input. The result is millions of trouble-free cycles in a compact and modular switching package.

Ordering Key

RMD 1 H 23 D 20

- **Hybrid Relay**
- **Number of Poles**
- **Switching mode**
- **Rated operational voltage**
- **Control voltage**
- **Rated operational current**

Type Selection

Switching mode	Rated operational voltage	Rated operational current	Control voltage
H: Hybrid Switching	23:230 VAC ± 15%	20: 20AACrms	D: 4-32 VDC A: 24-275VAC/ 24-190VDC

Selection Guide

Rated operational voltage	Blocking voltage	Control voltage	Rated operational current 20 AACrms
230 VAC±15%	600 V_p	4-32 VDC	**RMD1H23D20**
		24-275 VAC 24-190 VDC	**RMD1H23A20**

General Specifications

Operational voltage range	90-260VACrms
Blocking voltage	600V_p
Zero voltage turn-on	<15V
Operational frequency range	45-65Hz
Power factor	≥ 0.9 @ 230VACrms
Approvals	UL, cUL
Markings	CE
Emission	
RMD1H23D20	EN55011/CISPR11 Class A
RMD1H23A20	EN55011/CISPR11 Class B

Pollution degree	2
Degree of protection	IP20 (IEC 60529)
Numbers of cycles	> 5,000,000
Audible noise	< 40dB at 1m
Control status indication	LED, Green
Dielectric withstand voltage input to output	2.5kVACrms

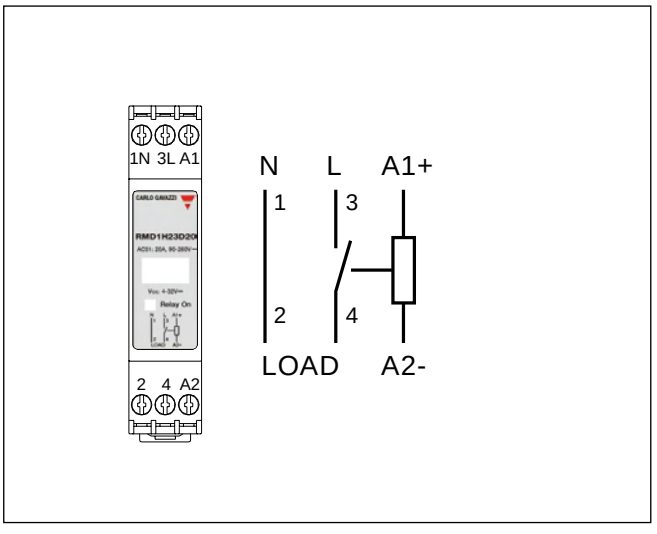
Output Specifications

Rated opertional current AC1/AC51/AC7a @ 25°C	20AACrms,(16AACrms UL rating)	Power dissipation at rated operational current	6.4W
@ 40°C	16AACrms	Number of commutations per minute @ 25°C	6
@ 55°C	11.5AACrms		
Assigned load rating (resistive)	4.5kW @ 25°C	Minimum load current	100mA
Rep. overload current t=1s	37AACrms	Max. leakage current	3mA
Non-rep. surge current, t=10ms	200A$_p$	Relay contacts	Normally open AgCdO
I^2t for fusing, t=10ms	200A^{2}s	Recommended fusing (not supplied)	660 gRB 10-20 Fuse type ST10
Critical dV/dt off state min.	500 V/µs		

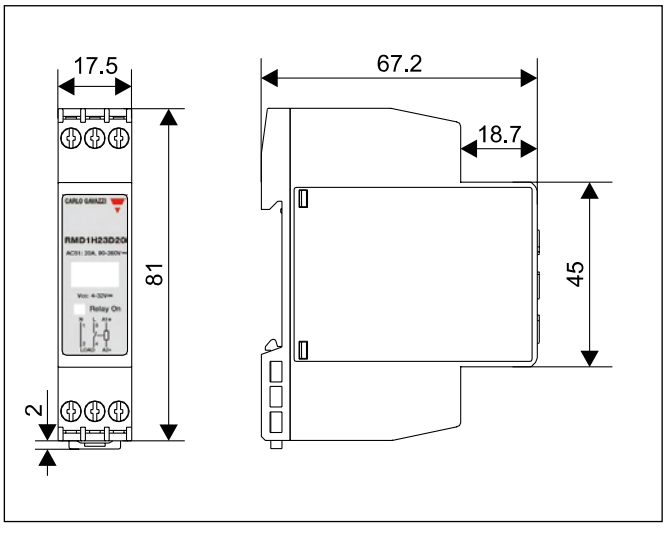
Input Specifications

	RMD1H23D20	RMD1H23A20
Control voltage	4-32VDC	24-275VAC/ 24-190VDC
Pick-up voltage	2VDC	9VAC
Drop-out voltage	1VDC	5VAC
Reverse voltage	32VDC	-
Max. input current	5mADC	2.5mAAC
Response time pick-up	≤ 40ms	40ms
Response time drop-out	≤ 70ms	≤ 100ms

Connection Diagram



Dimensions



All dimensions in mm

Housing Specifications

Weight	60g (approx)
Housing material	self extinguishing UL94V0
Potting compound	none
Terminals	
Tightening screws	M3
Max. terminal tightening torque	0.6Nm (5.3 lb.in)
Max. cross-sectional area of cable (stranded)	4.0mm^2 (AWG 12) 2.5mm^2 (AWG12) accord. to IEC 60947-1

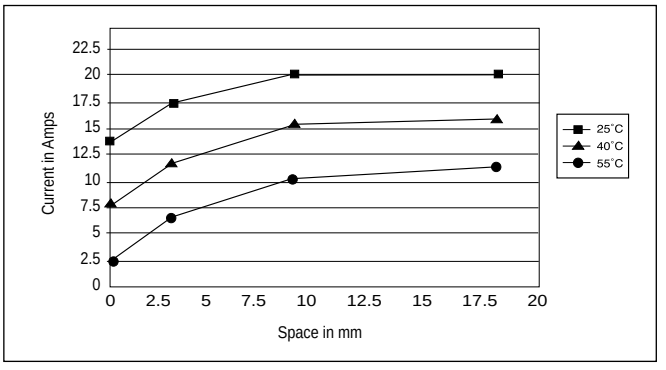
Thermal Specifications

Operating temperature	-5° to +55°C
Storage temperature	-40° to +85°C
Relative humidity	< 95% non-condensing

Over Temperature Protection

Over-temperature indication	LED intermittent
Reset	Switch OFF supply and switch back ON in > 100ms
Temperature limit	100°C

Derating vs. mounting space



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]**

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 2.5mm^2 cables can be connected in each screw terminal to allow looping. A removable IP20 cover allows connection of a 4mm^2 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	23: 230 VACrms	D: 4-32 VDC	20: 20 AACrms	U: SSR	P: Over-temp. protection[2]
B: Instant-on switching[1]	60: 600 VACrms	A: 24-275 VAC/ 24-48 VDC	30: 30 AACrms	E: Contactor	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	**RJ1A23D20E** **RJ1A23D20U**	**RJ1A23D30E** **RJ1A23D30U**	**RJ1A23D30EP**
		24 - 275 VAC / 24 - 48VDC	**RJ1A23A20E** **RJ1A23A20U**	**RJ1A23A30E** **RJ1A23A30U**	**RJ1A23A30EP**
600 VACrms	1200 V_p	4 - 32 VDC	**RJ1A60D20E** **RJ1A60D20U**	**RJ1A60D30E** **RJ1A60D30U**	**RJ1A60D30EP**
		24 - 275 VAC / 24 - 48VDC	**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

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
Vibration	6g (According to EN50155)	6g (According to EN50155)
Approvals	UL, cUL, CSA	UL, cUL, CSA
CE-marking	Yes	Yes
Pollution degree	2	2

Input Specifications

	RJ1A..D	RJ1B.D	RJ..A
Control voltage range	4 to 32 VDC	4.5 to 32 VDC	24-275VAC/ 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
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

Output Specifications

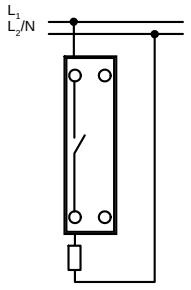
	RJ..20	RJ..30
Rated operational current AC51 @TA=25°C AC53a @Ta=25°C	 20 AACrms 5 AACrms	 30 AACrms 15 AACrms
Min. operational current	350 mAACrms	250mAACrms
Rep. overload current t = 1s	< 35 AACrms	<125 AACrms
Non rep. surge current Tj(init.) = 25°C and t = 10 ms	300 A_p	600 A_p
Off-state leakage current @ 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

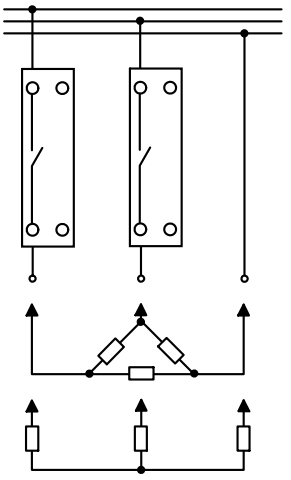
	RJ...D	RJ...A
Operating temperature	-30 to +70°C (-22 to +158°F)	-30 to +70°C (-22 to +158°F)
Storage temperature	-40 to +100°C (-40 to +176°F)	-40 to +100°C (-40 to +176°F)

Applications

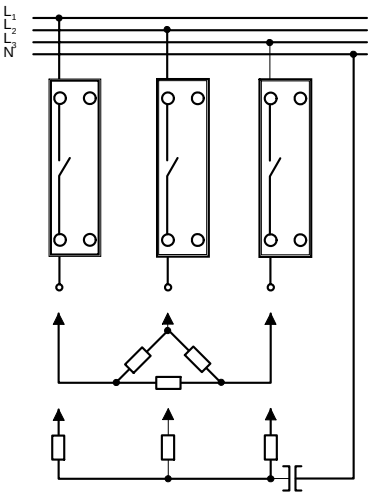
Single pole relay application
Line-Neutral, Line-Line



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

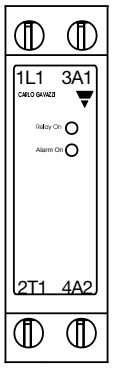


3 single pole relays in 3-phase application
Delta, Star, Star with neutral



Terminal Layout

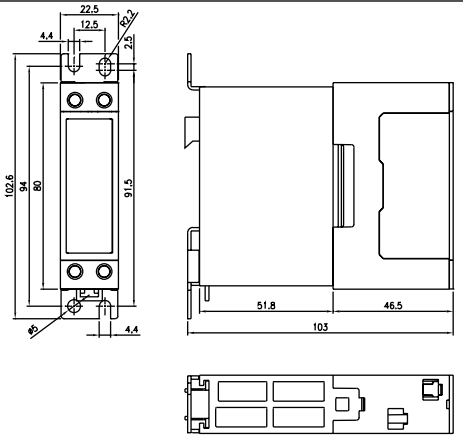
RJ1A.....E



RJ1A.....U

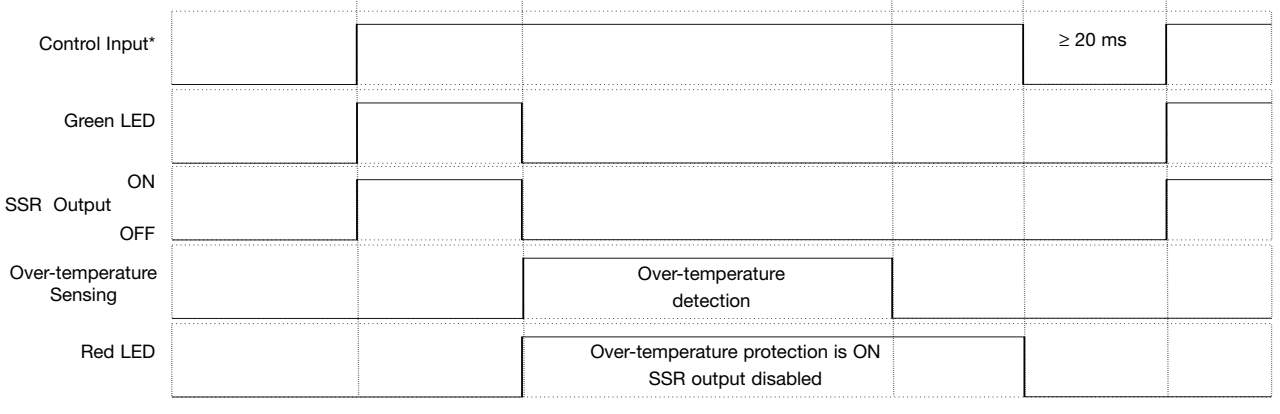
L1: Phase
T1: Load
A1: Control + or ~
A2: Control - or ~

Dimensions



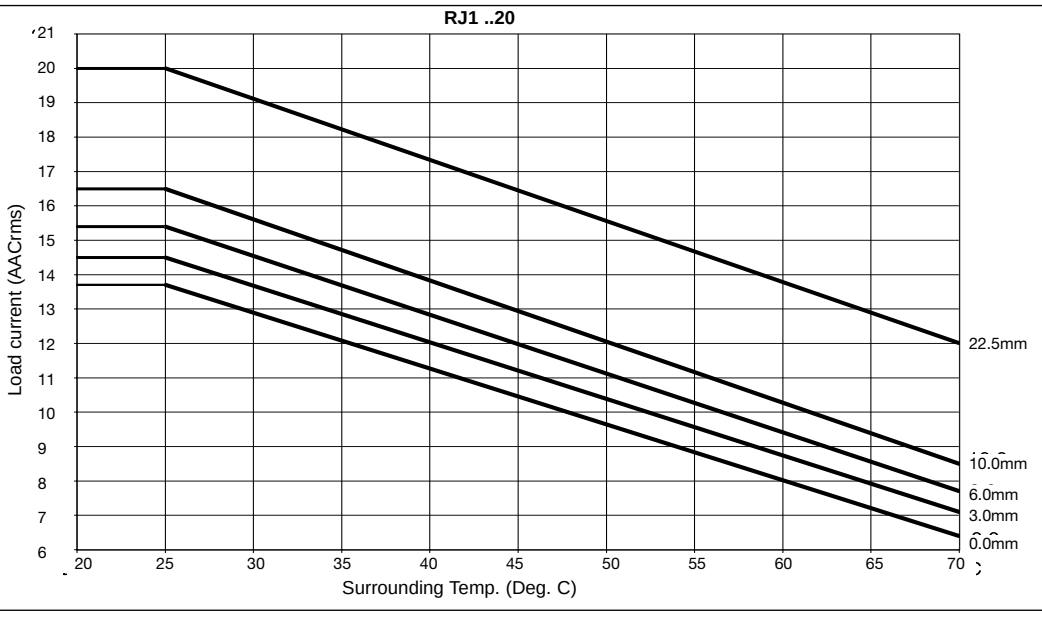
All dimensions in mm

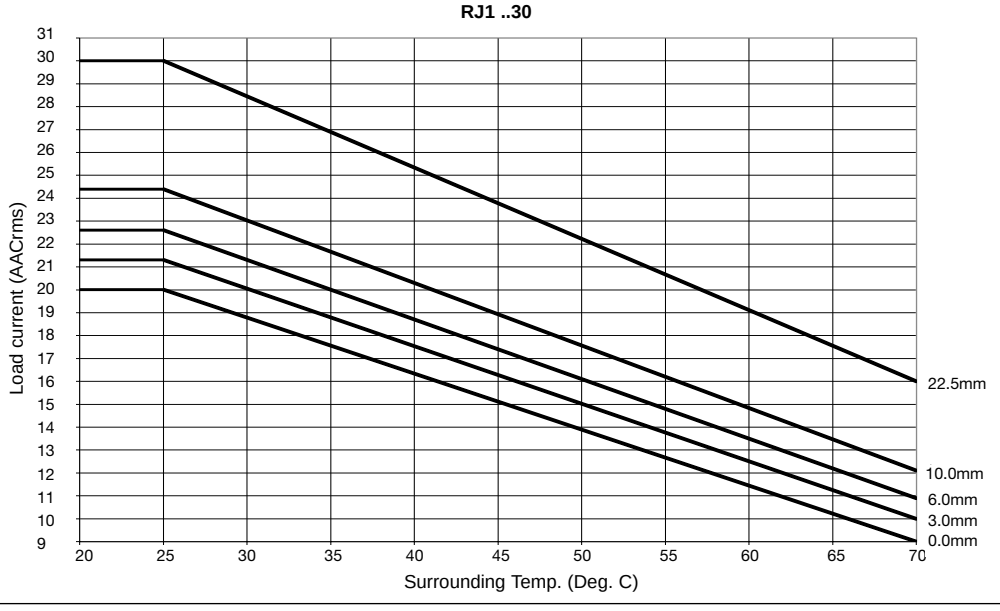
Over-temperature Protection (option: ...P)



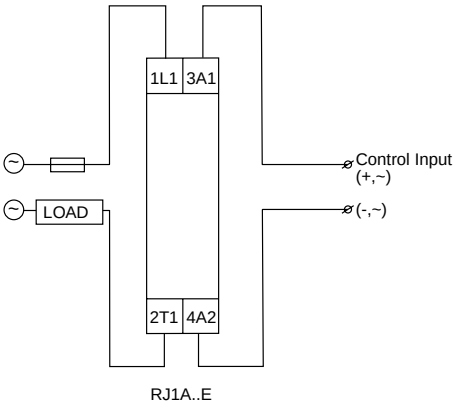
*After over-temperature condition is removed, SSR can be reset by switching OFF the control input for more than 20 ms and switching back ON: this will switch ON the SSR output

Derating vs. Spacing Curves

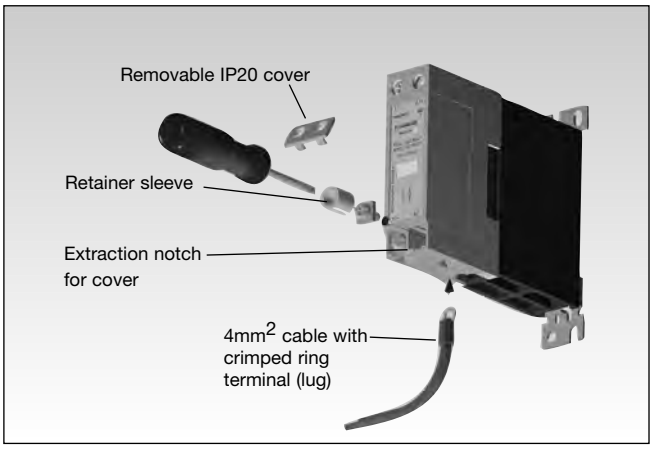




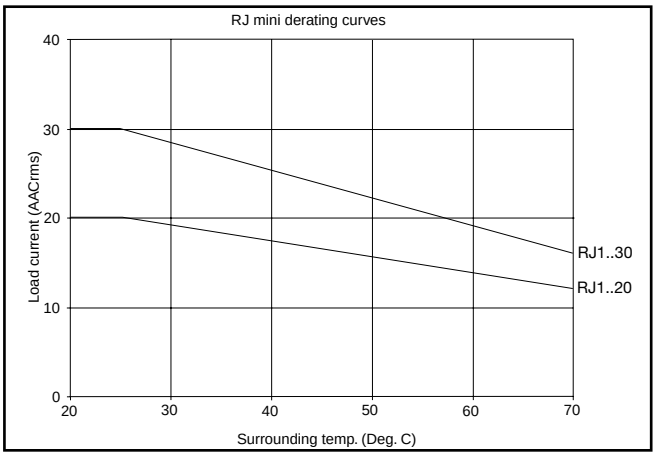
Connection Example



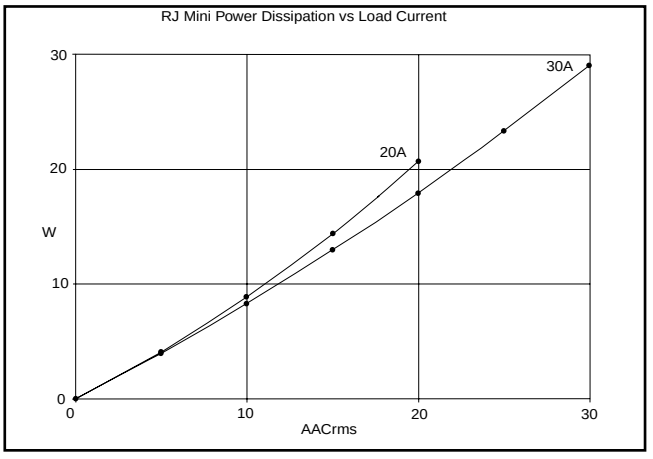
Installation



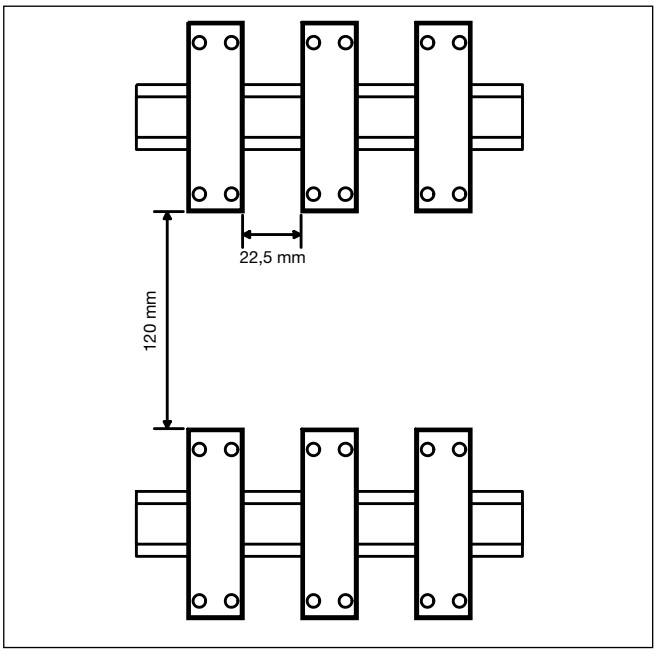
Derating Curve



Dissipation Curve



Panel Mounting



Housing Specifications

Weight	Approx. 225 g
Housing material	PBT Flame retardant
Control terminal cable size	
Min	1 x 0.5 mm^2 (1 x AWG20)
Max	2 x 2.5 mm^2 (2 x AWG14)
Mounting torque max.	2 Nm
Control terminal screws	M4
Power terminal cable size	
Min	1 x 0.5 mm^2 (1 x AWG20)
Max	2 x 2.5 mm^2 (2 x AWG14) or
Max (with crimped terminal)	1 x 4 mm^2 (1 x AWG 12)
Mounting torque max.	2 Nm
Power terminal screws	M4

Isolation

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

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**

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

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

Selection Guide

Rated operational voltage	Blocking voltage	Control voltage	Rated operational current 45 A	50 A	75 A (FAN+OTP)[2]
230 VACrms	650 V_p	4 - 32 VDC	**RJ1A23D45E** **RJ1A23D45U**	**RJ1A23D50E** **RJ1A23D50U**	**RJ1A23D75EP**
		24 - 275 VAC / 24 - 48 VDC	**RJ1A23A45E** **RJ1A23A45U**	**RJ1A23A50E** **RJ1A23A50U**	**RJ1A23A75EP**
600 VACrms	1200 V_p	4 - 32 VDC	**RJ1A60D45E** **RJ1A60D45U**	**RJ1A60D50E** **RJ1A60D50U**	**RJ1A60D75EP**
		24 - 275 VAC / 24 - 48 VDC	**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

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
Over-temperature alarm		
I max	50mADC	50mADC
U max	50VDC	50VDC
Approvals	UL,cUL, CSA	UL, cUL, CSA
CE-marking	Yes	Yes
Pollution degree	2	2

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

Output Specifications

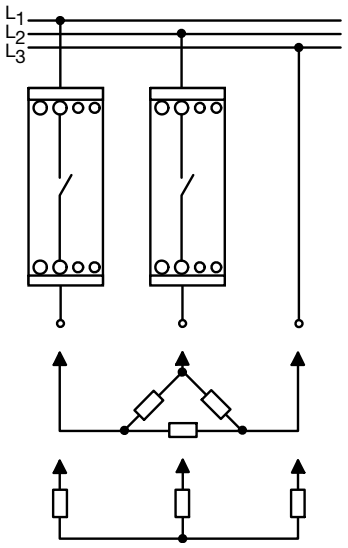
	RJ..45	RJ..50	RJ..75 (With integrated fan)
Rated operational current AC51 @Ta=25°C AC53a @Ta=25°C	 45 AACrms 20 AACrms	 50 AACrms 30 AACrms	 75 AACrms 30 AACrms
Min. operational current	400 mAACrms	500mAACrms	500mAACrms
Rep. overload current t = 1s	< 150 AACrms	<200 AACrms	<200 AACrms
Non rep. surge current Tj(init.) = 25°C and t = 10 ms	1150 A_p	1900 A_p	1900 A_p
Off-state leakage current @ rated voltage and frequency	< 3 mArms	< 3 mArms	< 3 mArms
I^2t for fusing t = 10 ms	6600 A^2s	18000 A^2s	18000 A^2s
On-state voltage drop @ rated current	1.6 Vrms	1.6 Vrms	1.6 Vrms
Critical dV/dt off-state	500 V/µs	500 V/µs	500 V/µs

Thermal Specifications

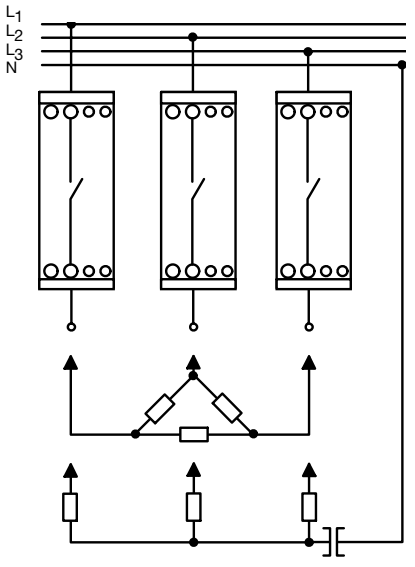
	RJ...D	RJ...A
Operating temperature	-30 to +70°C (-22 to +158°F)	-30 to +70°C (-22 to +158°F)
Storage temperature	-40 to +100°C (-40 to +176°F)	-40 to +100°C (-40 to +176°F)

Applications

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

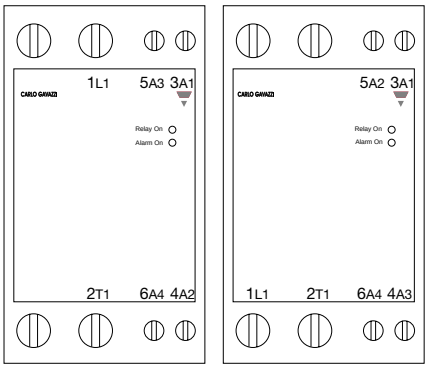


3 single pole relays in
3-phase application
Delta, Star, Star with neutral

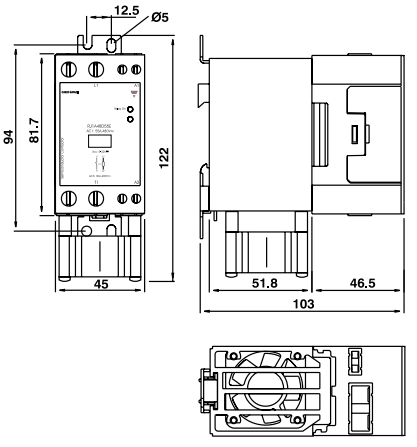


Terminal Layout

RJ1A.....E **RJ1A.....U**

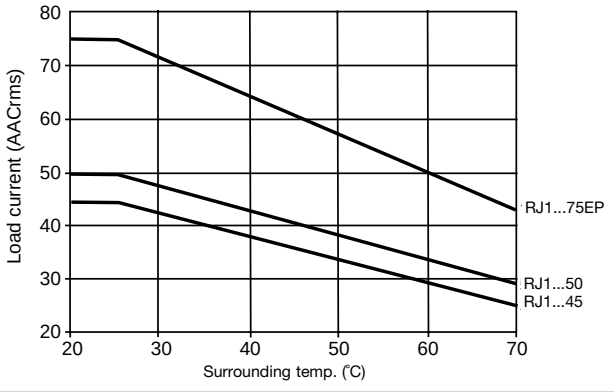


Dimensions

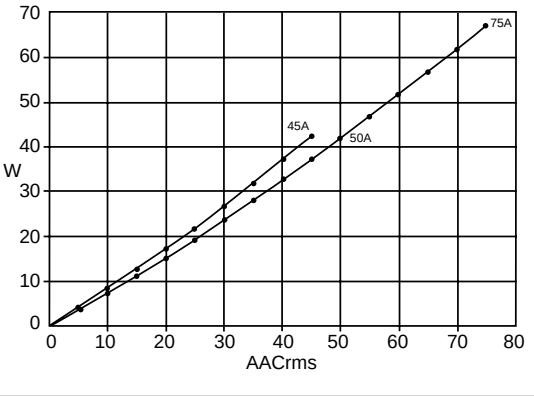


All dimensions in mm

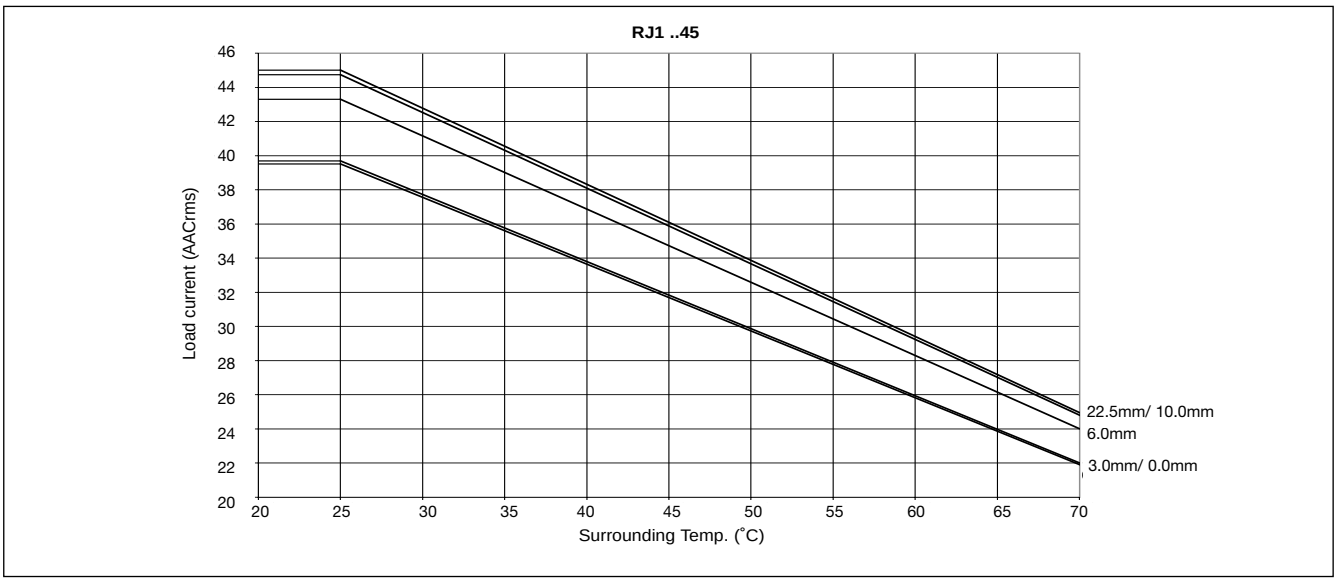
Derating Curve

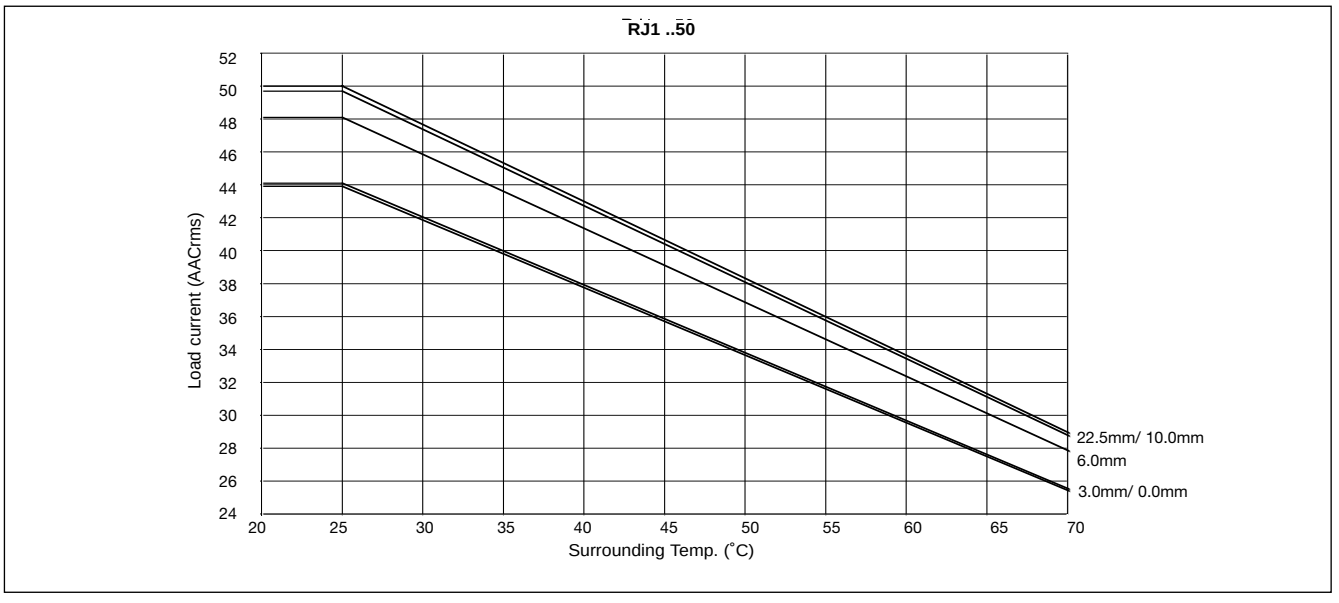


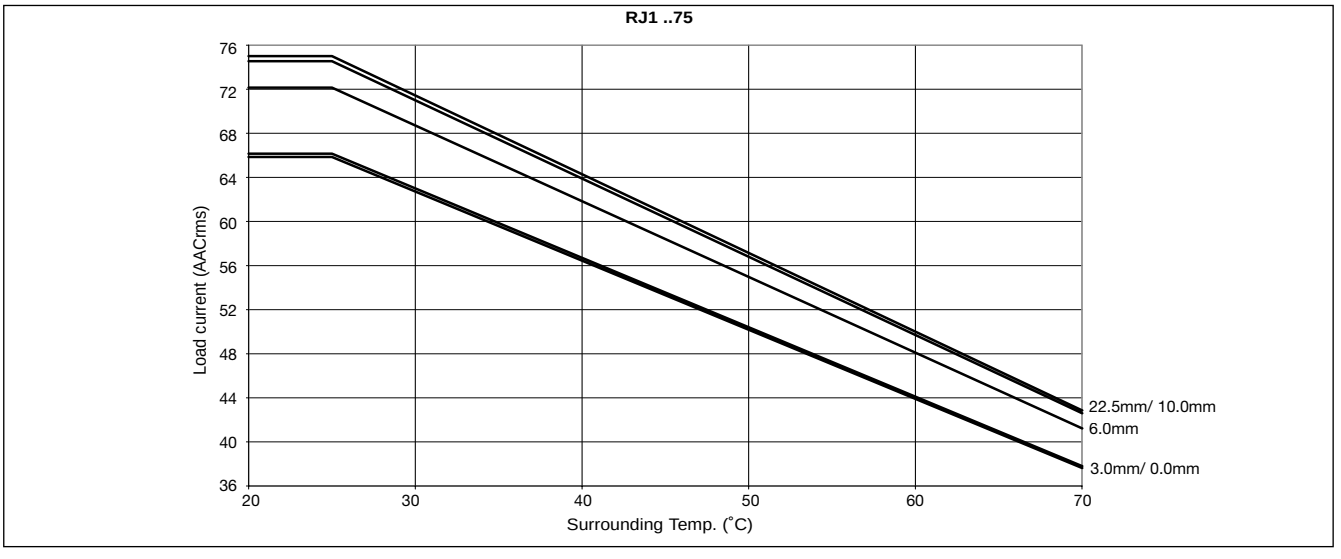
Dissipation Curve



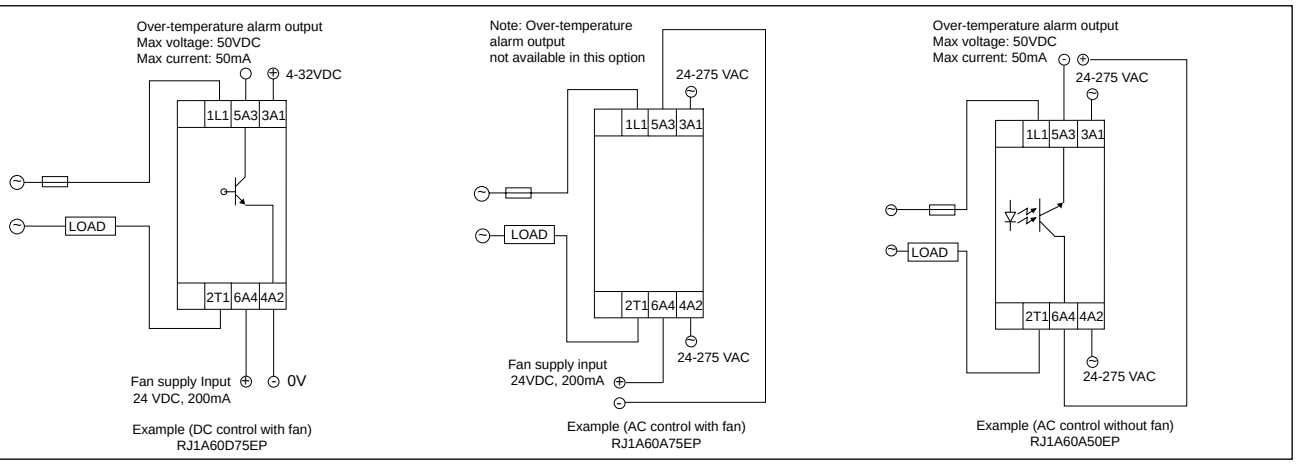
Derating vs spacing curves



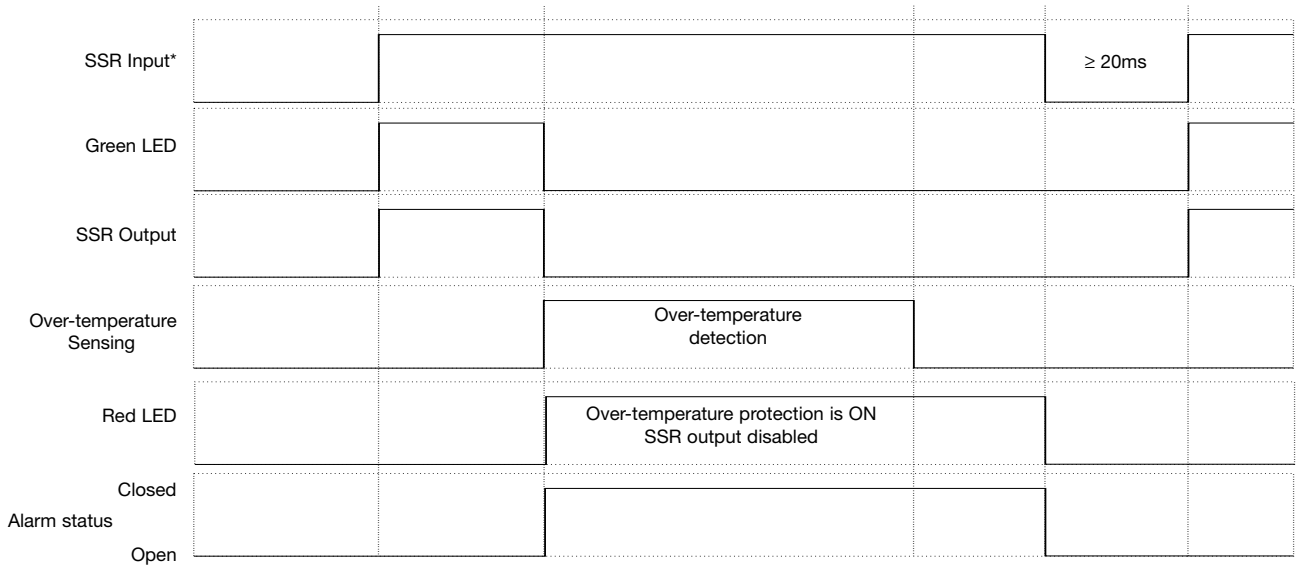




Connection Examples



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

Housing Specifications

Weight	
RJ MIDI	Approx. 430g
RJ MIDI w. fan	Approx. 460g
Housing material	PBT Flame retardant
Control terminal cable size	
Min	1 x 0.5 mm^2 (1 x AWG20)
Max	1 x 4.0 mm^2 (1 x AWG12) or 2 x 2.5 mm^2 (2 x AWG14)
Mounting torque max.	0.6 Nm with Posidrive 0 bit
Control terminal screws	M3
Power terminal cable size	
Min	1 x 4 mm^2 (1 x AWG12)
Max	1 x 25 mm^2 (1 x AWG3) or 2 x 10 mm^2 (2 x AWG6)
Mounting torque max.	2.5 Nm with Posidrive 2 bit
Power terminal screws	M5

Isolation

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

Solid State Relays
SOLITRON POWER - 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 terminals**
- **2 input ranges: 4-32 VDC and 24-275 VAC/24-48 VDC**
- **Operational ratings up to 90 AACrms and 600 VAC[1]**
- **Blocking voltage: Up to 1200 V_p**
- **Opto-isolation > 4000 VACrms**
- **Over-temperature safety option[2]**
- **Integrated fan option**

Product Description

The *SOLITRON* Power is a single-phase Solid State Contactor designed to replace electro-mechanical contactors in industrial heating and motor applications. This product can cope with frequent switching of high current loads. The product is ready to mount on DIN-rail or chassis and comes with integral heatsink. For current rating of 90 AACrms (AC51) convection cooling is used. The terminal layout allows both contactor (E) and SSR (U) type connection. Cage clamp terminals are used to ensure secure load connection withcable 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 90 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[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	70: 70 AACrms 90: 90 AACrms[4]	U: SSR E: Contactor	P: Over-temp. protection2 V: Integrated Varistor

Selection Guide

Rated operational voltage	Blocking voltage	Control voltage	Rated operational current 70 A	90 A(FAN+OTP)[2]
230 VACrms	650 V_p	4 - 32 VDC	**RJ1A23D70E** **RJ1A23D70U**	**RJ1A23D90EP**
		24 - 275 VAC / 24 - 48 VDC	**RJ1A23A70E** **RJ1A23A70U**	**RJ1A23A90EP**
600 VACrms	1200 V_p	4 - 32 VDC	**RJ1A60D70E** **RJ1A60D70U**	**RJ1A60D90EP**
		24 - 275 VAC / 24 - 48 VDC	**RJ1A60A70E** **RJ1A60A70U**	**RJ1A60A90EP**

Notes

1 690 VACrms rated operational voltage available on request. Example: RJ1A69D70U

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

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
Over-temperature alarm		
I max	50mADC	50mADC
U max	50VDC	50VDC
Approvals	UL, cUL, CSA	UL, cUL, CSA
CE-marking	Yes	Yes
Pollution degree	2	2

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

Output Specifications

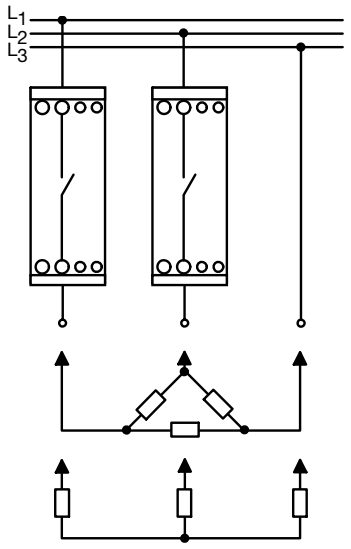
	RJ...70	RJ...90 (With integrated fan)
Rated operational current		
AC51 @Ta=25°C	70 AACrms	90 AACrms
AC53a @Ta=25°C	30 AACrms	30 AACrms
Min. operational current	500 mAACrms	500mAACrms
Rep. overload current t = 1s	< 200 AACrms	<200 AACrms
Non rep. surge current Tj(init.) = 25°C and t = 10 ms	1900 A_p	1900 A_p
Off-state leakage current @ rated voltage and frequency	< 3 mArms	< 3 mArms
I^2t for fusing t = 10 ms	18000 A^2s	18000 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

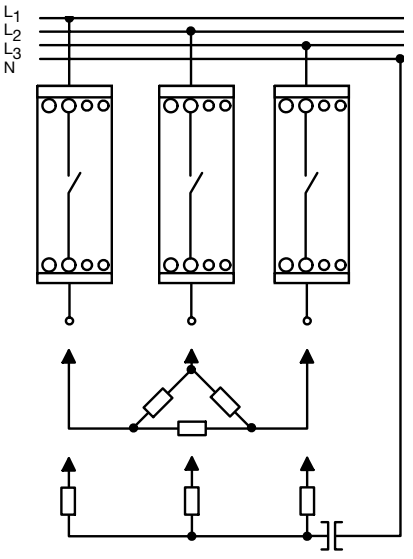
	RJ...D	RJ...A
Operating temperature	-30 to +70°C (-22 to +158°F)	-30 to +70°C (-22 to +158°F)
Storage temperature	-40 to +100°C (-40 to 176°F)	-40 to +100°C (-40 to 176°F)

Applications

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

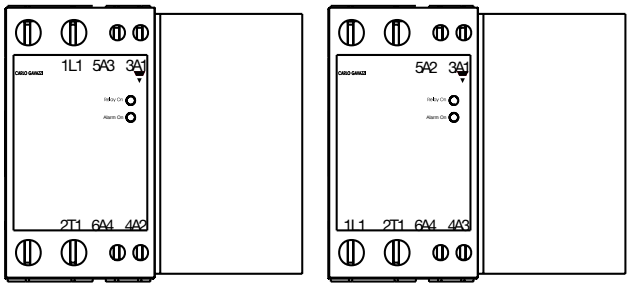


3 single pole relays in
3-phase application
Delta, Star, Star with neutral

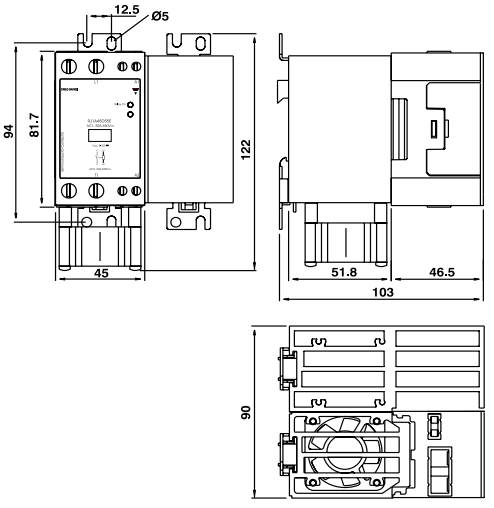


Terminal Layout

RJ1A.....E **RJ1A.....U**

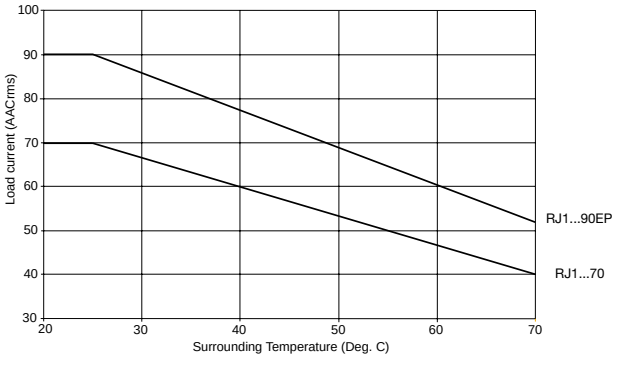


Dimensions

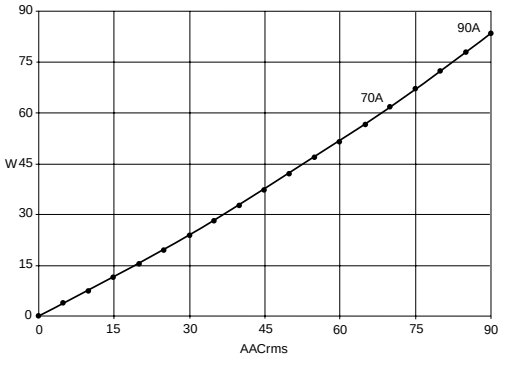


All dimensions in mm

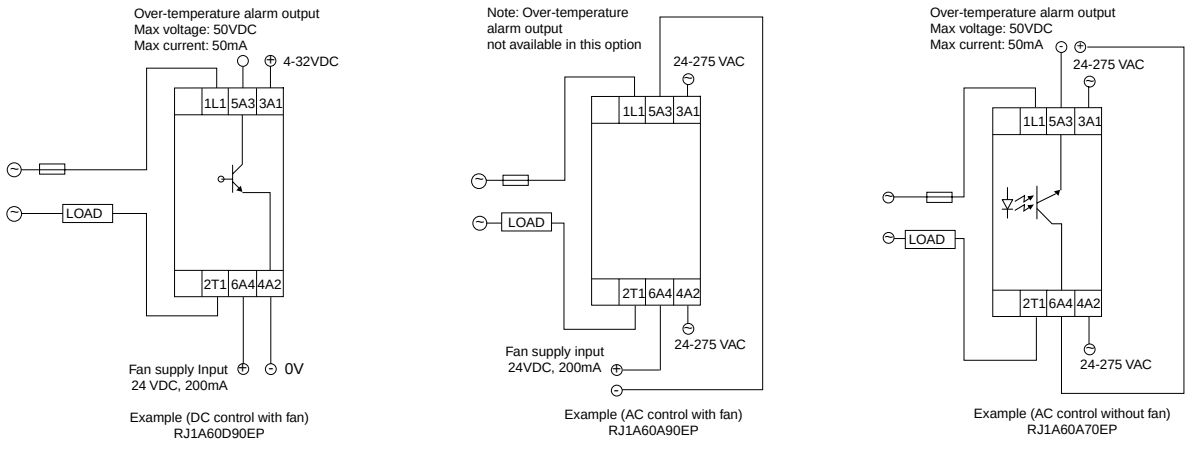
Derating Curve



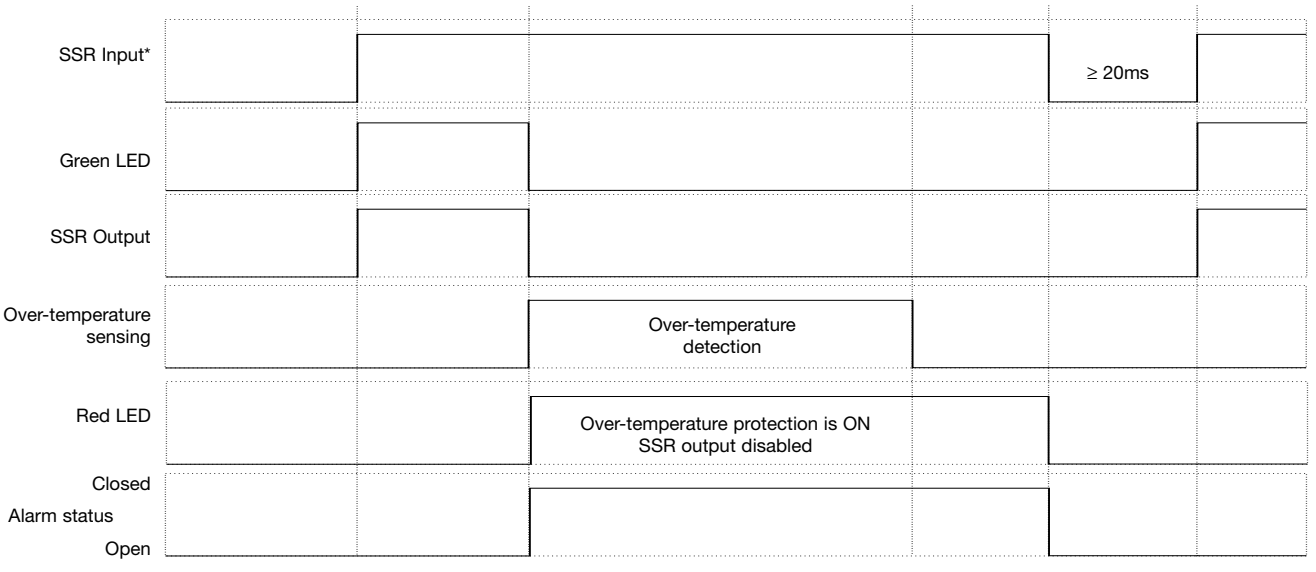
Dissipation Curve



Connection Examples



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

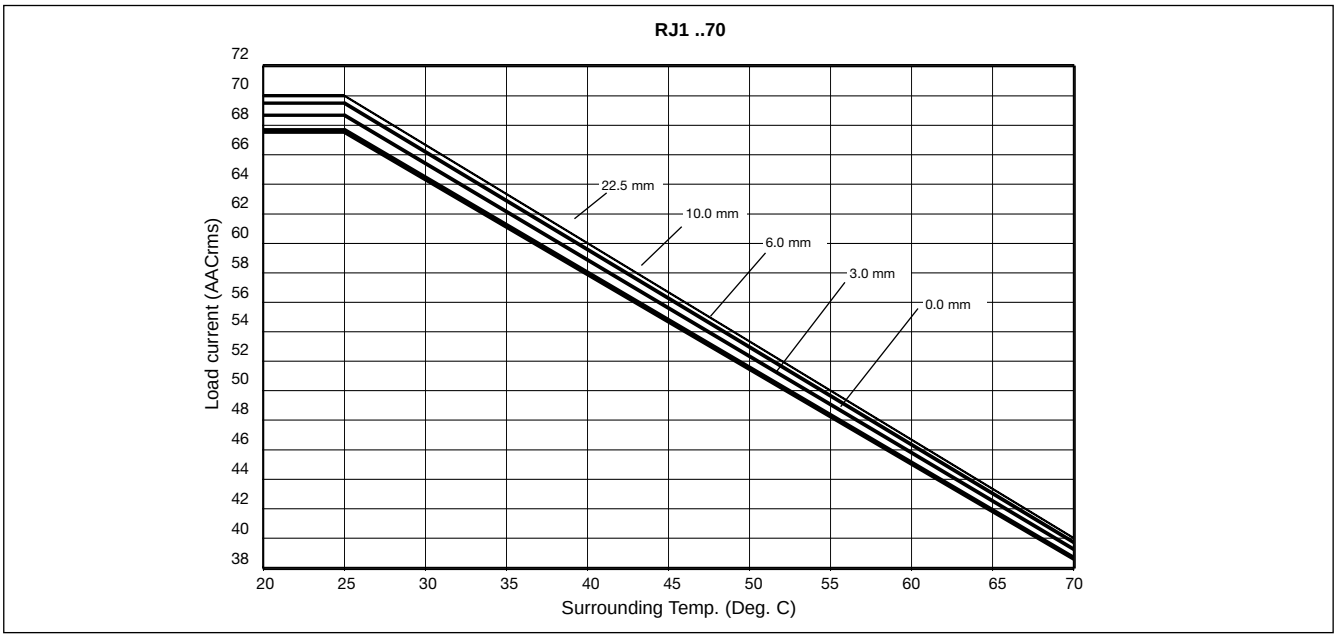
Housing Specifications

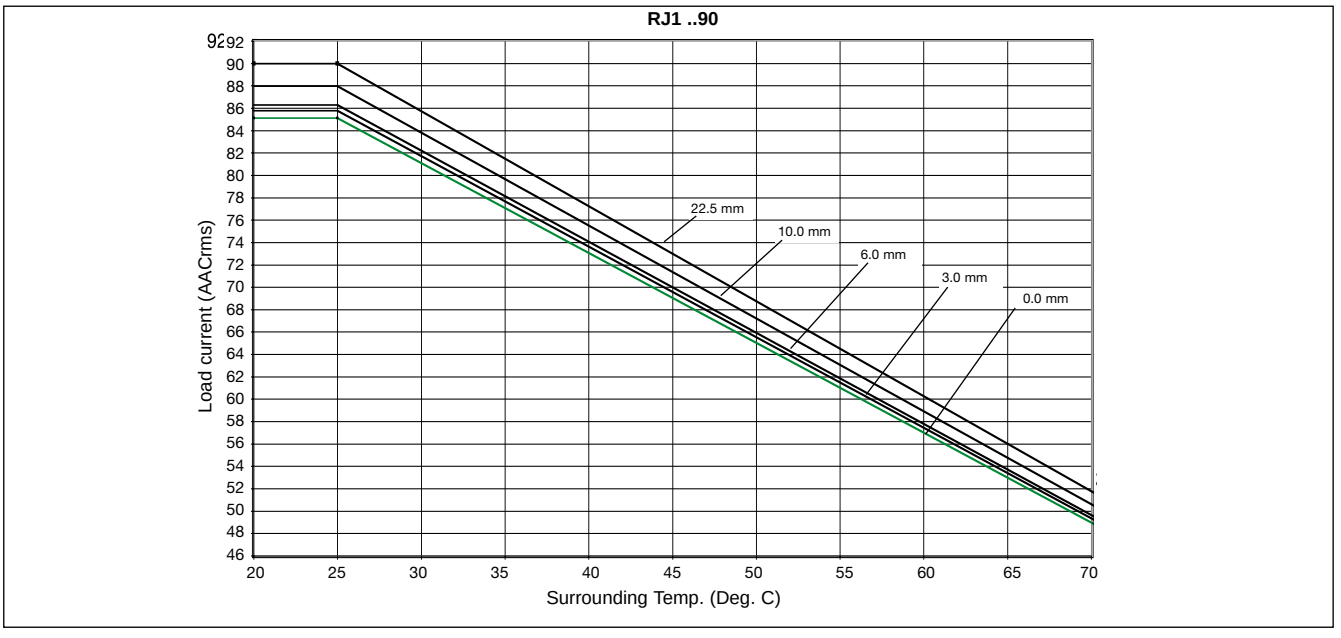
Weight	
RJ Power	Approx. 750 g
RJ Power w. fan	Approx. 780 g
Housing material	PBT, Flame retardant
Control terminal cable size	
Min	1 x 0.5 mm^2 (1 x AWG20)
Max	1 x 4.0 mm^2 (1 x AWG12) or 2 x 2.5 mm^2 (2 x AWG14)
Mounting torque max.	0.6 Nm with Posidrive 0 bit
Control terminal screws	M3
Power terminal cable size	
Min	1 x 4 mm^2 (1 x AWG12)
Max	1 x 25 mm^2 (1 x AWG3) or 2 x 10 mm^2 (2 x AWG6)
Mounting torque max.	2.5 Nm with Posidrive 2 bit
Power terminal screws	M5

Isolation

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

Derating vs Spacing Curves





Solid State Relays
SOLITRON MIDI Current Sensing
Type RJCS, RJCSR

- **AC semiconductor contactor**
- **Integrated current monitoring**
- **Zero switching**
- **Direct copper bonding (DCB) technology**
- **LED-indication**
- **Cage clamp output terminals**
- **4-32 VDC control input**
- **Operational ratings up to 50 AACrms and 600 VAC**
- **Local and remote alarm status**
- **Set-point adjustable**
- **Time delay adjustable**
- **Local and remote setup**

Product Description

The SOLITRON Midi Current Sensing is a compact, single-phase SSR that is sensitive to variations in load conditions in industrial heating applications. This microprocessor-based device is ideal for detection of partial load failure and to ensure the highest process quality. Current sensing is integrated inside to eliminate the need to install an external current transformer. A membrane "button" on the front is used to effect a simple "teach in" of the current setpoint. Alarm delay time is set by a potentiometer. A drop in setpoint current of more than 13% will trigger an open collector alarm.
Up to 50 alarm outputs can be connected in parallel to a standard PLC input. Typical conditions that can be detected are heater break or open-circuit, blown fuse, semiconductor short-circuit and faulty power connection.
Device over-temperature protection is integrated as a standard feature.
The product is ready to mount on DIN-rail or chassis and comes with integral heatsink. The standard housing dimensions enable straightforward replacement of alternative products.

Ordering Key **RJ CS R 1 A 60 D 50 E P NO**

- **Solid State Relay**
- **Current Sensing**
- **Autoranging (option)**
- **Number of poles**
- **Switching mode**
- **Rated operational voltage**
- **Control voltage**
- **Rated operational current**
- **Terminal layout**
- **Over-temperature protection**
- **Alarm output type**

Type Selection

Options	Switching mode	Rated operational voltage	Control voltage	Rated operational current	Terminal layout	Protection	Alarm output type
R:Autoranging	A: Zero switching	23: 230 VACrms 60: 600 VACrms	D: 4 - 32 VDC	30: 30 AACrms 50: 50 AACrms	E: Contactor	P: Over-temp. protection	NO: NPN, Normally open PO: PNP, Normally open

Selection Guide

Options	Rated operational voltage	Blocking voltage	Control voltage	Supply voltage	Alarm output type	Rated operational current 30 A	50A
-	230 VACrms	650 Vp	4 - 32 VDC	24 VDC	NPN, NO	-	**RJCS1A23D50EPNO**
					PNP, NO	-	**RJCS1A23D50EPPO**
	600 VACrms	1200 Vp	4 - 32 VDC	24 VDC	NPN, NO	-	**RJCS1A60D50EPNO**
					PNP NO	-	**RJCS1A60D50EPPO**
Auto-ranging	230 VACrms	650 Vp	4 - 32 VDC	24 VDC	NPN, NO	**RJCSR1A23D30EPNO**	**RJCSR1A23D50EPNO**
					PNP, NO	**RJCSR1A23D30EPPO**	**RJCSR1A23D50EPPO**
	600 VACrms	1200 Vp	4 - 32 VDC	24 VDC	NPN, NO	**RJCSR1A60D30EPNO**	**RJCSR1A60D50EPNO**
					PNP NO	**RJCSR1A60D30EPPO**	**RJCSR1A60D50EPPO**

General Specifications

	RJCS.1.23..	RJCS.1.60..
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
Approvals	UL, cUL	
CE-marking	Yes	
Supply status indication	Green LED, half intensity	
Control status indication	Green LED	
Over-temperature alarm trip indication	Red LED, intermittent	
Alarm indication (excpect for over-temperature trip)	Red LED	

Input Specifications

Control voltage range	4 - 32 VDC
Pick-up voltage	3.8 VDC
Reverse voltage A1-A4, A2-A4	32 VDC
Drop-out voltage	1.2 VDC
Maximum control input current	1.5 mA
Response time pick-up	≤ 1/2 cycle
Response time drop-out	≤ 1/2 cycle

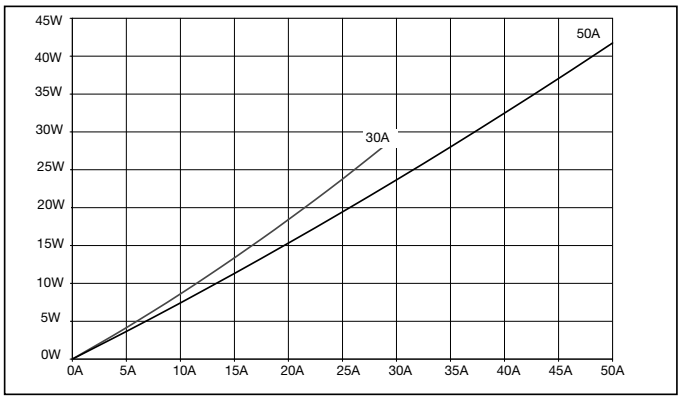
Supply Specifications

Power supply voltage, Vcc	24 VDC ± 15%
Max. supply current	22 mA (per device)
Max. PLC current @ 24VDC during normal conditions	275 µA (per device)

Alarm Specifications

Output current, i_o		≤50 mADC
Output voltage	NPN	1 + 0.15i_o
	PNP	Vcc - 1 - 0.15i_o
No. of outputs in parallel		≤50

Dissipation Curve



Housing Specifications

Weight	Approx. 450 g
Housing material	PBT Flame retardant
Control terminal cable size	
Min	1 x 0.5 mm^2 (1 x AWG20)
Max	1 x 4.0 mm^2 (1 x AWG12) or 2 x 2.5 mm^2 (2 x AWG14)
Mounting torque max.	0.6 Nm Posidriv 0 bit
Control terminal screws	M3
Power terminal cable size	
Min	1 x 4 mm^2 (1 x AWG12)
Max	1 x 25 mm^2 (1 x AWG3) or 2 x 10 mm^2 (2 x AWG6)
Mounting torque max.	2.5 Nm Posidriv 2 bit
Power terminal screws	M5

Thermal Specifications

Operating temperature	-20 to +70°C (-4 to +158°F)
Storage temperature	-40 to +100°C (-40 to +212°F)

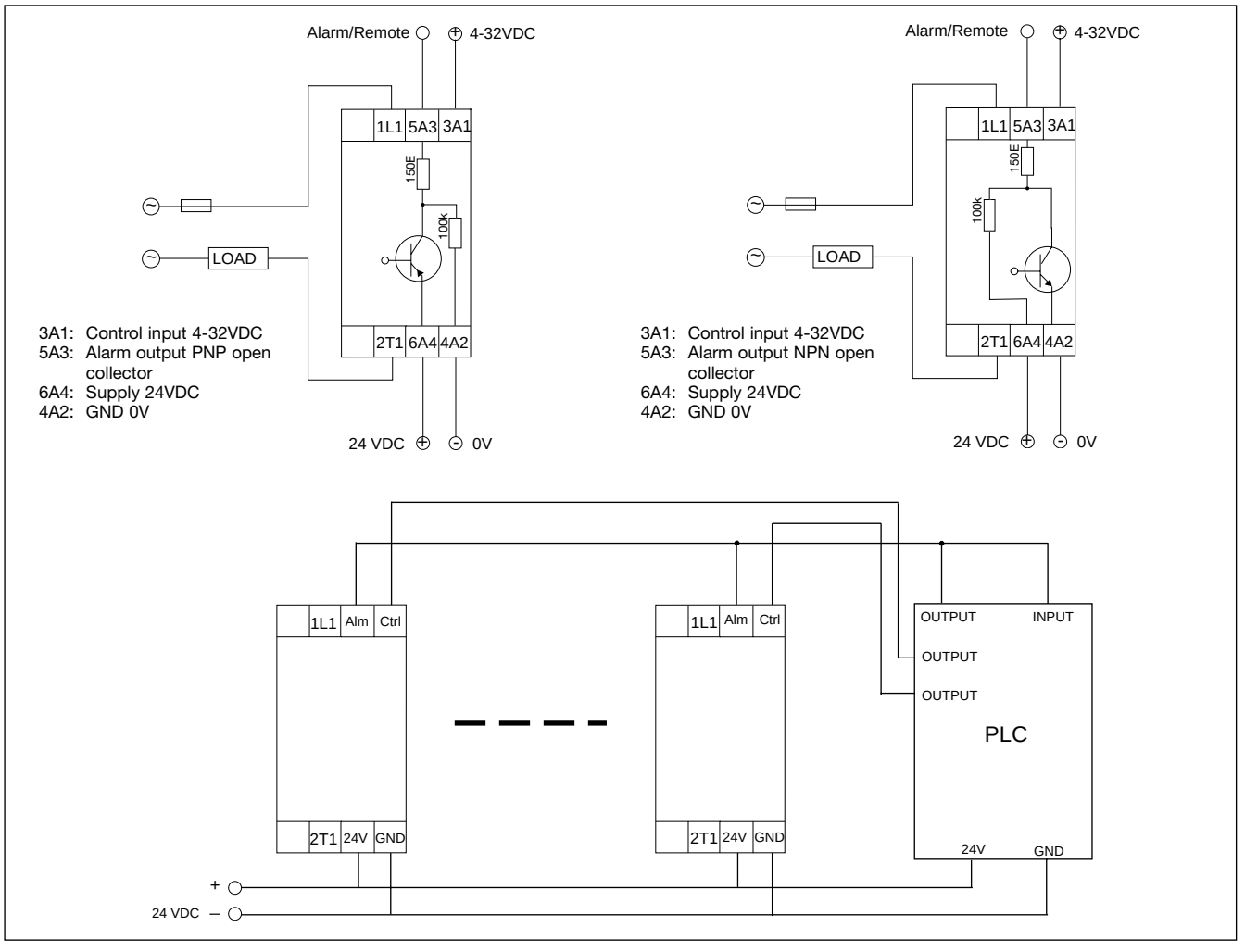
Isolation

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

Output Specifications

		RJCS.1...30	RJCS.1...50
Rated operational current AC51 @Ta=25°C		30 AACrms	50 AACrms
Measuring range	RJCS1A... RJCSR1A...	- 0.3 - 30 AACrms	8 - 50 ACrms 0.5 - 50 AACrms
Min. TEACH current	RJCS1A... RJCSR1A...	- 0.3 AACrms	8 AACrms 0.5 AACrms
Min. partial load current	RJCS1A... RJCSR1A...	- 0.05 AACrms	1.3 AACrms 0.083 AACrms
Non rep. surge current (t=10ms)		600 Ap	1900 Ap
Off-state leakage current @rated voltage and frequency		< 5 mArms	< 5 mArms
I^2t for fusing (t = 10 ms)		1800 A^2s	18000 A^2s
On-state voltage drop @ rated current		1.6 Vrms	1.6 Vrms
Critical dV/dt off-state		1000 V/µs	1000 V/µs

Connection Examples



Notes:

1. Control input (terminal A1) and 24VDC supply (terminal A3) must have common ground
2. RJCSc ... and PLC should be sourced from the same 24VDC supply
3. RJCSc ... PO and RJCSc ...NO should not be connected to the same alarm line
4. It is recommended that up to 6 identical loads are connected in parallel

Alarm Operation

1.1 Current Setpoint
The current setpoint is the nominal operating current that is expected when all the heater loads are functioning properly. If the heater loads are faulty or the supply voltage is not close to the nominal level, the wrong setpoint will be stored.

1.2 Initialisation
When the device is shipped, no setpoint is stored in the flash memory. Both green and red LEDs will flash intermittently to indicate that a setpoint must be stored using the **TEACH** procedure. The load will not go on when the control is applied so long as a TEACH command is succesful.

1.3 Local Functions
Local functions can be activated by using the push button on the front of the device. While an alarm is being issued by any SSR connected to the common alarm line or a remote command is being issued, no local commands are accepted.

1.3.1 Local TEACH
Press and hold the push button for approximately 3 seconds. The red LED will flash after each second. After the LED flashes 3 times, release the button. If the "teach" command has been accepted the heater loads are automatically switched ON. The red LED will flash quickly 10 times. When the current setpoint has been stored successfully, the red and green LEDs will scroll intermittently to indicate that the **TEACH** procedure has been completed. The load will now be switched on or off according to the control input's status
It is very important to hold the button down for only 3 flashes of the red LED to make a successful **TEACH**. If the **TEACH** procedure is not successful, the device will automatically reset to factory default (i.e. no setpoint stored).

1.3.2 Local RESET
When an alarm has occurred the device can be locally **RESET** by pressing the push button for 1 second. The red LED will flash once. This will reset the alarm. If the alarm condition has been cleared the device will return to normal operation. If the alarm condition is still active, the device will automatically go back to alarm status.

1.3.3 Local TEST
In the absence of a signal on the "control input" terminal, a local TEST can be made by pressing and holding the button for 5 seconds. After the red LED flashes 5 times, release the button. The device will switch ON the loads for 1 second. This test detects if there is an under-current or heater break alarm condition.

1.4 Remote Setup Procedure
Remote functions can be activated with a PLC or any other logic controller by applying timed pulses to the alarm terminal: >10V for RJCS...PO and <10V for RJCS...NO.

1.4.1 Remote TEACH
Apply a 3 second pulse. The red LED will flash after each second. After the LED flashes 3 times and the "teach" command has been accepted, the heater loads (of all SSRs connected to the same alarm line) are automatically switched ON and the red LED will flash quickly 10 times. When the current setpoint has been stored successfully, the red and green LEDs will scroll intermittently to indicate that the **TEACH** procedure has been completed. The load will now be switched on or off according to the control input's status

1.4.2 Remote RESET/ UNBLOCK
When an alarm has occurred the device can be remotely **RESET** by applying a 1 second pulse. A 1 second pulse will also unblock local TEACH of all SSRs connected to the similar alarm line. The red LED will flash once. This will reset the alarm. If the alarm condition has been cleared the device will return to normal operation. In RJCS only, if the alarm condition is still active, the device will automatically go back to alarm status.

1.4.3 Remote BLOCK
Applying a 5 second pulse will induce the device to block local TEACH. After this, no local TEACH commands are accepted. To unblock this situation, a remote RESET must be issued. In the case of the RJCS, if 24V supply is removed, local TEACH BLOCK is lost. Another REMOTE BLOCK should be issued.

2 Alarms
2.1 Alarm DELAY
A potentiometer on the front of the device allows a time delay on the heater break alarm between 2s and 40s for the RJCS1A... and between 0 and 40s for the RJCSR1A...
For heaters having a low cold resistance, the time for the inrush current to decay to a value less than 13% of the current set-pint, must be added to the potentiometer alarm delay setting plus a further 20ms.
For an alarm signal to occur, the alarm condition must persist throughout this time period. The alarm output is enabled only after this time delay has passed. However, if the control input is disabled for a period of time equal to four times the delay setting, the internal alarm delay timer is reset automatically. (see example)

2.2 Relay remains OFF due to Line Voltage Loss or Thyristor Open Circuit Failure. *(85ms for RJCSR and 500ms for RJCS)*
The device generates one pulse with duration of 7 seconds on the alarm terminal. This alarm is non-latching. The red LED remains ON after this alarm condition until a **RESET** is issued.

2.3 Heater Break.
A **Heater Break** alarm is given if the current measured through the device is 13% less than the current setpoint stored in the flash memory for a period of time greater or equal to the alarm delay potentiometer setting. The device generates one pulse with duration of 8 seconds on the alarm terminal. The alarm signal is non-latching. The red LED remains ON after this alarm condition until a **RESET** is made. If the measured current changes to within 10% of the Current Setpoint, before the **Alarm DELAY** time has elapsed, the **Alarm DELAY** timer is reset.

2.4 Over-temperature or Over-current.
This alarm occurs if any one of following two conditions is true:
1. The device detects an internal over-temperature condition at any time during operation and switches off the output. The red LED flashes intermittently.
2. A current above the nominal device rating is measured during current setpoint **TEACH**. This action erases the current setpoint from flash memory and both red and green LEDs will flash intermittently until a TEACH procedure with an acceptable current is carried out.

In both cases, the device generates one pulse with duration of 9 seconds on the alarm terminal. The alarm signal is non-latching.

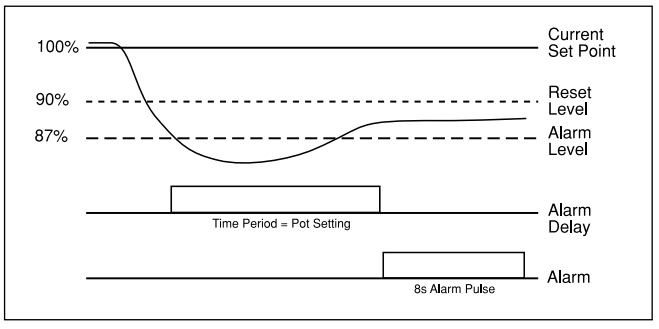
2.5 Thyristor Short Circuit. *(110ms for RJCSR and 90ms for RJCS)*
The device generates one pulse with duration of 10 seconds on the alarm terminal. The alarm signal is non-latching.
The red LED remains ON after this alarm condition until a **RESET** is made.

2.6 Alarms Connected in Parallel to one PLC Input and one PLC Output.
For **REMOTE** operation, up to 50 devices can be connected in parallel to at least one PLC input. This PLC input must also be connected in parallel to the PLC output. The PLC input must be programmed to detect alarms while the PLC output must be programmed to supply the pulses required for **REMOTE Setup**. When more than one device is present, pulses from the PLC output or alarm pulses from any device will cause the red LEDs on all devices in parallel to flash intermittently for a max. of 6.25 seconds. After this time, it is only devices with an alarm condition that will have their red LED on.

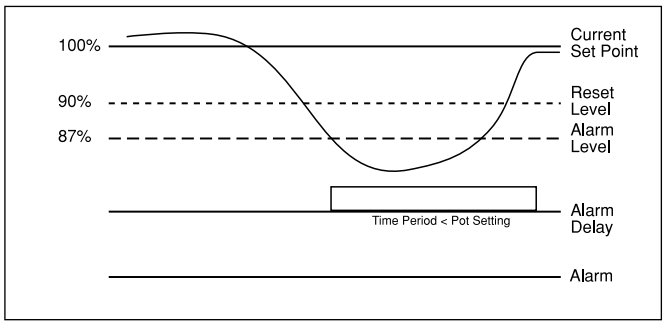
Example

Let the alarm delay setting be 2s (min). If the full load current is set at 30A, then there will be an alarm condition if the current is under 26.1A for more than 2s. (Any fluctutation in the load current that is present for <2s will not be signalled – this is intended to eliminate false alarms due to short duration under-voltage conditions on the supply phase). If the control input goes off within the 2s, the alarm timer will not be reset provided the control input goes on again within 8s (4x2s).

Alarm Operation

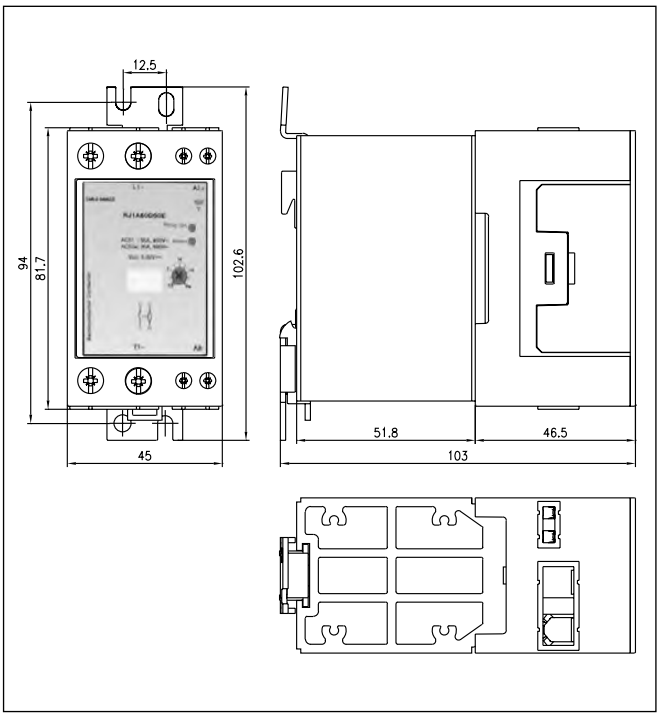


Alarm Condition



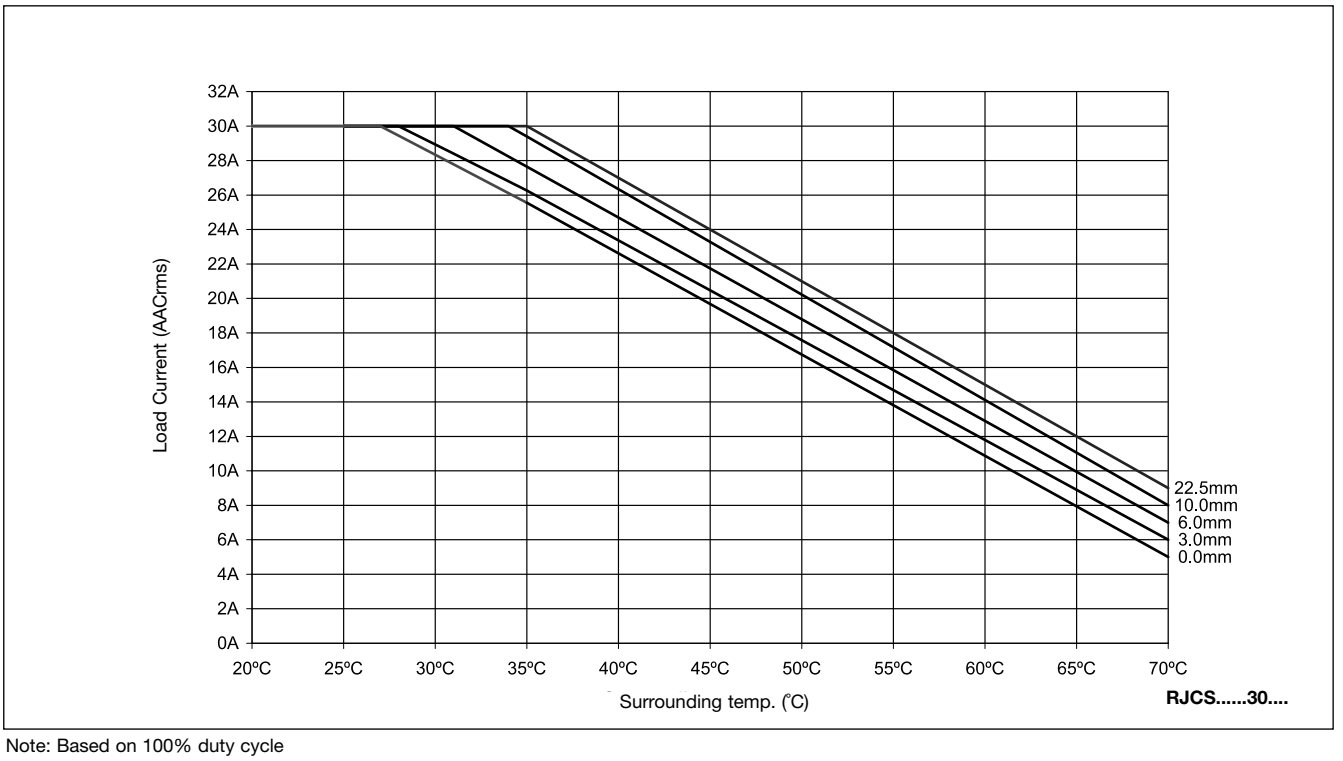
Reset Condition

Dimensions

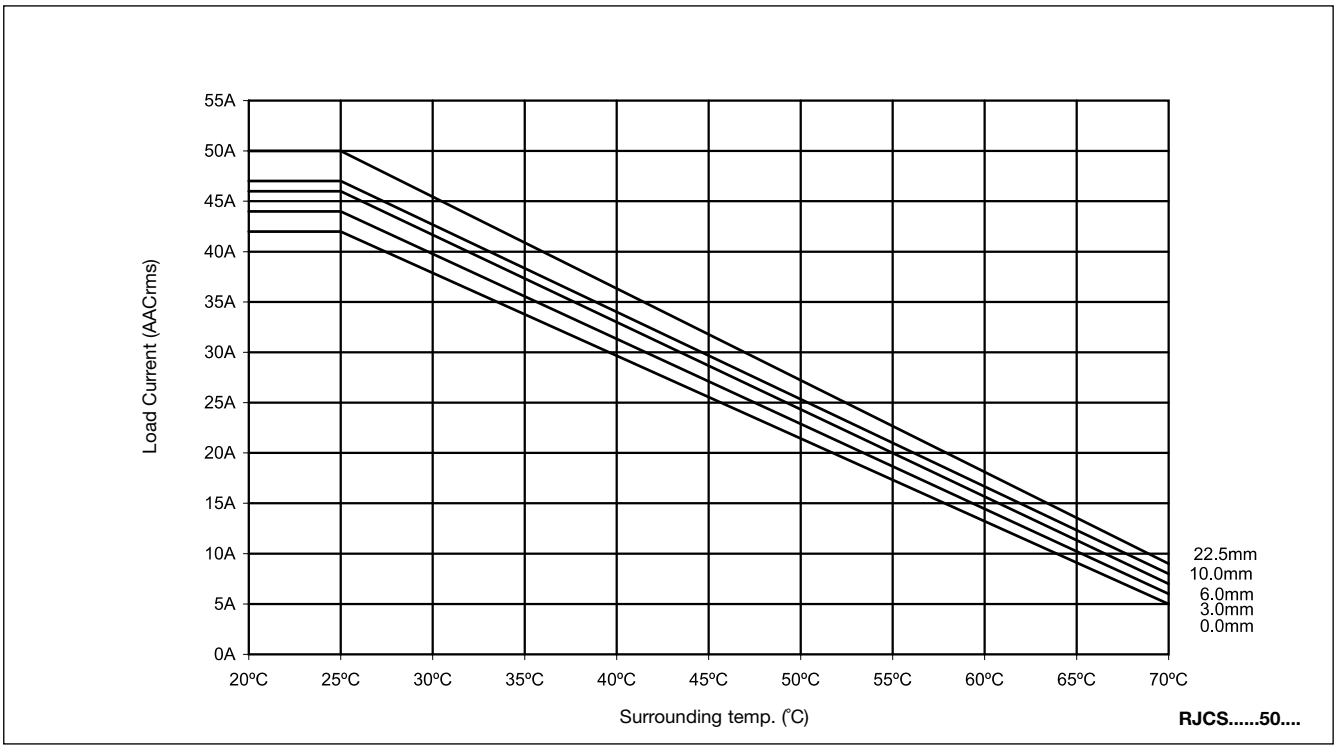


All dimensions in mm.

Derating vs. Spacing Curves

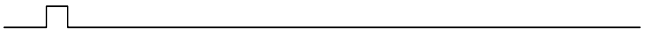
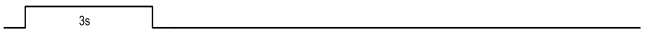
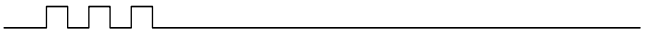
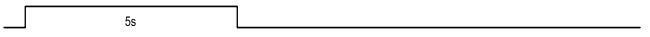
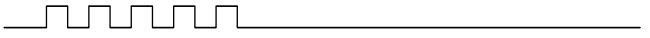
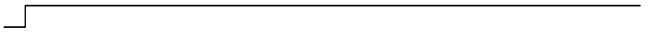
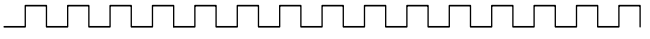
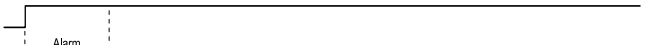
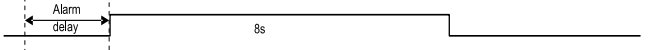
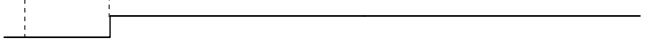
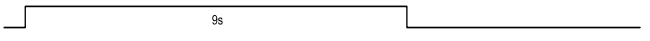
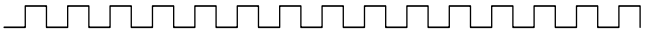
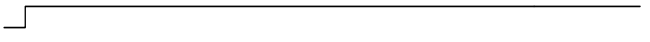
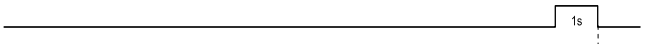
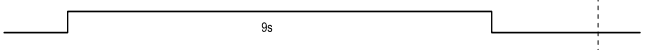
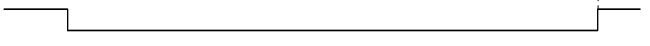
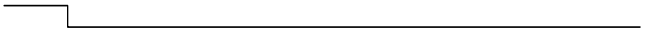
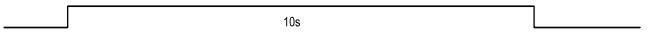
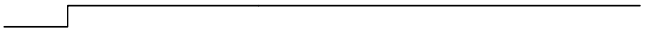


Note: Based on 100% duty cycle



Note: Based on 100% duty cycle

Setup and Alarms

RESET	Remote reset	PLC output to alarm terminal high >1s (<2s)	
	Local reset	Push and hold button for >1s (<2s)	
	Visual indication	Red LED ON	
TEACH	Remote teach	PLC output to alarm terminal high >3s (<4s)	
	Local teach	Push and hold button for >3s (<4s)	
	Visual indication	Red LED ON	
TEST	Remote test	Not available	
	Local test	Push and hold button for >5s (<6s)	
	Visual indication	Red LED ON	
BLOCK	Remote block	PLC output to alarm terminal high >5s (<6s)	
	Local Block	Not available	
	Visual Indication	Red LED ON	
ALARMS	Control input	Green LED - full intensity	
	Relay remains OFF due to line voltage loss or thyristor open circuit fault	Transistor alarm non-latching pulse (7s)	
	Visual indication	Red LED ON (latching)	
	Current under-range detected during TEACH	Transistor alarm non-latching pulse (7s)	
	Visual indication	Red and GREEN LEDs flashing together	
	Control input	Green LED - full intensity	
	Heater break alarm	Transistor alarm non-latching pulse (8s)	
	Visual indication	Red LED ON (latching)	
	Current over-range detected during TEACH	Transistor alarm non-latching pulse (8s)	
	Visual indication	Red and GREEN LEDs flashing together	
	Control input	Green LED - full intensity	
	Reset	Local or remote 1s pulse	
	Over-temperature alarm	Transistor alarm non-latching pulse (9s)	
	Visual indication	Red LED flashing	
	SSR output	Output is switched off during an OTP alarm	
	Control input	Green LED - full intensity	
	Thyristor short-circuit	Transistor alarm non-latching pulse (10s)	
	Visual indication	Red LED ON (latching)	

Note: Above shows pulses for PNP device

Solid State Relays
SOLITRON MIDI Modbus Communication Interface
Type RJ1P MB

- **AC semiconductor contactor**
- **MODBUS RTU interface over RS485**
- **RJ45 sockets for easy installation**
- **Dual sockets for daisy chaining**
- **Multi-function – 4 selectable modes of operation: ON/OFF, Phase angle, Distributed full cycle, Burst firing**
- **Operational ratings up to 50 AACrms and 230 VAC**
- **Temperature monitoring with over-temperature protection**
- **Opto isolation: > 4000 VACrms**
- **LED status indication**

Product Description

The RJ1P MB series is a solid state relay equipped with a fieldbus communication interface.

The relay operates under control of a microcontroller that handles communication, monitors operational parameters and controls the SSR thyristor firing. The RJ1P MB supports the Modbus RTU communication protocol, operating over an RS485 interface.

The communication interface allows modification and reading of several parameters very quickly through a single connection. Diagnostic information is easily accessible for troubleshooting and repair.

Ordering Key

RJ 1 P 23 MBT 50 E BC

- **Solid State Relay**
- **Number of poles**
- **Switching mode (Proportional)**
- **Rated operational voltage**
- **Control input type**
- **Rated operational current**
- **Terminal layout**
- **Configuration options**

Type Selection

Switching mode	Rated operational voltage	Control input	Rated operational current	Terminal layout	Options
P: Proportional Output	23: 230VACrms	MBT: 2-wire Modbus RTU	50: 50AACrms	E: Contactor layout	BC: Basic Controller CS: Current Sensing CV: Current & Voltage Sensing

Selection Guide

Rated operational voltage	Blocking voltage	Supply voltage	Control input	Rated operational current (50 A)
230VACrms	650Vp	24VDC	RS485 interface (2-wire)	**RJ1P23MBT50EBC** **RJ1P23MBT50ECS** **RJ1P23MBT50ECV**

General Specifications

Operational voltage range	90 - 265 VAC
Blocking voltage	650 V_p
Power factor	>0,9 @ 230VAC$_{RMS}$
Operational frequency range	45-65 Hz
Output indication	Green LED (dual intensity)
Alarm indication	Red LED
Data indication	Orange LED, flashing
SSR fault detection	Yes
Over temperature protection	Yes
Output power	0 – 99.6%

Output power resolution	
Mode 0 ON/ OFF	1/1
Mode 1 Phase angle	1/256
Mode 2 Full cycle	1/256
Mode 3 Burst firing	1/32 – 1/256 depending on time-base setting
Pollution degree	2
Installation category	III
Approvals	UL, cUL
CE-marking	Yes

Thermal Specifications

Operating temperature	-30 to +70°C (-22 to +158°F)
Storage temperature	-40 to +100°C (-40 to +212°F)

Isolation

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

Housing Specifications

Weight	Approx. 415 g
Housing material	PBT
Control terminal cable size	
Min	1 x 0.5 mm^2 (1 x AWG20)
Max	1 x 4.0 mm^2 (1 x AWG12) or 2 x 2.5 mm^2 (2 x AWG14)
Mounting torque max.	1 Nm Posidriv 0 bit
Control terminal screw	M3
Power terminal cable size	
Min	1 x 4 mm^2 (1 x AWG12)
Max	1 x 25 mm^2 (1 x AWG3) or 2 x 10 mm^2 (2 x AWG6)
Mounting torque max.	2.4 Nm Posidriv 2 bit
Power terminal screw	M5
Data Connection	Shielded RJ45

Output Specifications

Rated operational current AC51 @Ta=25°C	50AACrms
Min. operational current	500mAACrms
Rep. overload current t=1 s (Tj init.=25°C)	< 200AACrms
Non-rep. surge current t=10 ms (Tj init.=25°C)	1900A_p
Off-state leakage current, @ rated voltage and frequency	< 3 mArms
I^2t for fusing t=10 ms	18000A^2s
Max. On-state voltage drop @ rated current	1.6Vrms
Critical dV/dt off-state	1000V/µs

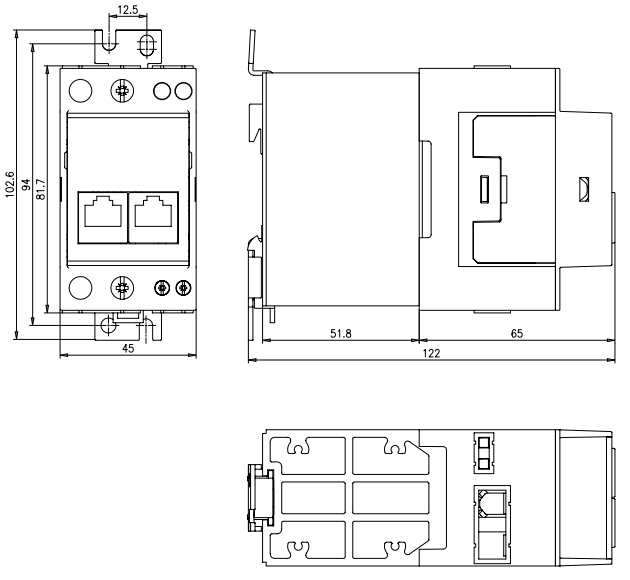
Data Specification

Interface	RS485
Bus Loading	1/8 unit load
Communication protocol	Modbus RTU
Data line ESD voltage withstand	15KV HBM
Parity	Selectable - None, Odd, Even
Data Rate	9600, 19200, 38400, 57600, 115200 baud
Devices on Bus	247
Address configuration	DIP-SWITCH

Supply Specifications

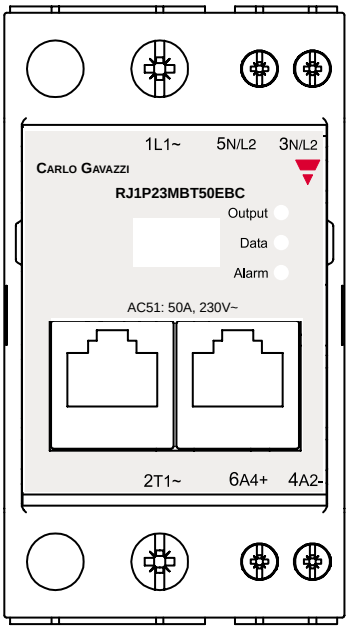
Supply voltage range (according to EN 61131-2)	19.2 - 30 VDC
Supply current	
@ 19.2 VDC	13mA
@ 30 VDC	10mA
Supply status indication	Green LED, half intensity

Dimensions



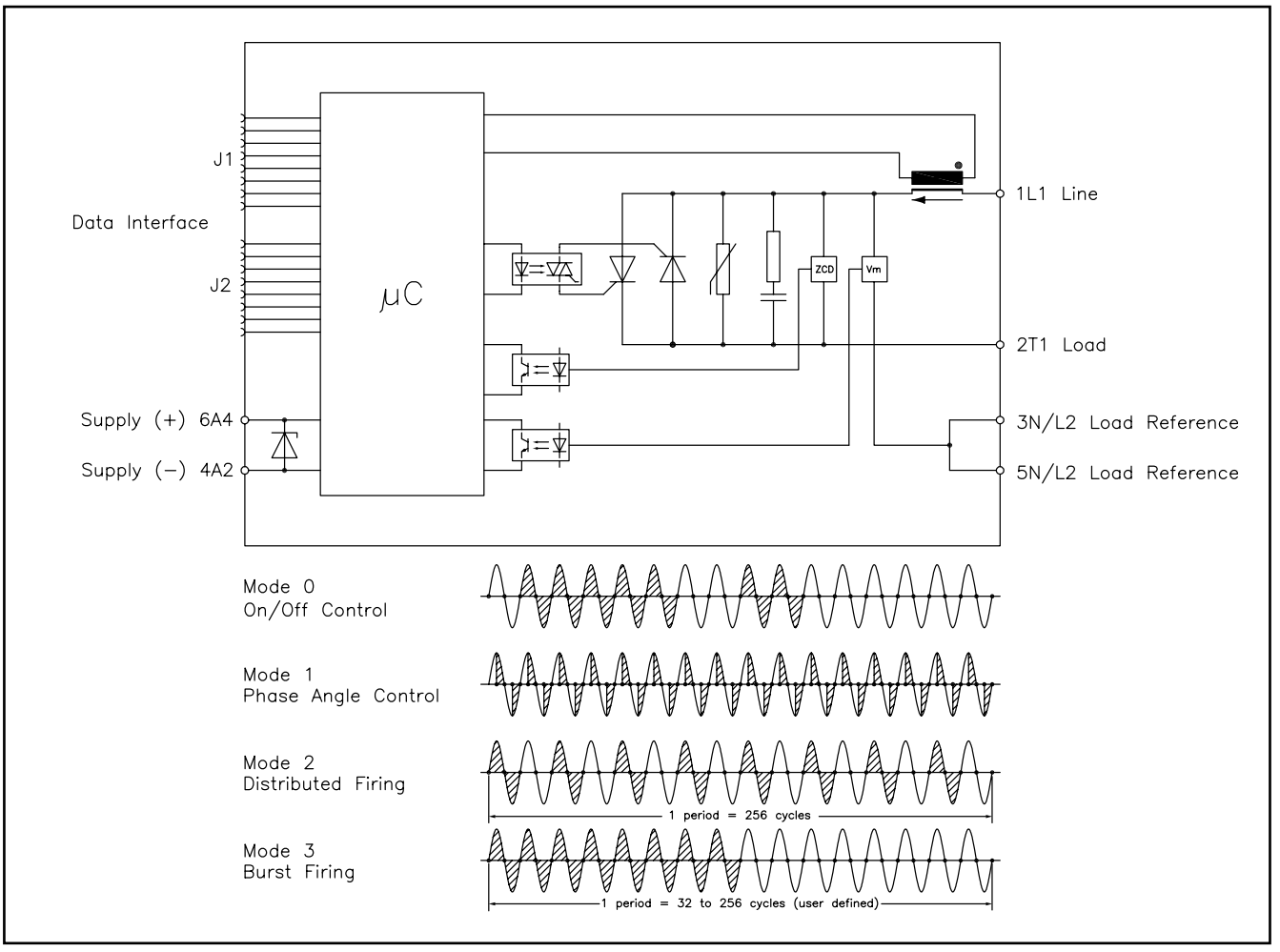
All dimensions in mm

Terminal Layout



Note: Terminals 5N/L2 and 3N/L2 are available only on RJ1P23MBT50ECV

Functional Diagram



Alarms and Features

BC - Basic Controller	• **Internal temperature measurement from -32 to +128°C** • **Power control by:** On/Off — Mode 0 Phase angle — Mode 1 Distributed firing — Mode 2 Burst firing — Mode 3 • **Fault detection:** Over temperature, SSR fault (shorted, 1/2 wave conduction, open circuit), Phase Loss, Full Load Loss
CS – Adds Current Sensing capability	Same features as RJ1P23MBT50EBC with additional: • **Current monitoring**
CV – Adds Current and Voltage sensing capability	Same features as RJ1P23MBT50ECS with additional: • **Voltage monitoring** • **Power measurement**

LED indication

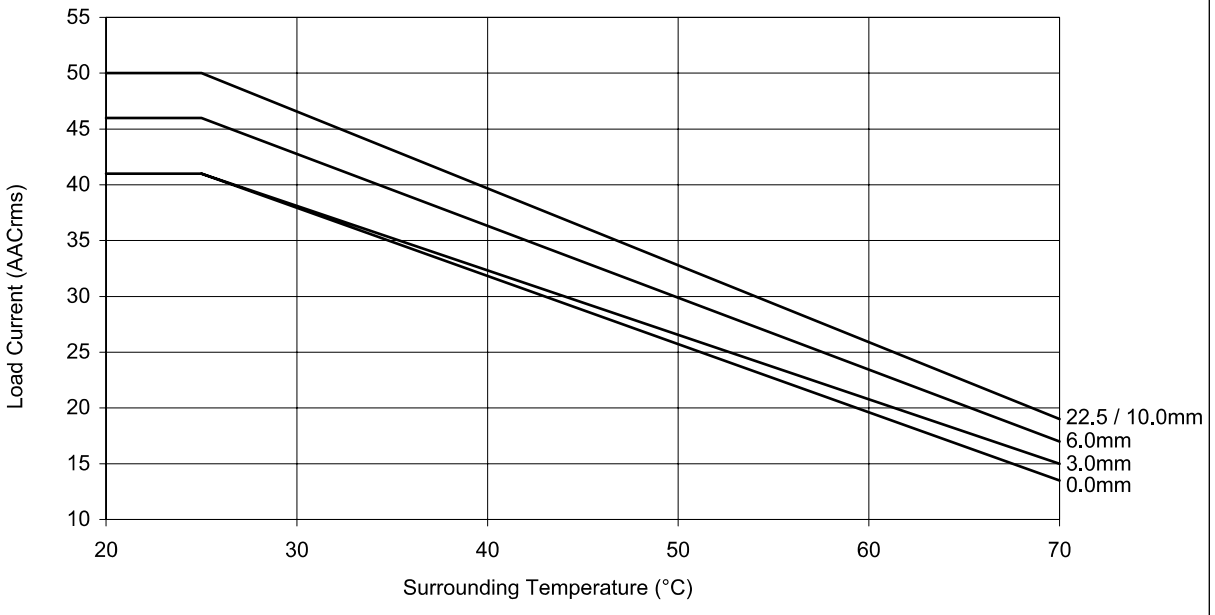
The Green LED (Output) is a dual purpose indicator. When 24V power is applied the Green LED is dimly lit. When the output thyristors are activated, the Green LED is lit up more brightly in tandem with application of power to the load.

The Yellow LED (Data) shows communication activity. It lights up for the period of time that the relay is involved in communication over the RS485 bus. This applies for both transmission and reception.

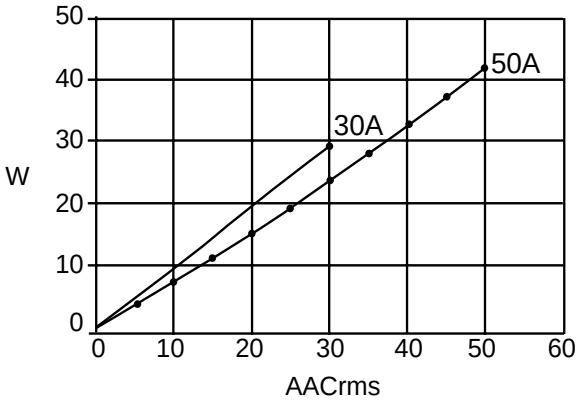
The Red LED (Alarm) lights up when there are communication errors or when the relay is operating abnormally. In the case of communication errors, the Alarm LED is reset by the next valid communication sequence. When there is abnormal operation the Alarm LED resets when the operating conditions revert back to normal.

All three LEDs flashing continuously indicate that the device is in configuration mode (Modbus address set to unsopported value). Details shown in product manual.

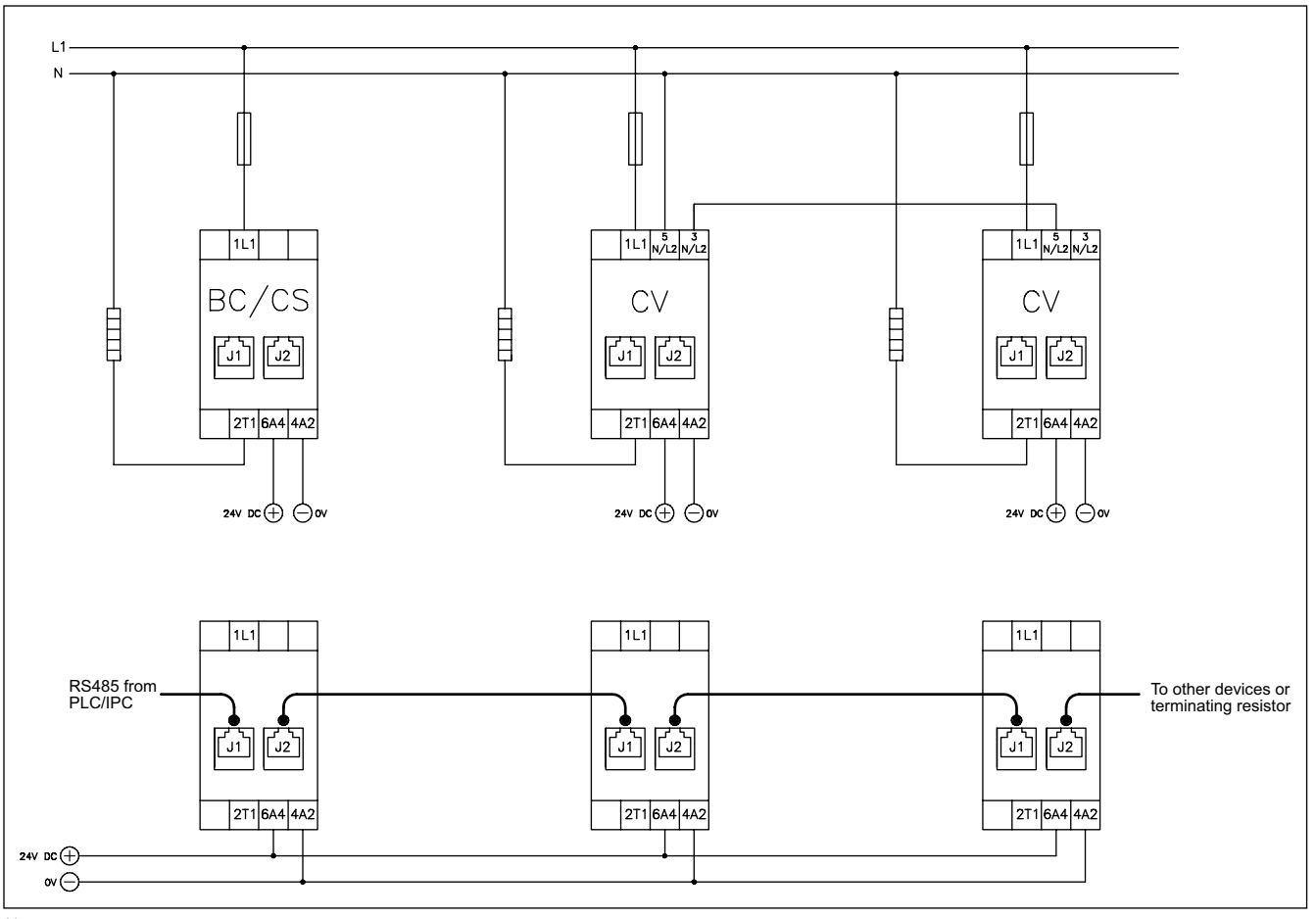
Derating Curve



Dissipation Curve



Connection Examples



Notes:

1. A terminating resistor (value 100 Ω to 130 Ω) must be fitted at each end of the RS485 network.
2. 24V power may be applied through terminals 6A4, 4A2 or through the RJ-45 connector. If daisy chaining several devices using standard ethernet patch leads, the connection to 6A4, 4A2 is optional for the second and successive devices. For large networks it is necessary to connect 6A4, 4A2 every 25th device.
3. Max. no of daisy chained devices may be limited by patch-lead conductor diameter and length.
4. Refer to product handbook for detailed installation instructions.

Operation

Mode 0 – ON/OFF control
In Mode 0 the relay operates as a standard ON/OFF relay with zero switching. In this mode the relay can deliver either 0% or 100% power. This mode is ideal for systems where the process controller employs a digital process variable, similar to that used in standard solid state relay applications.

Mode 1 – Phase angle control
In Mode 1 the load power is adjusted by delaying the thyristor switching signal according to the required power. The resulting output is a chopped sine-wave. The relay switches itself off every half cycle. Timings are calculated such that a linear power response curve is obtained. This mode is suited for loads where continuous control of power is required.

Mode 2 – Distributed firing
In Mode 2 full cycles are switched ON/OFF over a period of 256 mains cycles. The number of cycles that are switched ON corresponds to the value specified in the load power register. This mode uses an algorithm that distributes the ON cycles evenly over the 256 cycle period.

Mode 3 – Burst firing
In Mode 3 full cycles are switched ON/OFF over a period of mains cycles as defined by the Time-Base Register. Mode 3 uses an algorithm that will switch ON a number of cycles in a continuous burst for a time period corresponding to the required power.

Solid State Relays
SOLITRON MIDI Multi-Function Analog Switching
Type RJ1P

- **AC semiconductor contactor**
- **Multi-function - 5 selectable modes of operation: Phase Angle, Distributed Full Cycle and Burst Control (1, 3 and 10s)**
- **Direct copper bonding (DCB) technology**
- **LED-indication for control and load status**
- **Operational ratings up to 50 AACrms and 600 VAC**
- **4-20mA or 0-10V control input**
- **Built-in varistor**
- **Blocking voltage: Up to 1200Vp**
- **Opto-isolation > 4000VACrms**
- **Cage clamp terminals**
- **IP20 protection**

Product Description

The Solitron Midi Analog Switching is a single-phase SSR that provides proportional output power in relation to the control signal level applied. This microprocessor-based device provides for 5 different switching modes integrated into one package. A selector switch on the front of the device is used for the selection of the preferred mode of operation, i.e., either Phase Angle, Distributed Full Cycle or Burst Control. This multi-function selection makes this device ideal for the control of a variety of loads, including heaters and lamps. The control signal can be either 4 - 20mA or 0 - 10VDC. 4mA or 0V correspond to zero output power, whilst 20mA or 10VDC correspond to full output power.
The product is ready to mount on DIN-rail or chassis and comes with integral heatsink.

Ordering Key

RJ 1 P 48 V 50 E

- **Solid State Relay**
- **Number of poles**
- **Switching mode (Proportional)**
- **Rated operational voltage**
- **Control input type**
- **Rated operational current**
- **Terminal layout**

Type Selection

Switching mode	Rated operational voltage	Control input	Rated operational current	Terminal layout
P: Proportional Output	23: 230VACrms 48: 480VACrms 60: 600VACrms	V: 0 - 10VDC I: 4 - 20mA	30: 30AACrms 50: 50AACrms	E: Contactor

Selection Guide

Rated operational voltage	Blocking voltage	Control input	Supply voltage	Rated operational current 30 A	50 A
230VACrms	650Vp	0 - 10VDC	24VAC/DC	**RJ1P23V30E**	**RJ1P23V50E**
		4 - 20mA		**RJ1P23I30E**	**RJ1P23I50E**
480VACrms	1200Vp	0 - 10VDC	24VAC/DC	**RJ1P48V30E**	**RJ1P48V50E**
		4 - 20mA		**RJ1P48I30E**	**RJ1P48I50E**
600VACrms	1200Vp	0 - 10VDC	24VAC/DC	**RJ1P60V30E**	**RJ1P60V50E**
		4 - 20mA		**RJ1P60I30E**	**RJ1P60I50E**

Isolation

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

Thermal Specifications

Operating temperature	-20 to +70°C (-4 to +158 °F)
Storage temperature	-40 to +100°C (-40 to +212 °F)

General Specifications

	RJ1P23...	RJ1P48...	RJ1P60...
Operational voltage range	90 to 265VAC	200 to 550VAC	410 to 660VAC
Blocking voltage	650V_p	1200V_p	1200V_p
Operational frequency range	45 to 65Hz	45 to 65Hz	45 to 65Hz
Output power	0 to 99%	0 to 99%	0 to 99%
Power factor	≥ 0.9 @ 230VACrms	≥ 0.9 @ 480VACrms	≥ 0.9 @ 600VACrms
Load status indication	Red LED	Red LED	Red LED
Output power resolution			
MODE 1 Phase Angle	1/300 @ 50Hz, 1/300 @ 60Hz		
MODE 2 Full Cycle	1/64 @ 50Hz, 1/64 @ 60Hz		
MODE 3 Burst with 1s period	1/50 @ 50Hz, 1/60 @ 60Hz		
MODE 4 Burst with 3s period	1/150 @ 50Hz, 1/180 @ 60Hz		
MODE 5 Burst with 10s period	1/500 @ 50Hz, 1/600 @ 60Hz		
Approvals	UL, cUL		
CE-marking	Yes		

Input Specifications

Current controlled input	RJ1P..I...
Control current range	4 - 20mA
Max. allowable input current	50mA
Pick up current	4.2mA
Drop out current	3.9mA
Control status indication	Green LED
Reverse polarity protected	Yes
Voltage drop	10VDC @ 20mA

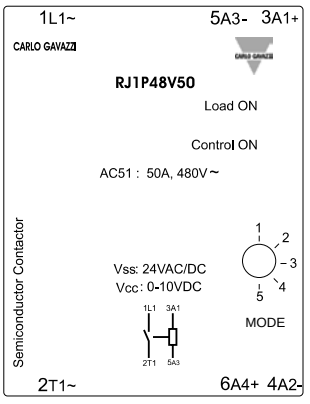
Voltage controlled input	RJ1P..V...
Supply voltage range, Vss	20 - 28VAC/DC
Supply current	18mA @ 24VDC 23mA @ 24VAC
Control voltage range, Vcc	0 - 10VDC
Control input current	0.1mA @ 10VDC
Reverse polarity protected	Yes
Pick up voltage	0.5VDC
Drop out voltage	0.05VDC
Control status indication	Green LED

Note: the use of twisted pair cable for the control input is recommended

Output Specifications

	RJ1P...30	RJ1P...50
Rated operational current AC51 @Ta=25°C	30AACrms	50AACrms
Min. operational current	150mAACrms	500mAACrms
Rep. overload current t=1 s (Tj init.=25°C)	< 55AACrms	< 200AACrms
Non-rep. surge current t=10 ms (Tj init.=25°C)	325A_p	1900A_p
Off-state leakage current, @ rated voltage and frequency	< 3 mArms	< 3 mArms
I^2t for fusing t=10 ms	525A^2s	18000A^2s
On-state voltage drop @ rated current	1.6Vrms	1.6Vrms
Critical dV/dt off-state	1000V/µs	1000V/µs

Terminal Layout



Mode Selection

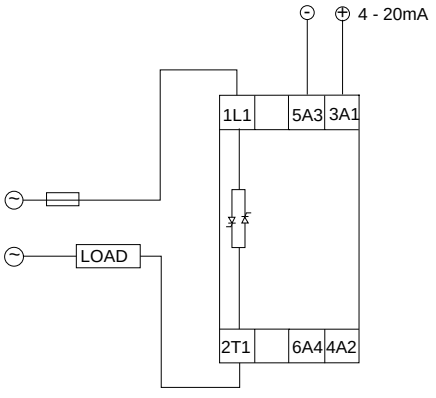
MODE 1	Phase Angle Switching
MODE 2	Distributed Control
MODE 3	Burst Switching (1 sec. period)
MODE 4	Burst Switching (3 sec. period)
MODE 5	Burst Switching (10 sec. period)

Transfer characteristics

Output power as a function of control input

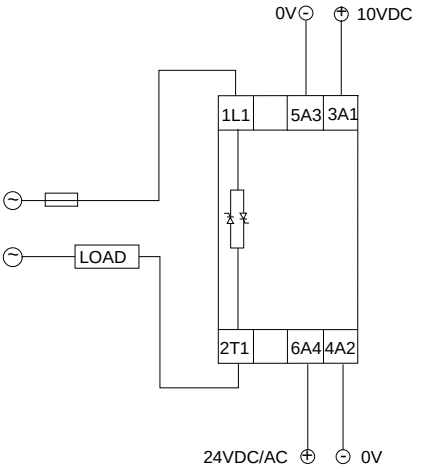
Control Current (mA)	Control Voltage (VDC)	Output Power (%)
4	0	0
8	2.5	25
12	5	50
16	7.5	75
20	10	99

Connection Examples



3A1 - 5A3: Control input current

Example: RJ1P48I..E



3A1 - 5A3: Control input voltage, Vcc
4A2 - 6A4: Supply input voltage, Vss

Example: RJ1P48V..E

Note: For the RJ1P..V..., it is possible to have the ground terminals of the supply and control power supplies used commoned. In the case, this common ground is connected either to terminal A2 or terminal A3. This is only applicable when a 24 VDC supply voltage is used. There should be no external direct link from Terminal A2 to Terminal A3.

Operation

MODE 1: The Phase Angle switching mode works in accordance with the phase angle control principle, i.e. the output switching point in the AC sine wave depends on the signal level applied at the input. The relay switches off everytime the output current crosses zero.

MODE 2: The Distributed mode provides a number of full cycles, evenly distributed over a fixed period of 1.28s @ 50Hz (1.07s @ 60Hz), depending on the control input.

MODE 3, 4, 5: The Burst Switching mode generates a number of full cycles, depending on the control input over fixed periods of 1s, 3s or 10s for MODES 3, 4 and 5 respectively.

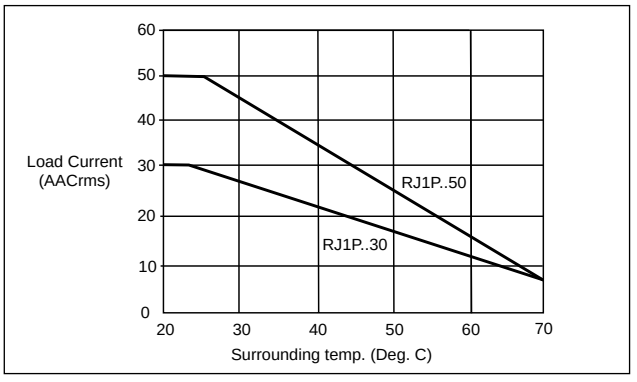
Modes 2, 3, 4 and **5** use the zero switching principle, thus ensuring a reduced level of radiated and wire-conducted noise. The Distributed and Burst Switching modes are not recommended for light control due to light-flickering.

LED INDICATION
The top Red LED indicates the load status. It goes ON whenever the load is activated. The Green LED gives indication of the status of the control input.

Upon application of control current (for the RJ1P..I...) to terminals A1-A3, the Green LED will be dimly lit, with its intensity increasing with an increase in control current.

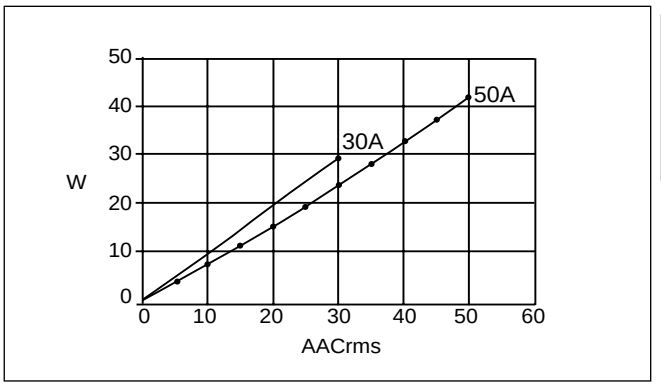
For the RJ1P..V..., the Green LED will be ON (flickering) upon application of the supply voltage to terminals A2 - A4. Once a control voltage is applied to terminals A1 - A3, the Green LED will be fully ON, if greater than a threshold voltage (approx. 0.5V). Note that the first time the device (voltage control version) is to be activated, the mains voltage has to be present for the Green LED to indicate the control status.

Derating Curve

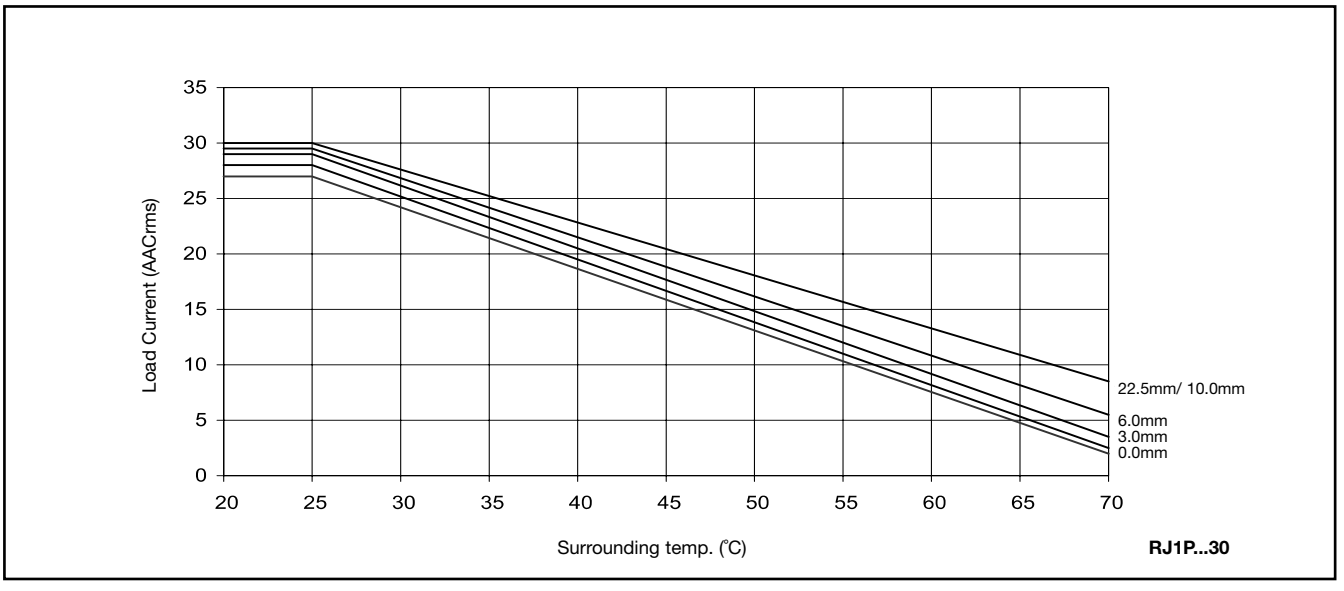


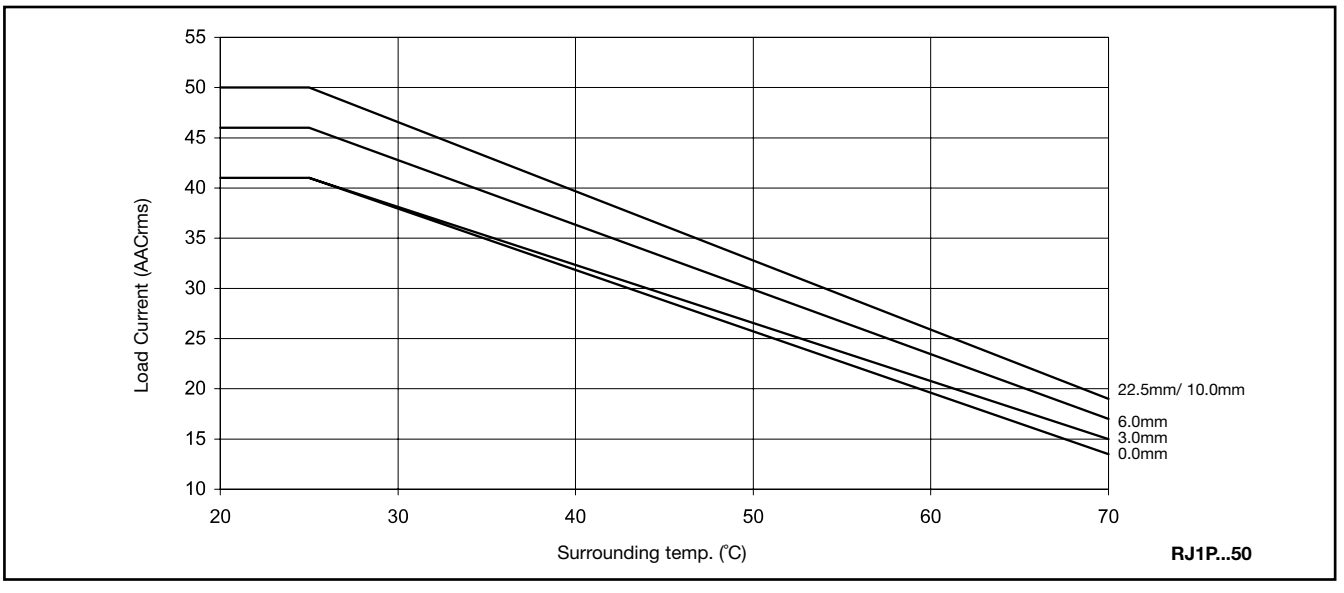
Note: Based on 100% output power

Dissipation Curve



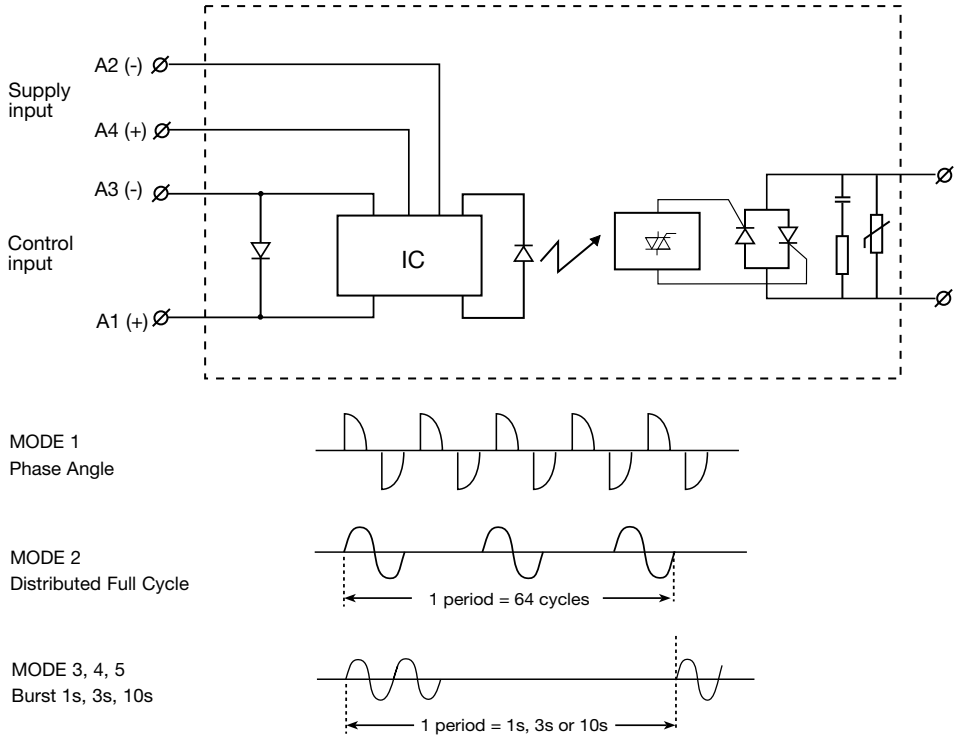
Derating vs. Spacing Curves





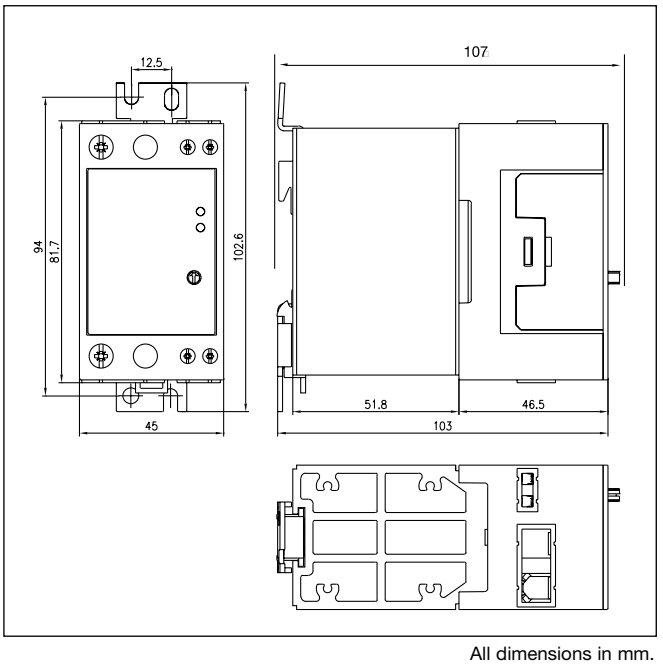
Note: Based on 100% output power

Functional Diagram



Note: A2, A4 used only for voltage control version

Dimensions



All dimensions in mm.

Housing Specifications

Weight	Approx. 430 g
Housing material	PBT Flame retardant
Control terminal cable size	
Min	1 x 0.5 mm^2 (1 x AWG20)
Max	1 x 4.0 mm^2 (1 x AWG12) or 2 x 2.5 mm^2 (2 x AWG14)
Mounting torque max.	0.6 Nm Posidriv 0 bit
Control terminal screw	M3
Power terminal cable size	
Min	1 x 4 mm^2 (1 x AWG12)
Max	1 x 25 mm^2 (1 x AWG3) or 2 x 10 mm^2 (2 x AWG6)
Mounting torque max.	2.5 Nm Posidriv 2 bit
Power terminal screw	M5

Solid State Relays
SOLITRON MINI - With Integrated Heatsink
Type RJ2A

- **AC semiconductor contactor**
- **Two pole switching with common control input**
- **Direct copper bonding (DCB) technology**
- **LED-indication**
- **Self-lifting power terminals**
- **Operational ratings : Up to 2 x 18AACrms and 480VAC**
- **Blocking voltage: Up to 1200V_p**
- **Opto-isolation > 4000VACrms**

Product Description

The SOLITRON RJ2A MINI is a two pole Solid State Contactor designed to replace electro-mechanical contactors in industrial heating and motor applications, especially when switching is frequent. The two switching poles in the RJ2A MINI are simultaneously activated upon application of the control voltage. A Green LED indicates the status of the control input.
The relay will switch on when the sinusoidal curve crosses zero and switches off when the current crosses zero. Two 2.5mm^2 cables can be connected in each screw terminal to allow looping. A removable IP20 cover allows connection of a 4mm^2 cable with crimped terminal. The control voltage is supplied via a screw plug-in connector on the front of the device.
The product is ready to mount on DIN-Rail or chassis and comes with integral heatsink. The heatsink is moved to the back for optimal space saving in the panel and easy wire mounting at the front of the relay. The standard housing dimensions enable installation in limited space.

Ordering Key

RJ 2 A 48 D 12 E

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

Type Selection

Switching mode	Rated operational voltage	Control voltage	Rated operational current	Terminal layout
A: Zero switching	22: 220VACrms 48: 480VACrms	D: 4 - 32VDC	12: 2 x 12AACrms 18: 2 x 18AACrms	E: Contactor

Selection Guide

Rated operational voltage	Blocking voltage	Control voltage	Rated operational current 2 x 12A	2 x 18A
220VACrms	650V_p	4 - 32VDC	**RJ2A22D12E**	**RJ2A22D18E**
480VACrms	1200V_p	4 - 32VDC	**RJ2A48D12E**	**RJ2A48D18E**

General Specifications

	RJ2A22...	RJ2A48...
Operational voltage range	24 to 280VAC	42 to 530VAC
Blocking voltage	650V_p	1200V_p
Operational frequency range	45 to 65Hz	45 to 65Hz
Power factor	≥ 0.5 @ 220VACrms	≥ 0.5 @ 480VACrms
Approvals	UL, cUL	UL, cUL
CE-marking	Yes	Yes
Pollution degree	2	2

Output Specifications

	RJ2A...12	RJ2A...18
Rated operational current		
AC51 @Ta=25°C	2 x 12AACrms	2 x 18AACrms
AC53a @Ta=25°C	2 x 5AACrms	2 x 15AACrms
Min. operational current	350mAACrms	250mAACrms
Rep. overload current t = 1s	< 35AACrms	<125AACrms
Non rep. surge current Tj(init.) = 25°C and t = 10 ms	$300A_p$	$600A_p$
Off-state leakage current @ rated voltage and frequency	< 3mArms	< 3mArms
I^2t for fusing t =10 ms	$450A^2s$	$1800A^2s$
On-state voltage drop @ rated current	1.6Vrms	1.6Vrms
Critical dV/dt off-state	500V/µs	500V/µs

Input Specifications

Control voltage range	4 - 32VDC
Pick-up voltage	3.8VDC
Reverse voltage	32VDC
Drop-out voltage	1.2VDC
Max. input current	24mA
Response time pick-up	≤ 1/2 cycle
Response time drop-out	≤ 1/2 cycle

Thermal Specifications

Operating temperature	-30 to +70°C (-22 to +158°F)
Storage temperature	-40 to +100°C (-40 to +212°F)

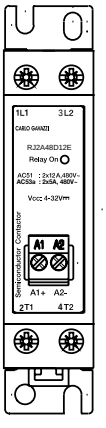
Isolation

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

Housing Specifications

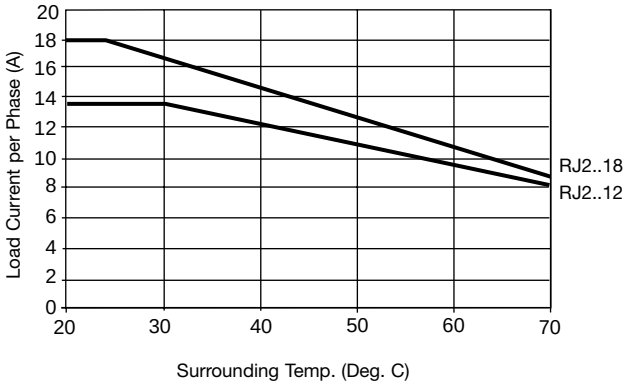
Weight	Approx. 300g
Housing material	PBT Flame retardant
Control terminal	
Terminal screws	M3
Max. terminal tightening torque	0.8Nm with Philips bit
Min. cross-sectional area of cable (stranded)	1 x 0.05mm^2 (1 x AWG30)
Max. cross-sectional area of cable (stranded)	1 x 2.5mm^2 (1 x AWG12) or 2 x 1.5mm^2 (2 x AWG16)
Power terminal	
Terminal screws	M4
Maximum tightening torque	2Nm with Posidriv 2 bit
Min. cross-sectional area of cable (stranded)	1 x 0.5mm^2 (1 x AWG20)
Max. cross-sectional area of cable (stranded)	2 x 2.5mm^2 (2 x AWG14)
Max. cross-sectional area of cable with crimped terminal	1 x 4.0mm^2 (1 x AWG12)

Terminal Layout

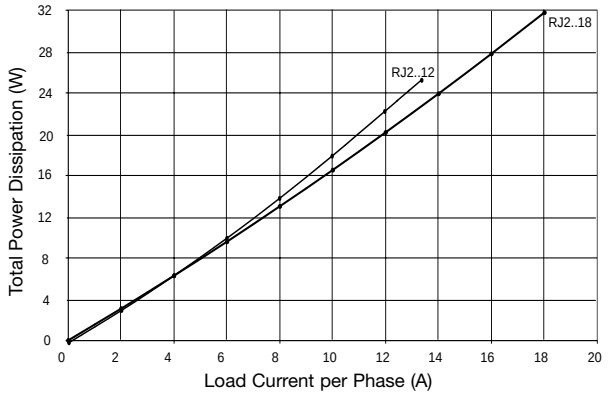


L1, L2: Phase
T1, T2: Load
A1: Control +
A2: Control -

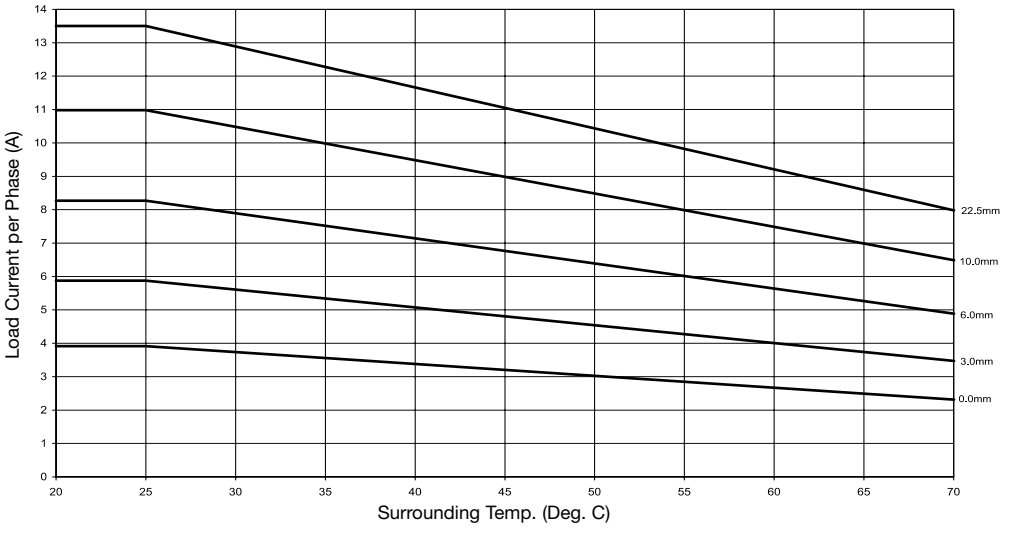
Derating Curve



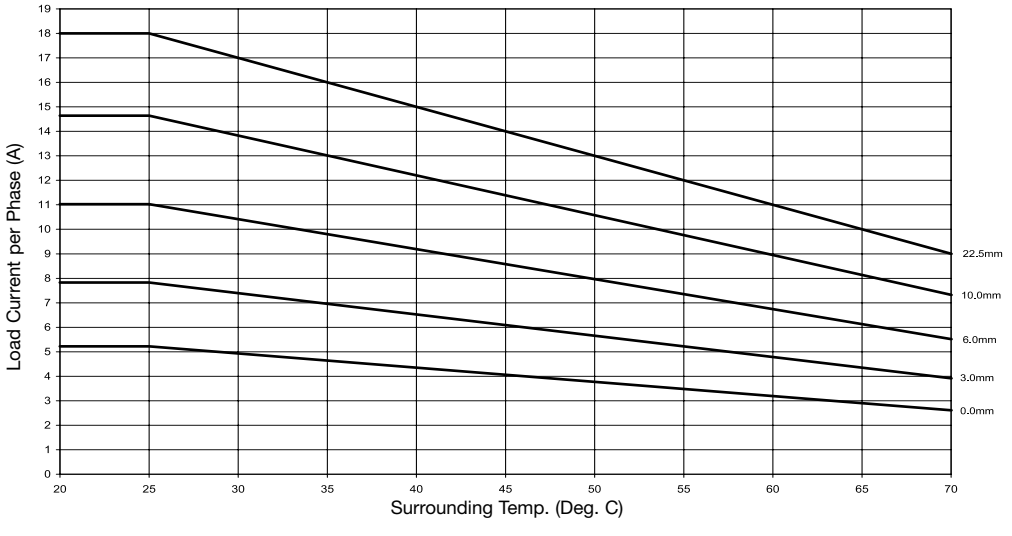
Dissipation Curve



Derating vs. Spacing Curves

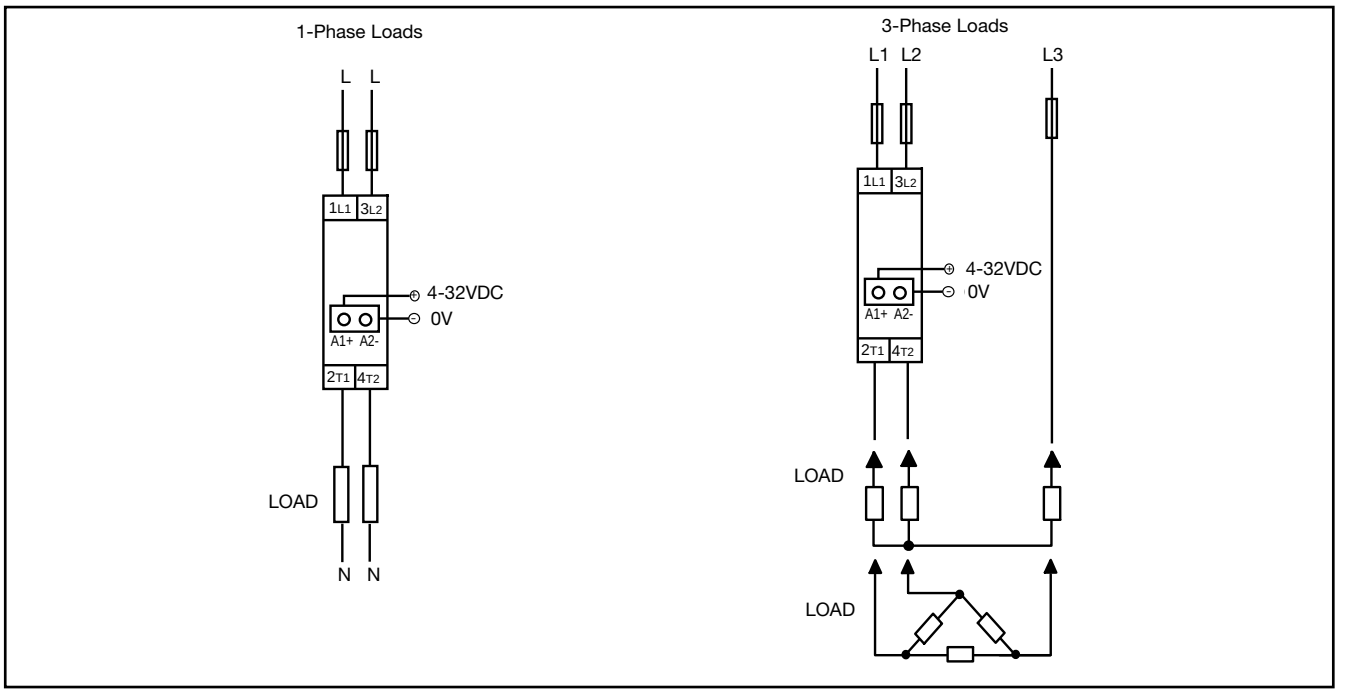


RJ2...12



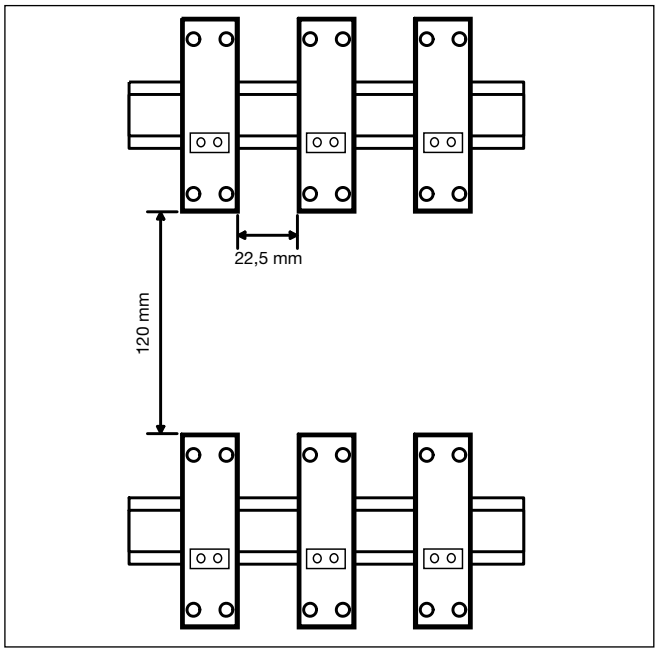
RJ2...18

Connection Example

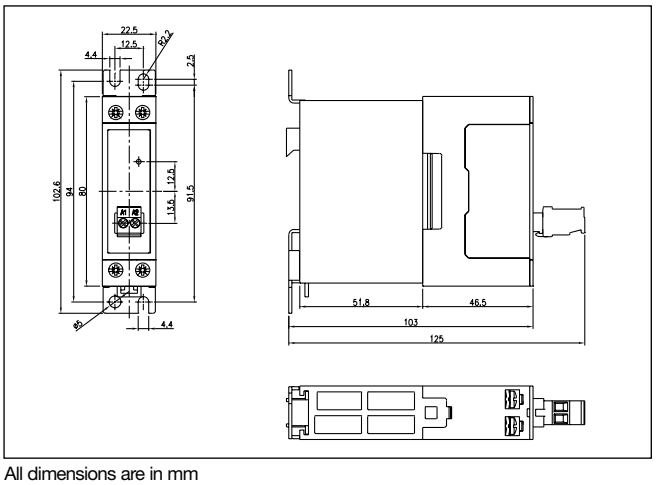


Note: Application of control voltage to terminals A1 - A2 will activate both poles simultaneously.

Panel Mounting

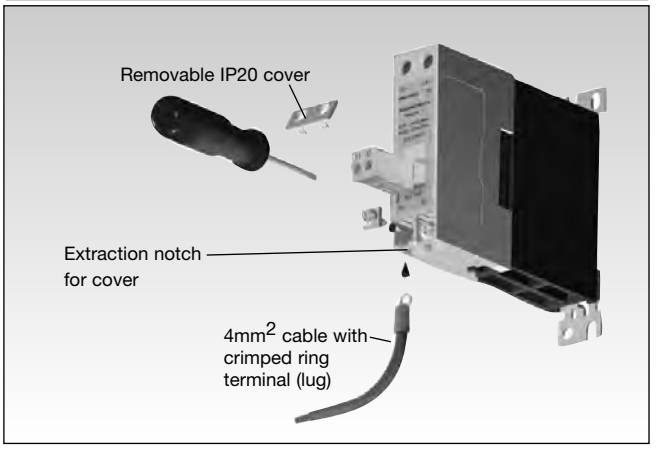


Dimensions

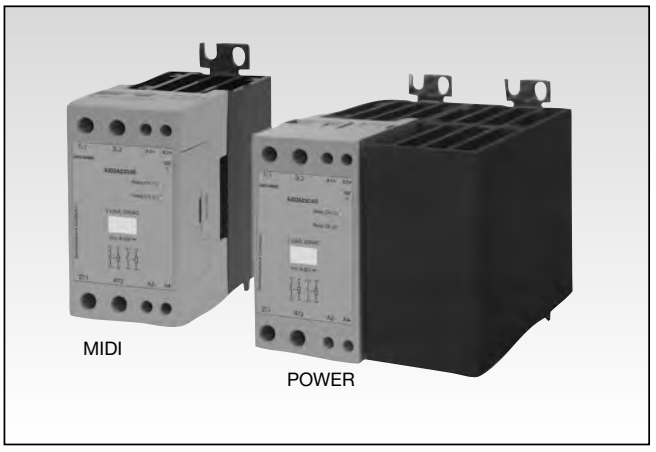


All dimensions are in mm

Installation



Solid State Relays
2 Independently Switched Poles
Integrated Heatsink
Type RJD2A - Duo



- **2 in 1 semiconductor contactor**
- **Two control inputs - two independently switched poles**
- **Direct copper bonding (DCB) technology**
- **LED-indication for each pole**
- **Housing free of moulding mass**
- **Cage clamp output terminals**
- **Input range: 4-32 VDC**
- **Operational ratings: up to 2x45 AAC and 600 VAC**
- **Blocking voltage: up to 1200 Vp**
- **Opto-isolation > 4000 VACrms**

Product Description

This product is designed in such a way as to replace electro-mechanical contactors in industrial heating and motor applications, especially when switching is frequent. This product is ready to mount on DIN-rail or chassis and comes with integral heatsink. Cage clamp terminals are used to ensure secure load connection with cable up to 25mm^2.

The RJD2A series consists of two switching poles which are independently controlled. Green LEDs indicate the status of each control input. The relay will switch on when the sinosodial curve crosses zero and switches off when the current crosses zero.

Ordering Key

RJ D 2 A 60 D 30 E

- **Solid State Relay**
- **Two-in-one(Duo)**
- **Number of switching poles**
- **Switching mode**
- **Rated operational voltage**
- **Control voltage**
- **Rated operational current**
- **Terminal layout**

Type Selection

Switching mode	Rated operational voltage	Control voltage	Rated operational current
A: Zero switching	23: 230 VACrms 60: 600 VACrms	D: 4-32VDC	30: 2x30 AACrms (Midi) 45: 2x45 AACrms (Power)

Selection Guide

Rated operational voltage	Control voltage	Rated operational current 2x30A (Midi)	2x45A (Power)
230VACrms	4-32VDC	**RJD2A23D30E**	**RJD2A23D45E**
600VACrms	4-32VDC	**RJD2A60D30E**	**RJD2A60D45E**

General Specifications

	RJD2A23...	RJD2A60...
Operational voltage range	24 to 280 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
Approvals	UL, cUL	UL, cUL
CE-marking	Yes	Yes
Pollution degree	2	2

Output Specifications

	RJD2A...30 (Midi)	RJD2A...45 (Power)
Rated operational current AC51 @Ta=25°C AC53a @Ta=25°C	 2x30AACrms 2x30AACrms	 2x45AACrms 2x30AACrms
Min. operational current	500 mAACrms	500 mAACrms
Rep. overload current t = 1s	< 200 AACrms	< 200 AACrms
Non rep. surge current Tj(init.) = 25°C and t = 10 ms	1900 Ap	1900 Ap
Off-state leakage current @ rated voltage and frequency	< 3 mArms	< 3 mArms
I^2t for fusing t = 10 ms	18000 A^2s	18000 A^2s
On-state voltage drop @ rated current	1.6 Vrms	1.6 Vrms
Critical dv/dt commutating	500 V/µs	500 V/µs
Critical dV/dt off-state	500 V/µs	500 V/µs

Housing Specifications

Weight	Approx. 480g (MIDI) Approx. 800g (Power)
Housing material	PBT Flame Retardant
Control terminal cable size Min Max Tightening torque max.	 1 x 0.5 mm^2 (1 x AWG 20) 1 x 4.0 mm^2 (1 x AWG 12) or 2 x 2.5 mm^2 (2 x AWG 14) 0.6 Nm with Posidrive 0 bit
Control terminal screw	M3
Power terminal cable size Min Max Tightening torque max.	 1 x 4 mm^2 (1 x AWG 12) 1 x 25 mm^2 (1 x AWG 3) or 2 x 10 mm^2 (2 x AWG 6) 2.5 Nm with Posidrive 2 bit
Power terminal screw	M5

Input Specifications

Control voltage range	4 - 32 VDC
Pick-up voltage	3.8 VDC
Reverse voltage	32 VDC
Drop-out voltage	1 VDC
Maximum input current	15 mA
Response time pick-up	1 cycle
Response time drop-out	1 cycle

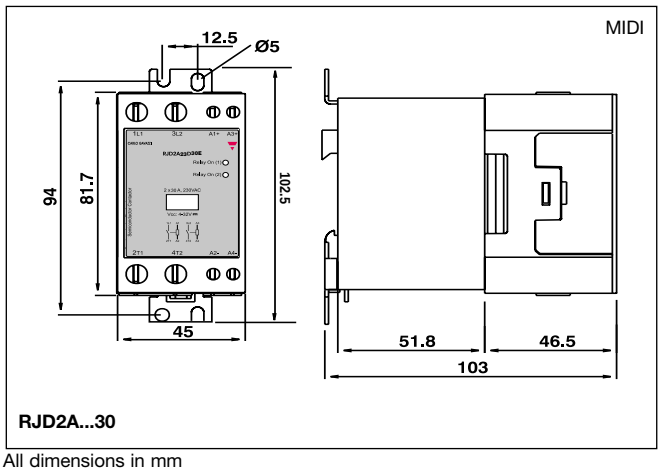
Thermal Specifications

Operating temperature	-30 to +70°C
Storage temperature	-40 to +100°C

Isolation

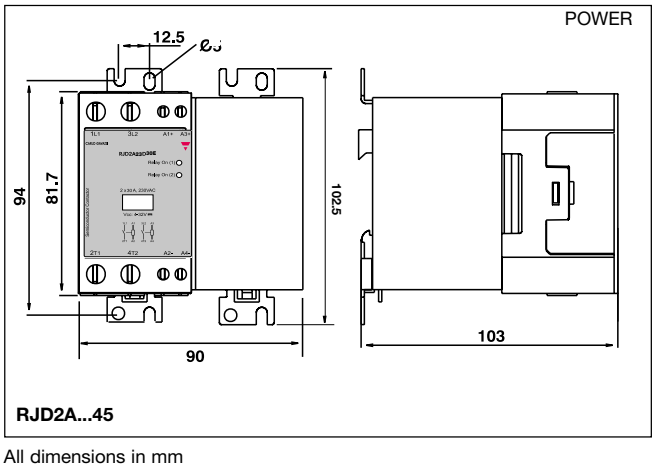
Rated isolation voltage Input to output Output to case	 ≥ 4000 VACrms ≥ 4000 VACrms

Dimensions



RJD2A...30

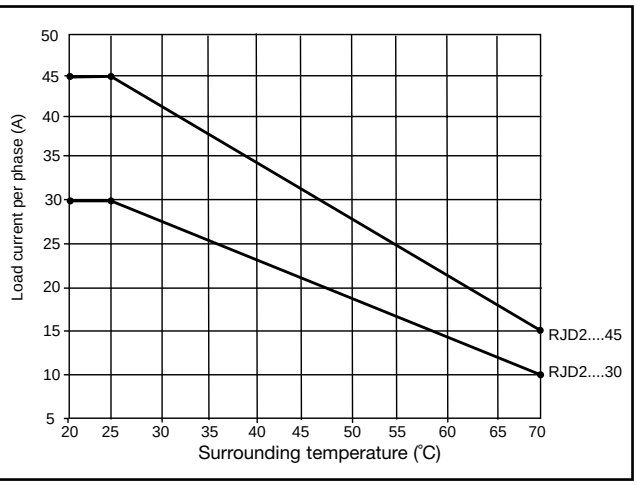
All dimensions in mm



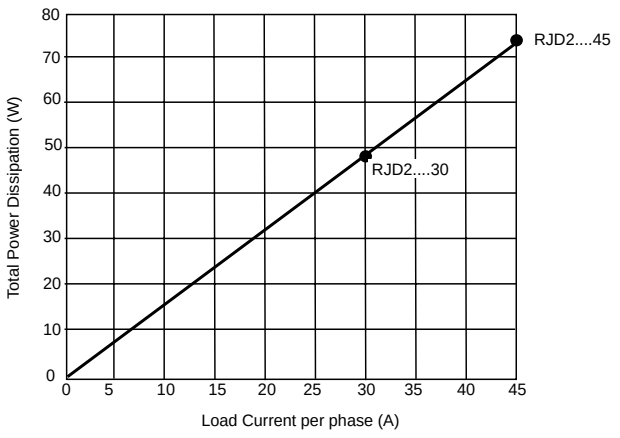
RJD2A...45

All dimensions in mm

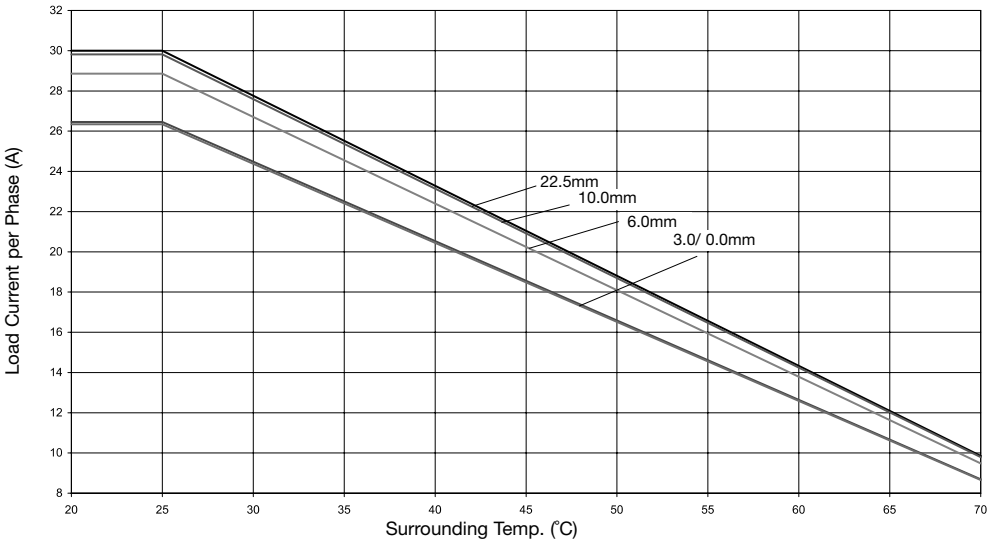
Derating Curve



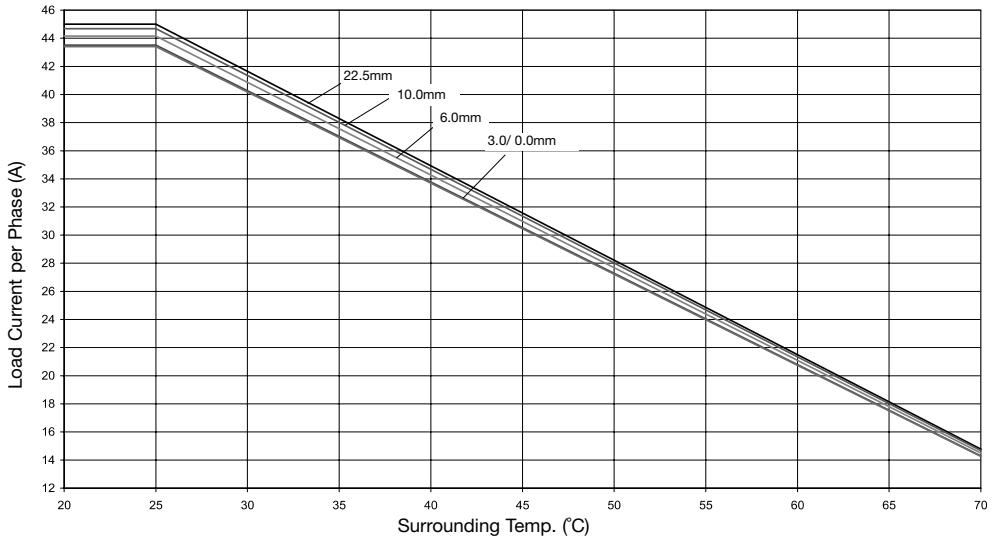
Dissipation Curve



Derating vs. Spacing Curves

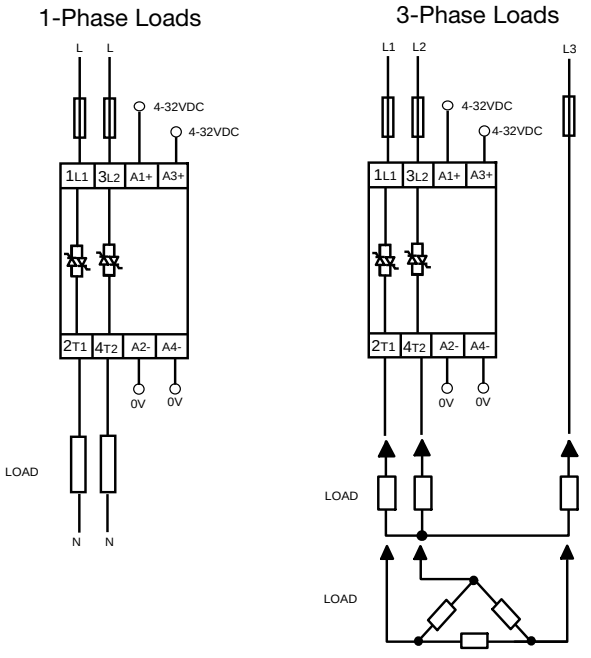


RJD2...30



RJD2...45

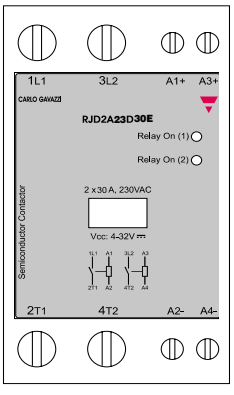
Connection example



• Application of DC voltage across terminals A1-A2 will activate pole L1-T1. The top green LED indicates the status of the control input across terminals A1-A2.

• Application of DC voltage across terminals A3-A4 will activate pole L2-T2. The bottom green LED indicates the status of the input voltage across terminals A3-A4.

Terminal Layout



Solid State Relays
Industrial, Rear Integrated Heatsink
3-Phase w LED
Types RJ2A, RJ3A

- **AC Semiconductor contactor**
- **Two and three pole switching types**
- **Direct copper bonding (DCB) technology**
- **LED indication**
- **Integrated over-voltage protection**
- **Housing free of moulding mass**
- **2 Input ranges: 5 – 32 VDC and 24-275VAC/24-190VDC**
- **Operational ratings: up to 3x32AAC, 600VAC**
- **Blocking voltage: Up to 1200V_p**
- **Opto-isolation > 4000 VAC_{rms}**

Product Description

This product is designed in such a way as to replace electro-mechanical contactors, especially when switching is frequent. It has an integrated heatsink and over-voltage protection. The heatsink is moved to the back for optimal space saving in the panel and easy wire mounting at the front of the relay.
The relay with antiparallel thyristor output is the most widely used industrial SSR due to its multiple application possibilities and robust construction. This relay can be used for resistive and inductive loads.
The zero switching relay switches ON when the sinusoidal curve crosses zero and switches OFF when the current crosses zero. A green and a red LED give status of the control input and alarm respectively.

Ordering Key

RJ 3 A 60 D 32 E P

- **Solid state relay**
- **Number of switching poles**
- **Switching mode**
- **Rated operational voltage**
- **Control voltage**
- **Rated operational current**
- **Terminal Layout**
- **Options**

Type selection

Switching poles	Switching mode	Rated operational voltage	Control voltage	Rated operational current
RJ2: 2 poles	A: Zero switching	22: 220 VACrms	D: 5 - 32 VDC	20: 3 x 20 AAC_{rms} (RJ3A)
RJ3: 3 poles		60: 600 VACrms	A: 24 - 275 VAC/ 24 - 190 VDC	25: 3 x 25 AAC_{rms} (RJ2A/RJ3A)
				32: 3 x 32 AAC_{rms} (RJ2A/RJ3A)

Selection Guide

Rated operational voltage	Control voltage	Rated operational current 2-Pole switching/1-Pole direct		3-Pole switching		
		3x25A (MIDI)	3x32A (POWER)	3x20A (MIDI)	3x25A (POWER)	3x32A (MIDI)[4]
220 VACrms	5 - 32 VDC	**RJ2A22D25**	**RJ2A22D32**	**RJ3A22D20**	**RJ3A22D25**	**RJ3A22D32EP**
	24 - 275 VAC/ 24 - 190 VDC	**RJ2A22A25E**	**RJ2A22A32E**	**RJ3A22A20E**	**RJ3A22A25E**	**RJ3A22A32EP**
600 VACrms	5 - 32 VDC	**RJ2A60D25**	**RJ2A60D32**	**RJ3A60D20**	**RJ3A60D25**	**RJ3A60D32EP**
	24 - 275 VAC/ 24 - 190 VDC	**RJ2A60A25E**	**RJ2A60A32E**	**RJ3A60A20E**	**RJ3A60A25E**	**RJ3A60A32EP**

Options

Model Type	Alarm LED indication	Alarm connections	Fan supply input
DC control	No	No	No
DC control + OTP	Yes	Yes	No
DC control + OTP + Fan	Yes	Yes	Yes
AC control	No	No	No
AC control + OTP	Yes	Yes	No
AC control + OTP + Fan	Yes	No	Yes

Notes
1 Basic models with DC control input (without over-temperature protection or fan) have both U-type and E-type terminal connections
2 All models with over-temperature protection option (suffix "P") or AC control input are only available with type "E" terminals
3 Fan switching is internally controlled. Fan requires an external supply connected to the fan supply input(s)
4 With integrated fan and over-temperature protection - fan will automatically switch on when necessary

CARLO GAVAZZI

General Specifications

	RJ..22..	RJ..60..
Operational voltage range	24 - 280 VAC	48 - 660 VAC
Blocking voltage	650 V_p	1200 V_p
Operational frequency range	45 - 65 Hz	45 - 65 Hz
Power factor	≥ 0.5 @ 230 VACrms	≥ 0.5 @ 600 VACrms
Internal Varistor	Yes	Yes
Approvals	UL, cUL, CSA	UL, cUL, CSA
CE-marking	Yes	Yes
Pollution degree	2	2

Input Specifications

	RJ..D..	RJ..A..
Control voltage range	5 - 32 VDC	24-275 VAC/ 24-190 VDC
Pick-up voltage	4.7 VDC	22 VAC/ VDC
Reverse voltage	32 VDC	N/A
Drop-out voltage	1.2 VDC	6 VAC/ 6VDC
Maximum input current	24 mA	15mA
Response time pick-up	<1 cycle	<1 cycle
Response time drop-out	<1 cycle	<1 cycle

Output Specifications

	2-Pole switching/1-Pole direct		3-Pole switching		
	RJ2A..25 (MIDI)	RJ2A..32 (POWER)	RJ3A..20 (MIDI)	RJ3A..25 (POWER)	RJ3A..32 (MIDI)*
Rated operational current AC51 @Ta=25°C AC53a @Ta=25°C	 3 x 25 A 3 x 15 A	 3 x 32 A 3 x 15 A	 3 x 20 A 3 x 15 A	 3 x 25 A 3 x 15 A	 3 x 32 A 3 x 15 A
Min. opertional current	250mA	250mA	250 mA	250mA	250mA
Rep. overload current t=1s	<125 A	<125 A	<125 A	<125 A	<125 A
Non rep. surge current Tj(init.)= 25°C and t=10ms	600 Apk	600 Apk	600 Apk	600 Apk	600 Apk
Off-state leakage current @ rated voltage & frequency	< 3 mA	< 3 mA	< 3 mA	< 3 mA	< 3 mA
I^2t for fusing (t = 10 ms)	1800 A^2s	1800 A^2s	1800 A^2s	1800 A^2s	1800 A^2s
On-state voltage drop @ rated current	1.6 Vrms	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	500 V/µs

* With integrated fan and over-temperature protection

Housing Specifications

Weight	
MIDI	Approx. 380 g
MIDI + FAN	Approx. 415 g
POWER	Approx. 680 g
Housing material	PBT, Flame Retardant
Conductors	
Size	0.5...4.0 mm^2 (AWG 20...12) 0.5...2x2.5 mm^2 (AWG 20...2x14)
Mounting torque max.	0.6 Nm with Posidrive 0 bit
Terminal screws	M3

Thermal Specifications

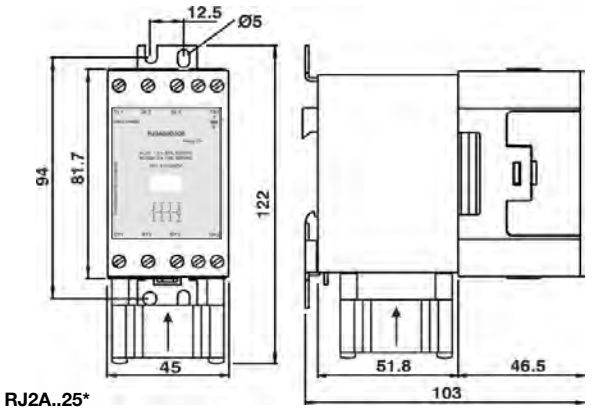
Operating Temperature	-30 to +70°C (-22 to +158°F)
Storage temperature	-40 to +80°C (-40 to +178°F)

Isolation

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

Dimensions

MIDI

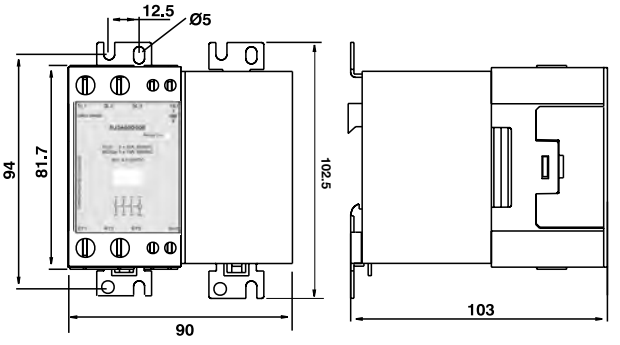


RJ2A..25*
RJ3A..20*
RJ3A..32

*** without fan**

All dimensions in mm

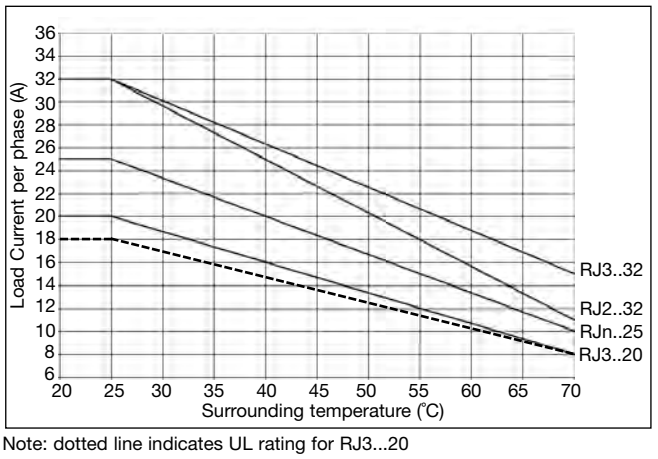
POWER



RJ2A..32
RJ3A..25

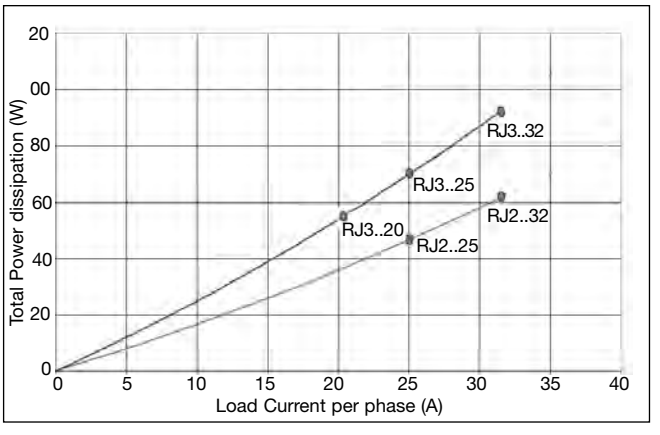
All dimensions in mm

Derating Curve

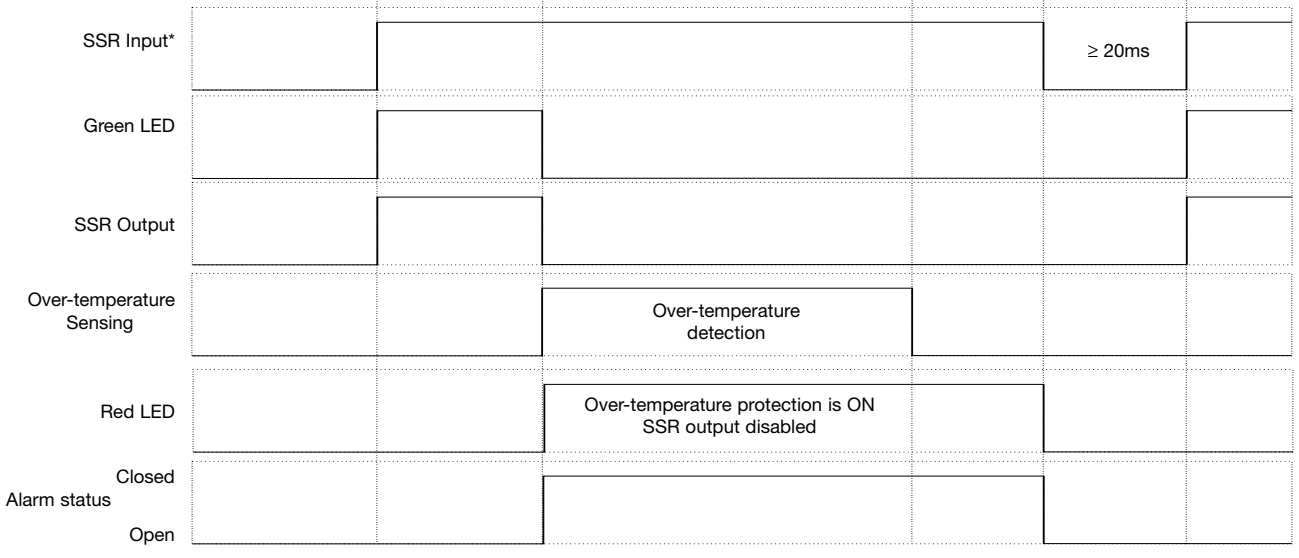


Note: dotted line indicates UL rating for RJ3...20

Dissipation Curve

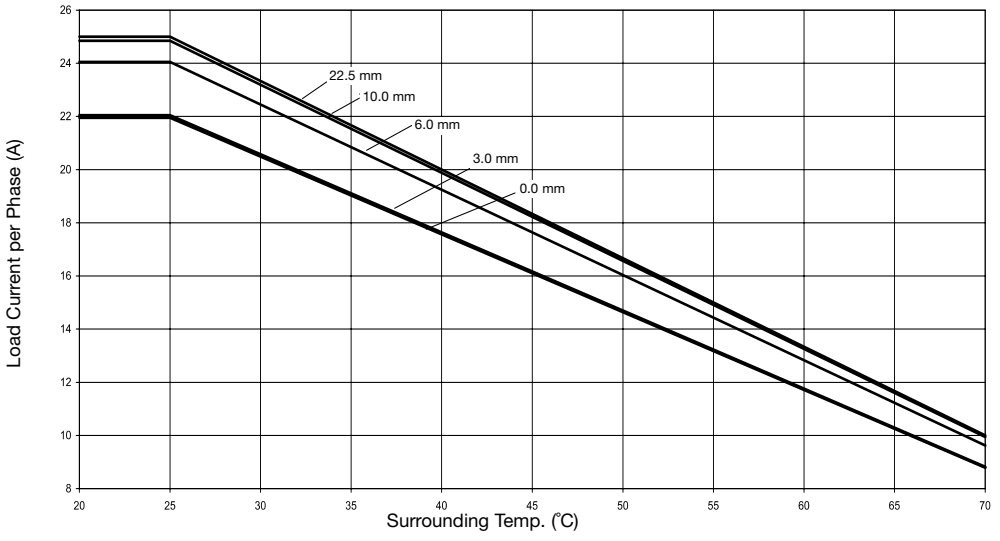


Over-temperature Protection (Option: ...P)

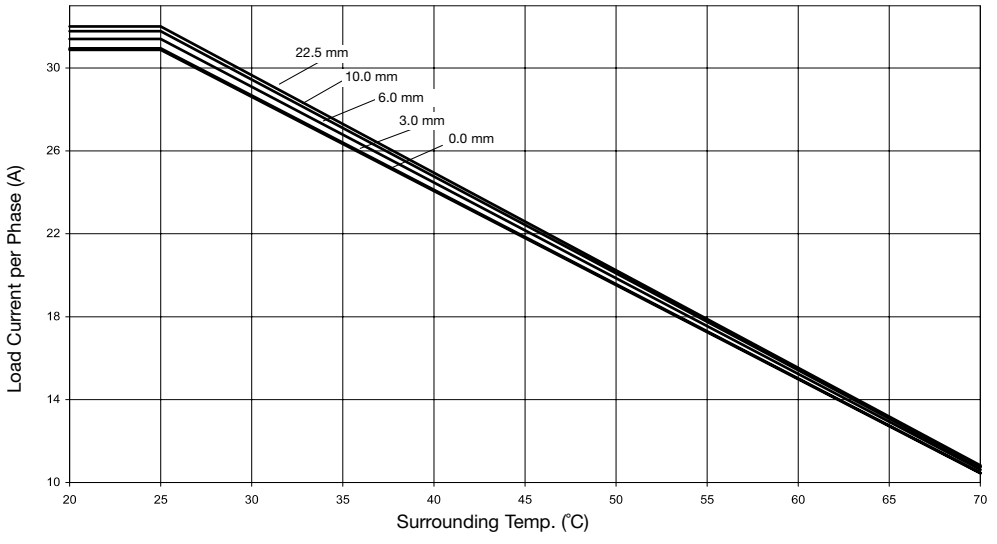


*After over-temperature condition is removed, SSR can be reset by switching OFF the control input for more than 20 ms and switching back ON: this will switch ON the SSR output

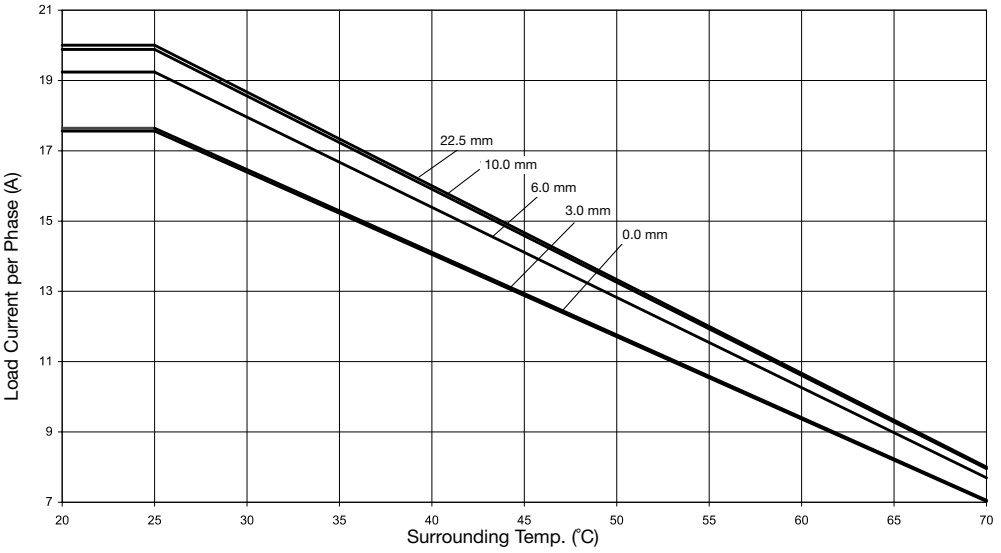
Derating vs. Spacing Curves



RJ2...25

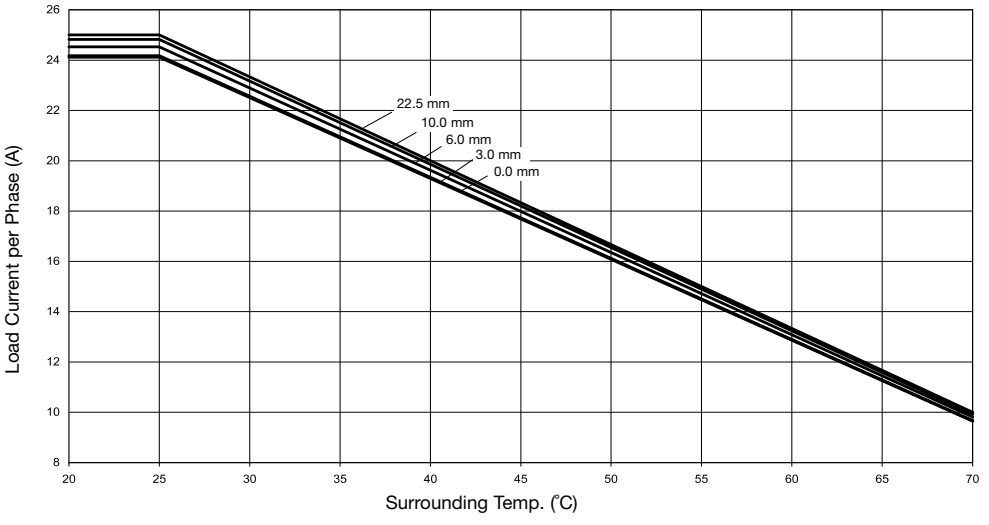


RJ2...32

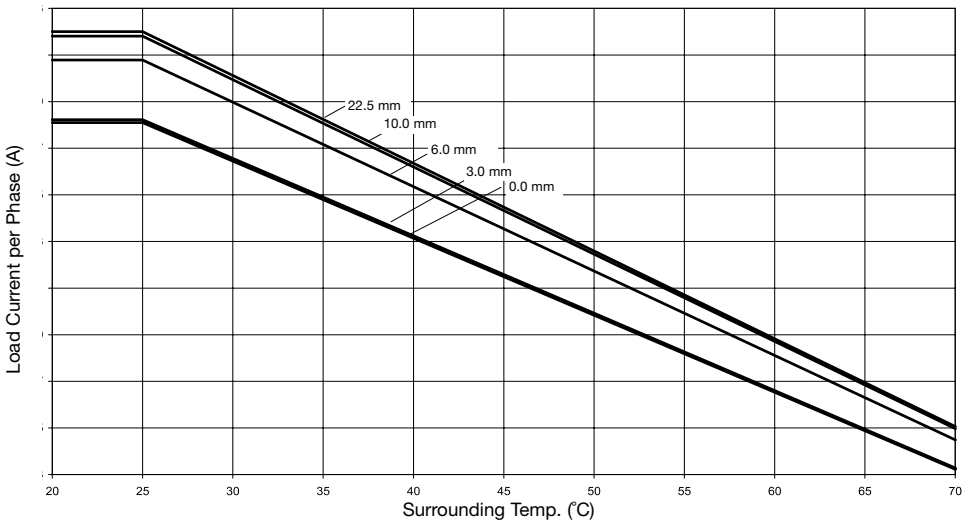


RJ3...20

Derating vs. Spacing Curves (cont.)

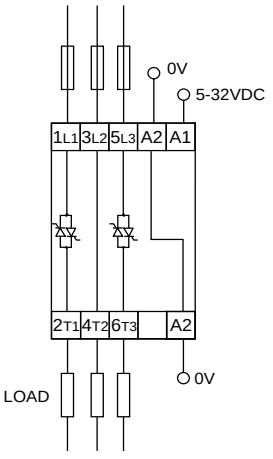


RJ3...25

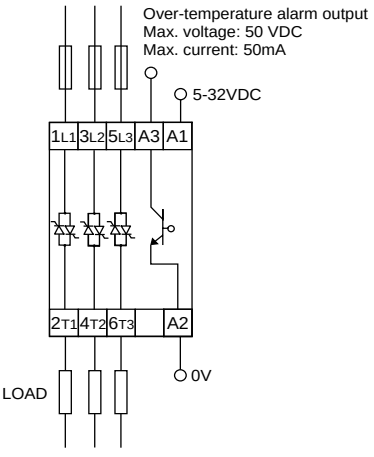


RJ3...32EP

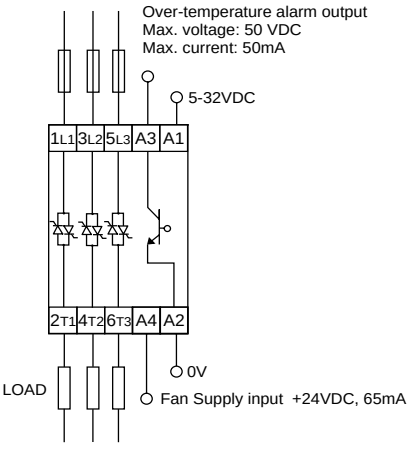
Connection Examples



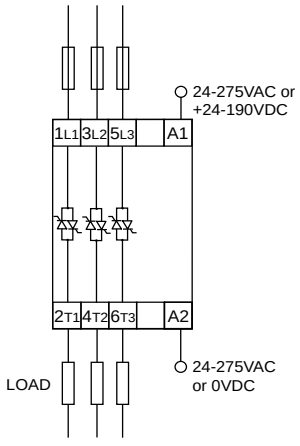
DC Control Input
Example: RJ2A60D25



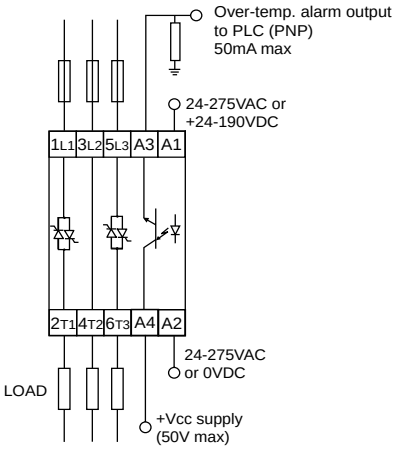
DC Control Input +
over-temperature protection
Example: RJ3A60D20EP



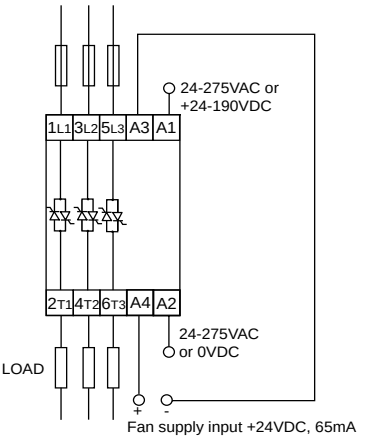
DC Control Input + Fan +
over-temperature protection
Example: RJ3A60D32EP



AC Control Input
Example: RJ3A22A20E



AC Control Input +
over-temperature protection
Example: RJ2A22A25EP

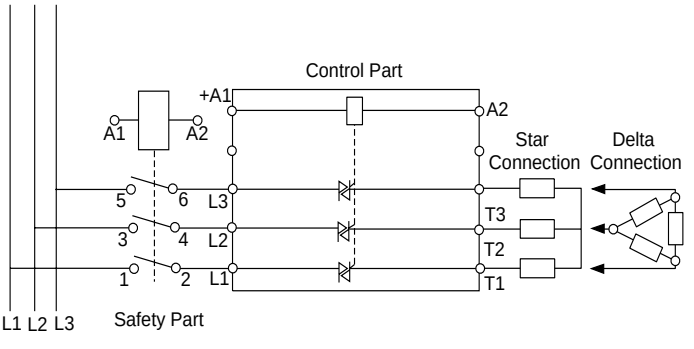


AC Control Input + fan +
over-temperature protection
Example: RJ3A22A32EP

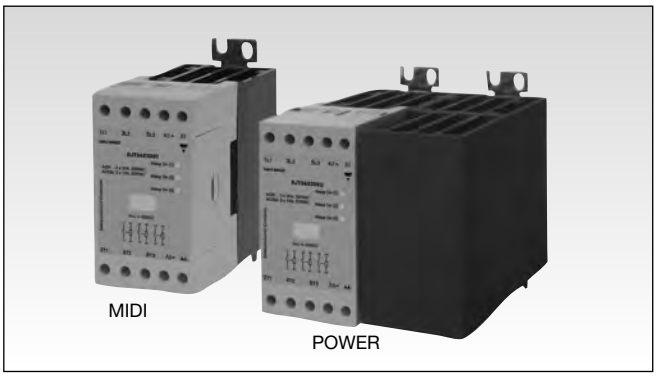
Applications

Safety

When using a semiconductor contactor, the electric configuration is split into a safety part and a control part. In the safety part the isolation of the load from the mains is assured by inserting switchgear that provides galvanic isolation from the power supply. A contactor or isolator can be mounted in series with the Solid State Relay to achieve this isolation. The contactor can be a very economical type as the switching is done by the Solid State Relay.



Solid State Relays
3 Independently Switched Poles
Integrated heatsink
Type RJT3A - Trio



- **3 in 1 semiconductor contactor**
- **Three control inputs - three independently switched poles**
- **Direct copper bonding (DCB) technology**
- **LED indication for each pole**
- **Housing free of moulding mass**
- **Input range: 4 – 32 VDC**
- **Operational ratings: up to 3x25AAC, 600VAC**
- **Blocking voltage: up to 1200V_p**
- **Opto-isolation > 4000 VAC_{rms}**

Product Description

This product is designed in such a way as to replace electro-mechanical contactors, especially when switching is frequent. It has an integrated heatsink and over-voltage protection. The heatsink is moved to the back for optimal space saving in the panel and easy wire mounting at the front of the relay.
The relay with antiparallel thyristor output can be used for resistive and inductive loads.
RJT3A comes with 3 independently controlled poles, with three LEDs to indicate status of each control input.
Each zero switching relay switches ON when the sinusoidal curve crosses zero and switches OFF when the current crosses zero.

Ordering Key

RJ T 3 A 60 D 25

- **Solid state relay**
- **Three-in-one (Trio)**
- **Number of switching poles**
- **Switching mode**
- **Rated operational voltage**
- **Control voltage**
- **Rated operational current**

Type selection

Switching mode	Rated operational voltage	Control voltage	Rated operational current
A: Zero switching	23: 230 VACrms 60: 600 VACrms	D: 4 - 32 VDC	20: 3 x 20 AAC_{rms} (MIDI) 25: 3 x 25 AAC_{rms} (POWER)

Selection Guide

Rated operational voltage	Control voltage	Rated operational current 3 x 20 (MIDI)	3 x 25 (POWER)
230 VACrms	4-32VDC	**RJT3A23D20**	**RJT3A23D25**
600 VACrms	4-32VDC	**RJT3A60D20**	**RJT3A60D25**

General Specifications

	RJT3A23...	RJT3A60...
Operational voltage range	24 - 280 VAC	48 - 660 VAC
Blocking voltage	650 V_p	1200 V_p
Operational frequency range	45 - 65 Hz	45 - 65 Hz
Power factor	≥ 0.5 @ 230 VACrms	≥ 0.5 @ 600 VACrms
Approvals	UL, cUL	UL, cUL
CE-marking	Yes	Yes
Pollution degree	2	2

Output Specifications

	RJT3A...20 (MIDI)	RJT3A...25 (POWER)
Rated operational current		
AC51 @Ta=25ºC	3 x 20 A	3 x 25 A
AC53a @Ta=25°C	3 x 15 A	3 x 15 A
Min. opertional current	250 mA	250 mA
Rep. overload current t=1s	<125 A	<125 A
Non rep. surge current		
Tj(init.)= 25ºC and t=10ms	600 Apk	600 Apk
Off-state leakage current @ rated voltage & frequency	< 3 mA	< 3 mA
I^2t for fusing (t = 10 ms)	1800 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

Input Specifications

Control voltage range	4 - 32 VDC
Pick-up voltage	3.8 VDC
Reverse voltage	32 VDC
Drop-out voltage	1 VDC
Maximum input current	12 mA
Response time pick-up	<1 cycle
Response time drop-out	<1 cycle

Housing Specifications

Weight	
MIDI	Approx. 380 g
POWER	Approx. 680 g
Housing material	PBT, Flame retardant
Conductors	
Size	0.5...4.0 mm^2 (AWG 20...12) 2 x 0.5...2.5 mm^2 (2 x AWG 20...14)
Tightening torque max.	0.6 Nm with Posidrive 0 bit
Terminal screws	M3

Thermal Specifications

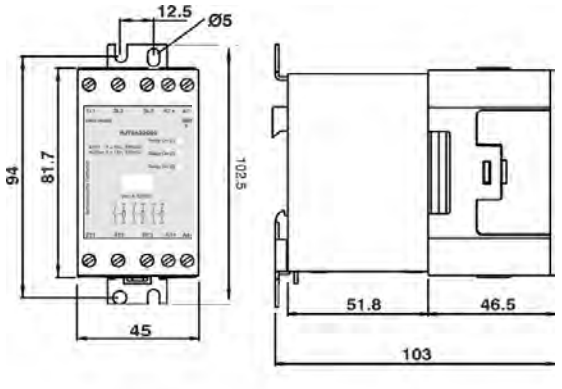
Operating Temperature	-30 to +70ºC (-22 to + 158˚F)
Storage temperature	-40 to +80ºC (-40 to +170˚F)

Isolation

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

Dimensions

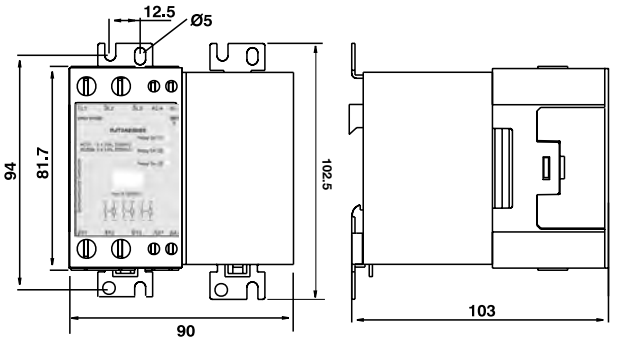
MIDI



RJT3A..20

All dimensions in mm

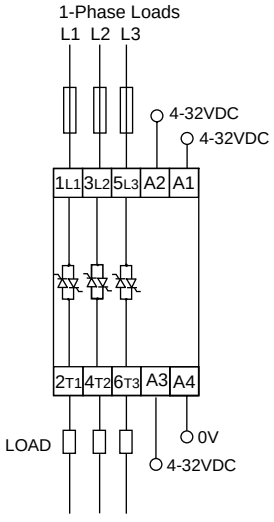
POWER

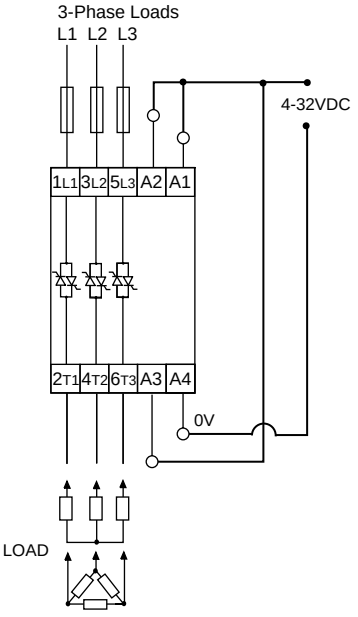


RJT3A..25

All dimensions in mm

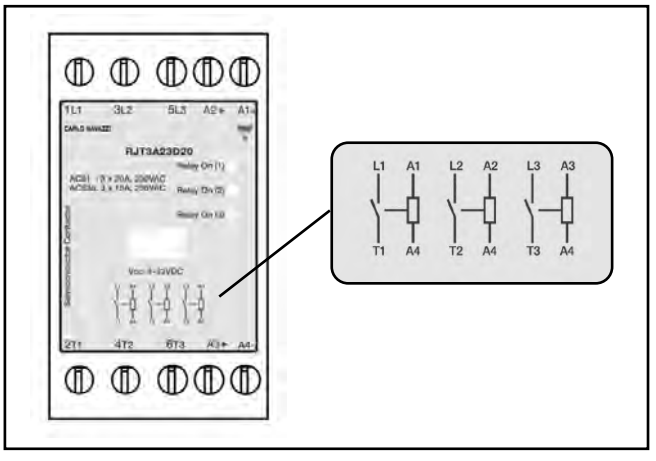
Connection Examples



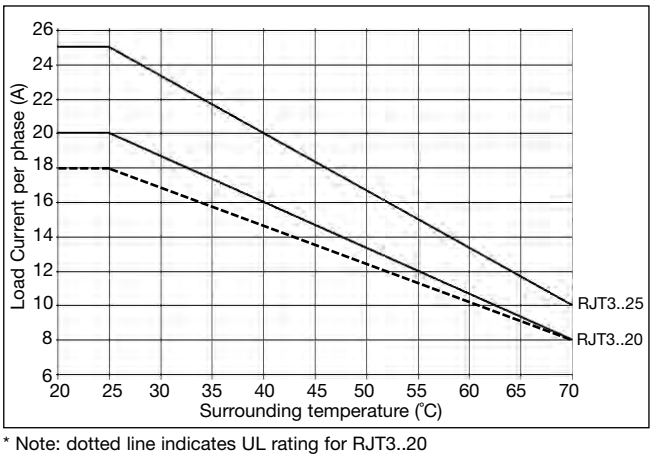


- Application of DC voltage across terminals A1-A4 will activate pole L1-T1. The top green LED indicates the status of the control input across terminals A1-A4.
- Application of DC voltage across terminals A2-A4 will activate pole L2-T2. The middle green LED indicates the status of the input voltage across terminals A2-A4.
- Application of DC voltage across A3-A4 will activate pole L3-T3. The bottom green LED indicates the status of the input voltage across terminals A3-A4.
- For 3-Phase control, A1, A2 and A3 can be connected together to switch all three poles simultaneously.

Terminal Layout

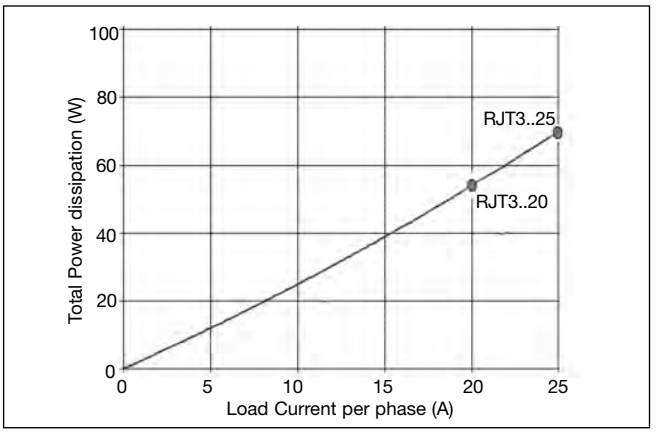


Derating Curve (100% duty on 3 Poles)

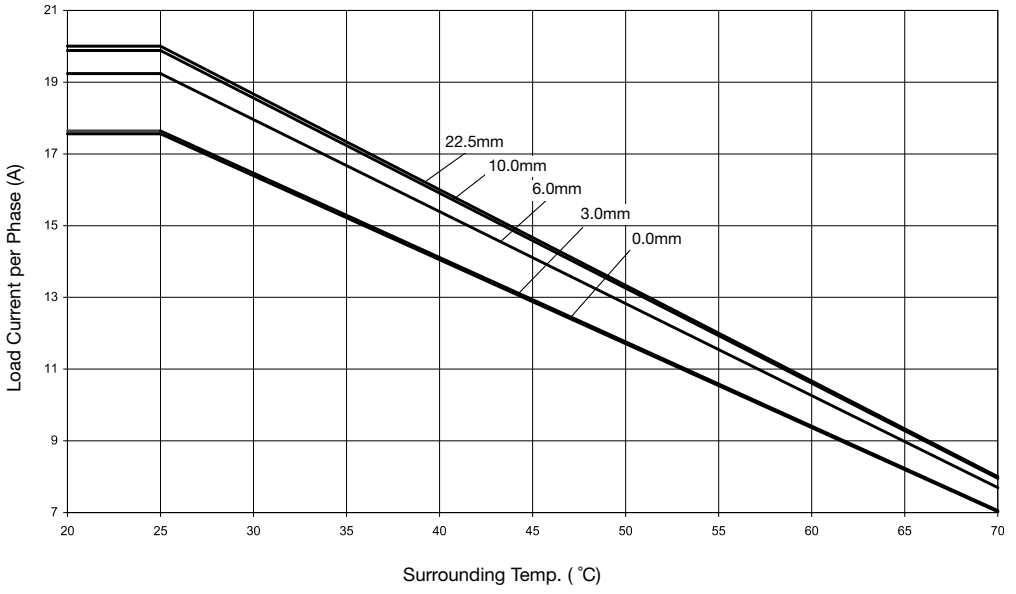


* Note: dotted line indicates UL rating for RJT3..20

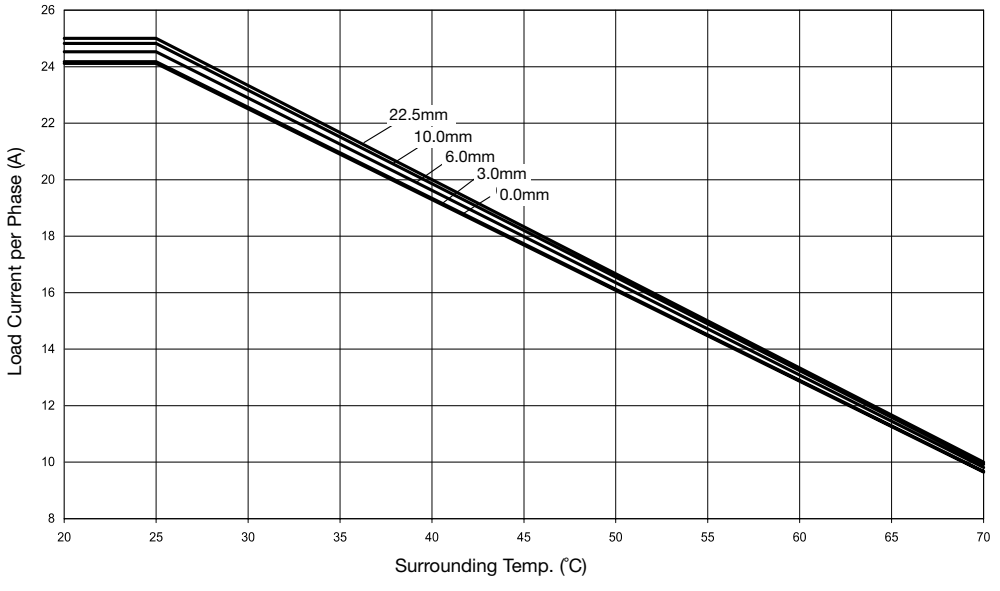
Dissipation Curve (100% duty on 3 Poles)



Derating vs. Spacing Curves



RJT3...20



RJT3...25

Note: Assuming 100% duty on 3 poles

Solid State Relays
1- and 2 Pole *SOLITRON*
With Integrated Heatsink

- **AC Solid State Contactor, 1- and 2 poles**
- **Zero switching (RN1A) for heating and motor applications**
- **Instant-on switching (RN1B)**
- **Rated operational current: 1-pole: 30 A, 50 A and 63 A 2-pole: 2 x 15 A and 2 x 25 A**
- **Rated operational voltage 230 VAC, 400/480 VAC**
- **Transient overvoltage protection built-in**
- **LED-indication**
- **IP 20 protection**
- **DIN-rail mountable**

Product Description

The *SOLITRON* Solid State Contactor is designed for industrial heating and motor control applications.

The Solid State Contactor is capable of switching 1-, 2-, and 3-phase applications with loads up to 63 A AC51 load and up to 24 A AC53a load. The Solid State Contactor is designed for DIN-rail mounting with integrated heatsink and overvoltage protection. The heatsink is moved to the front for optimal convection cooling in the panel. Cable ducting system will not stop the airflow.

The contactor elements are soldered directly on to the direct copper bonded substrate (DCB-technology). AC or DC controlled versions are available. Built-in LED status indication for applied control voltage.

Ordering Key

RN 1 A 23 A 50

- **Solid State Relay**
- **Number of poles**
- **Switching type**
  - **A: Zero switching**
  - **B: Instant on switching**
- **Rated operational voltage**
- **Control voltage**
- **Rated operational current**

Type Selection, 1 Pole

Rated operational voltage	Control voltage	Rated operational current AC51: 30 A AC53a: 6 A	AC51: 50 A AC53a: 12 A	AC51: 63 A AC53a: 24 A
230 VAC	5-32 VDC	**RN 1A23D30**	**RN 1A23D50**	**RN 1A23D63**
	5-32 VDC	**RN 1B23D30**	**RN 1B23D50**	**RN 1B23D63**
	24-230 ± 15% VAC/DC	**RN 1A23A30**	**RN 1A23A50**	**RN 1A23A63**
400/480 VAC	5-32 VDC	**RN 1A48D30**	**RN 1A48D50**	**RN 1A48D63**
	5-32 VDC	**RN 1B48D30**	**RN 1B48D50**	**RN 1B48D63**
	24-230 ± 15% VAC/DC	**RN 1A48A30**	**RN 1A48A50**	**RN 1A48A63**

Type Selection, 2 Pole

Rated operational voltage	Control voltage	Rated operational current AC51: 2 x 15 A AC53a: 2 x 6 A	AC51: 2 x 25 A AC53a: 2 x 12 A
230 VAC	5-32 VDC	**RN 2A23D30**	**RN 2A23D50**
	5-32 VDC	**RN 2B23D30**	**RN 2B23D50**
	24-265 VAC/DC	**RN 2A23A30**	**RN 2A23A50**
400/480 VAC	5-32 VDC	**RN 2A48D30**	**RN 2A48D50**
	5-32 VDC	**RN 2B48D30**	**RN 2B48D50**
	24-265 VAC/DC	**RN 2A48A30**	**RN 2A48A50**

CARLO GAVAZZI

General Specifications

	RN..23...	RN..48...
Operational voltage range	24 to 265 VAC	42 to 530 VAC
Blocking voltage	800 V_p	1200 V_p
Varistor voltage	275 VAC	510 VAC
Operational frequency range	45 to 65 Hz	45 to 65 Hz
Power factor at rated voltage	≥ 0.5	≥ 0.5
Approvals	UL, CSA	UL, CSA
CE-marking	Yes	Yes

Norms fulfilled	EN 60947-1	Low-voltage switchgear and control gear. Part 1- General Rules
	EN 61000-6-2	Generic Immunity Standard. Industrial Environment

Input Specifications

	RN....D	RN....A..
Rated control voltage range		
RN1	5 to 32 VDC	24 to 265 VAC/DC
RN2	2 x 5 to 32 VDC	2 x 24 to 265 VAC/DC
Pick-up voltage	4 VDC	14 VAC/DC
Drop-out voltage	3 VDC	6 VAC/DC
Reverse voltage max.	32 VDC	-
Input current		
RN1	< 9 mA	< 12 mA
RN2	< 9 mA per pole	< 12 mA per pole
Response time		
Pick-up time max. (50 Hz)		
RN.A	10 ms	20 ms
RN.B	< 1 ms	-
Drop-out time max. (50 Hz)		
RN.A	10 ms	20 ms
RN.B	10 ms	-
Input-ON indication (LED, green)	Yes	Yes

Output Specifications

			RN.....30	RN.....50	RN.....63
Rated operational current					
RN1A..	AC51	@Ta=30°C	30 A	50 A	63 A
	"	@Ta=40°C	30 A	50 A	50 A
	"	@Ta=50°C	23 A	38 A	40 A
	"	@Ta=60°C	20 A	30 A	30 A
	AC53a	@Ta=40°C	6 A	12 A	24 A
RN2A..	AC51	@Ta=30°C	2 x 15 A	2 x 25 A	-
	"	@Ta=40°C	2 x 15 A	2 x 25 A	-
	"	@Ta=50°C	2 x 11.5 A	2 x 19 A	-
	"	@Ta=60°C	2 x 10 A	2 x 15 A	-
	AC53a	@Ta=40°C	2 x 6 A	2 x 12 A	-
Zero crossing detection			Yes	Yes	Yes
Min. operational current			200 mA	250 mA	400 mA
Rep. overload current t=1 s (Tj init.=25°C)			55 AACrms	125 AACrms	150 AACrms
Non-rep. surge current t=10 ms (Tj init.=25°C)			325 A_p	600 A_p	1150 A_p
Off-state leakage current, @ rated voltage and frequency (Tj.=125°C, max.)			< 1 mA	< 1 mA	< 1 mA
I^2t for fusing t=10 ms			525 A^2s	1800 A^2s	6600 A^2s
Critical dV/dt off-state			500 V/µs	500 V/µs	500 V/µs

Thermal Specifications

	RN.....30	RN.....50	RN.....63
Operational temperature	-20 to +70°C (-4 to +158°F)	-20 to +70°C (-4 to +158°F)	-20 to +70°C (-4 to +158°F)
Storage temperature	-40 to +100°C (-40 to +212°F)	-40 to +100°C (-40 to +212°F)	-40 to +100°C (-40 to +212°F)

Housing Specifications

Mounting	DIN-rail 35 mm
Weight with RHN1	470 g
Weight with RHN2	780 g
Housing material	Noryl SEI, GFN1, Black
LED window material	PC Lexan 141R
Base plate	Aluminium, nickel-plated
Potting compound	Polyurethane, Casco Nobel
Terminals	Screw with captive wire clamp
Control terminals nominal	4 mm^2 or 2 x 2.5 mm^2 AWG 12 or 2 x AWG 14
Min.	0.5 mm^2, AWG 20
Mounting torque max.	0.6 Nm
Power terminals nominal	10 mm^2 or 2 x 6 mm^2 AWG 6 or 2 x AWG 10
Min.	1 mm^2, AWG 16
Mounting torque max.	2.0 Nm
Heatsink compound used	Electrolube HTS

Insulation

Rated impulse withstand voltage Input to output	4000 V_{imp}
Rated impulse withstand voltage Output to heatsink	4000 V_{imp}

Environment Specifications

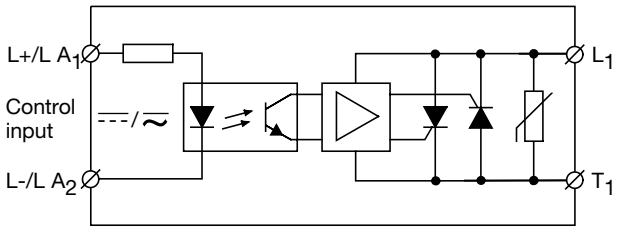
Humidity max.	95%, no condensation

Dimensions

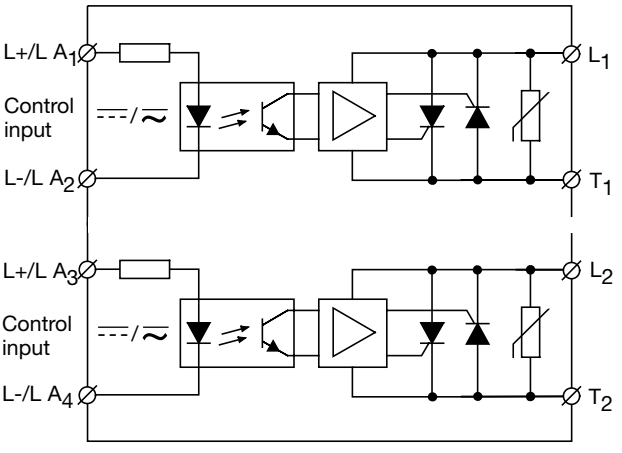
Dimensions	(H x W x D)
RN..30	120 x 45 x 110 mm
RN..50	120 x 90 x 110 mm
RN..63	120 x 90 x 110 mm

Wiring Diagrams

1-pole RN...

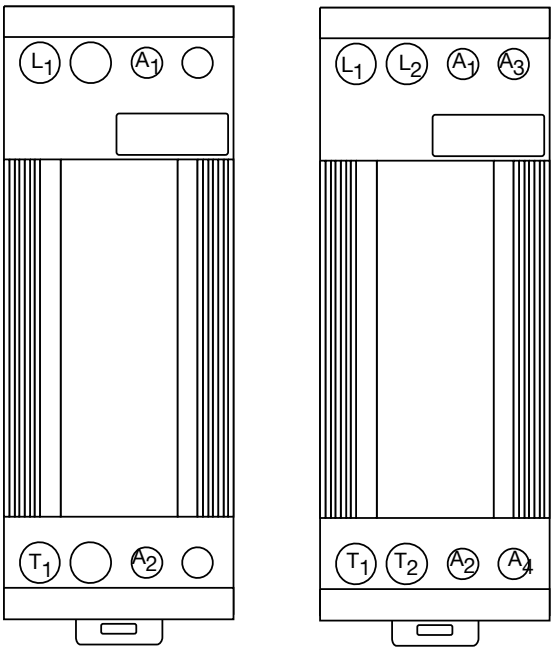


2-pole RN...



Terminal Layout

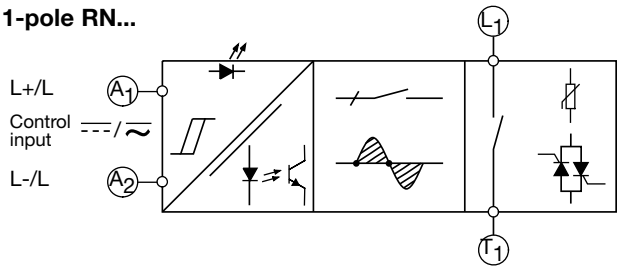
1-pole RN.. **2-pole RN..**



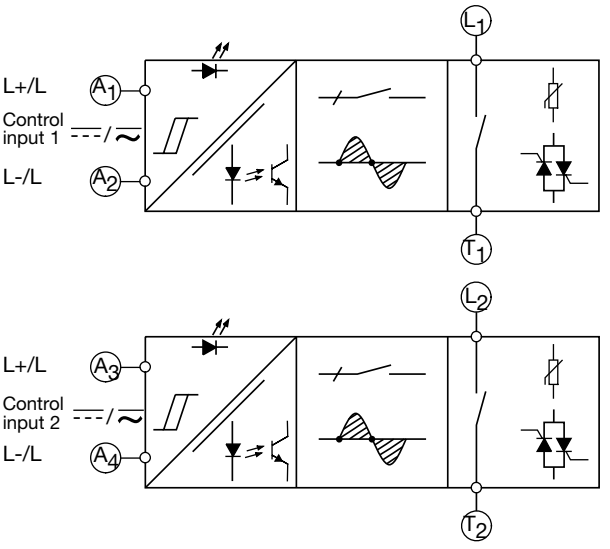
RN..30

Functional Diagrams

1-pole RN...

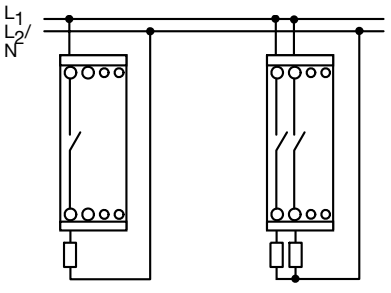


2-pole RN...

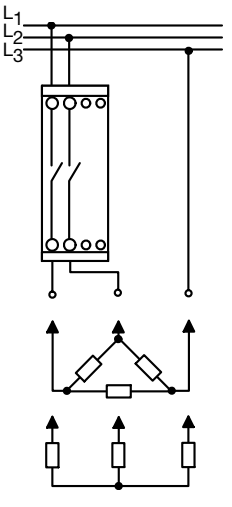


Applications

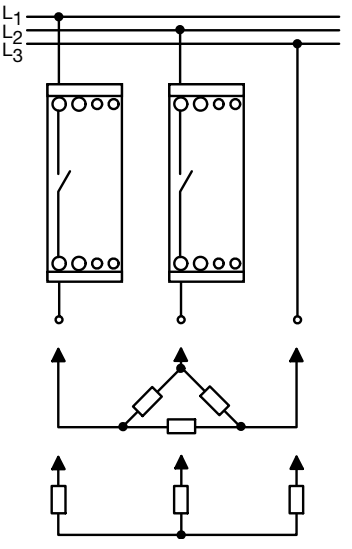
Single and double pole relay application
Line-Neutral
Line-Line



Double pole relay in
3-phase application
Delta and star application
(Economy Switch)

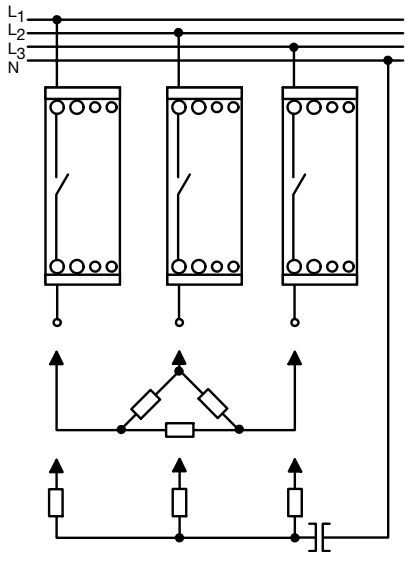


Two single pole relays in
3-phase application
Delta and star.
(Economy Switch)

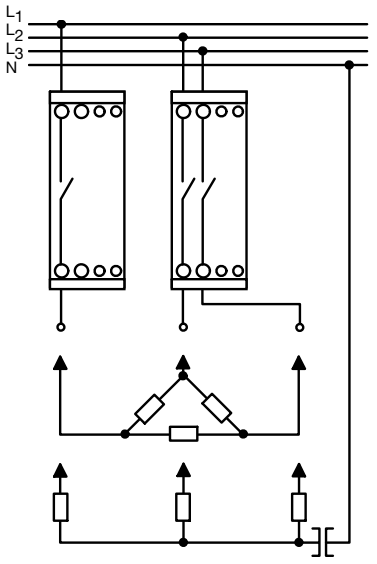


Applications (cont.)

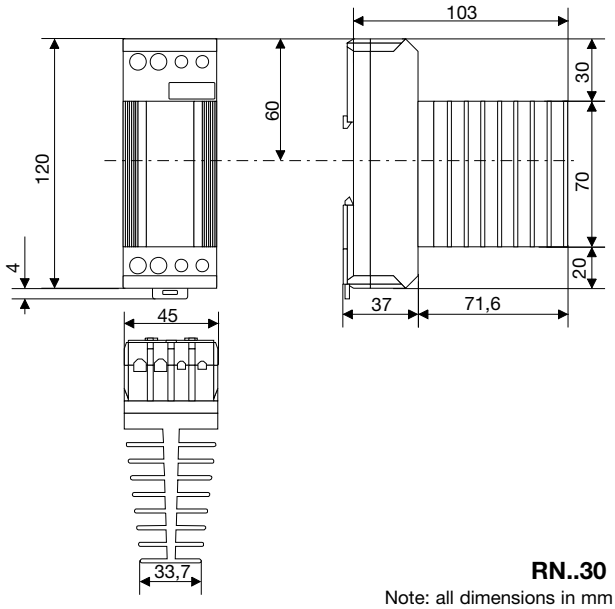
3 single pole relays in
3-phase application
Delta, Star, Star with neutral



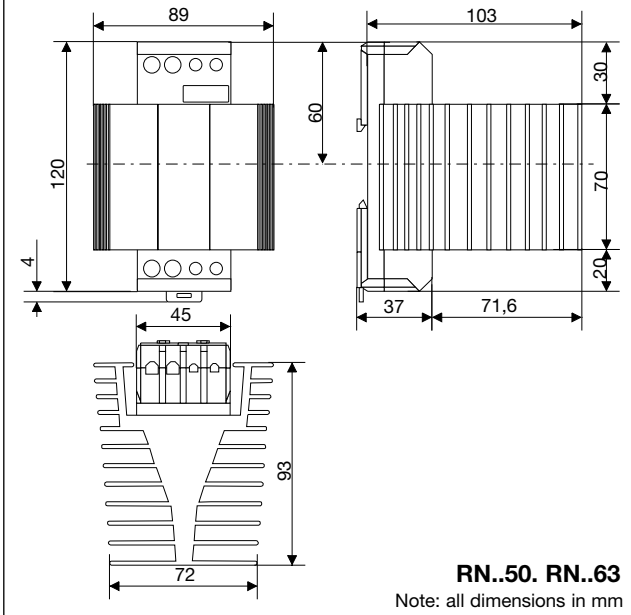
Single and double pole relay in
3-phase application
Delta, Star, Star with neutral



Dimensions



RN..30
Note: all dimensions in mm



RN..50. RN..63
Note: all dimensions in mm

Solid State Relays
System Monitoring Relay (*SOLITRON*)
Type RN1S (Sense Relay)

- **System (line and load) monitoring relay**
- **Rated operational current: 30 A and 50 AACrms**
- **Zero switching for heating and motor applications**
- **Rated operational voltage: 230, 400 and 480 VACrms**
- **Transient overvoltage protection built-in**
- **Alarm output signal**
- **LED-indication for alarm and supply/relay ON**
- **DIN-rail mountable**

Product Description

The system monitoring Solid State Relay (Sense Relay) provides an alarm output in the event of a circuit failure. Internal circuits monitor:
- line voltage
- load current
- correct functioning of the SSR
- SSR input status

The relay is designed for applications where immediate fault detection is required.

A red LED indicates an alarm, a green LED indicates DC control supply OK (half LED light intensity) resp. relay switched ON (full LED light intensity).

Ordering Key

RN 1S 23 H 30 NO

- **Solid State Relay**
- **Number of poles**
- **Rated operational voltage**
- **Control input**
- **Rated operational current**
- **Alarm output type**

Type Selection

Rated operational voltage	Control input	Rated operational current	Alarm output type
23: 230 VACrms	H: Active high	30: 30 AACrms	NO: NPN, NO
40: 400 VACrms	L: Active low	50: 50 AACrms	NC: NPN, NC
48: 480 VACrms			PO: PNP, NO
			PC: PNP, NC

Selection Guide

Rated operational voltage	Alarm output type	Rated operational current 30 AACrms Active high	30 AACrms Active low	50 AACrms Active high	50 AACrms Active low
230 VACrms	NPN, NO	**RN 1S23H30NO**	**RN 1S23L30NO**	**RN 1S23H50NO**	**RN 1S23L50NO**
	NPN, NC	**RN 1S23H30NC**	**RN 1S23L30NC**	**RN 1S23H50NC**	**RN 1S23L50NC**
	PNP, NO	**RN 1S23H30PO**	**RN 1S23L30PO**	**RN 1S23H50PO**	**RN 1S23L50PO**
	PNP, NC	**RN 1S23H30PC**	**RN 1S23L30PC**	**RN 1S23H50PC**	**RN 1S23L50PC**
400 VACrms	NPN, NO	**RN 1S40H30NO**	**RN 1S40L30NO**	**RN 1S40H50NO**	**RN 1S40L50NO**
	NPN, NC	**RN 1S40H30NC**	**RN 1S40L30NC**	**RN 1S40H50NC**	**RN 1S40L50NC**
	PNP, NO	**RN 1S40H30PO**	**RN 1S40L30PO**	**RN 1S40H50PO**	**RN 1S40L50PO**
	PNP, NC	**RN 1S40H30PC**	**RN 1S40L30PC**	**RN 1S40H50PC**	**RN 1S40L50PC**
480 VACrms	NPN, NO	**RN 1S48H30NO**	**RN 1S48L30NO**	**RN 1S48H50NO**	**RN 1S48L50NO**
	NPN, NC	**RN 1S48H30NC**	**RN 1S48L30NC**	**RN 1S48H50NC**	**RN 1S48L50NC**
	PNP, NO	**RN 1S48H30PO**	**RN 1S48L30PO**	**RN 1S48H50PO**	**RN 1S48L50PO**
	PNP, NC	**RN 1S48H30PC**	**RN 1S48L30PC**	**RN 1S48H50PC**	**RN 1S48L50PC**

General Specifications

	RN1S23.....	RN1S40.....	RN1S48.....
Operational voltage range	120 to 265 VAC	150 to 440 VAC	180 to 530 VAC
Blocking voltage	800 V_p	1000 V_p	1200 V_p
Varistor voltage	275 VAC	420 VAC	510 VAC
Zero voltage turn-on	≤ 15 V	≤ 15 V	≤ 25 V
Operational frequency range	45 to 65 Hz	45 to 65 Hz	45 to 65 Hz
Power factor	≥ 0.5 @ 230 VAC	≥ 0.5 @ 400 VAC	≥ 0.5 @ 480 VAC
Approvals	UL, cUL, CSA	UL, cUL, CSA	UL, cUL, CSA
CE-marking	Yes	Yes	Yes

Norms fulfilled EN 60947-1 Low-voltage switchgear and control gear. Part 1- General Rules.
EN 61000-6-2 Generic Immunity Standard. Industrial Environment

Control Specifications

Supply voltage range	20 to 32 V
Supply current	≤ 40 mA
Response time pick-up @ 50 Hz	≤ 10 ms
Response time drop-out @ 50 Hz	≤ 10 ms
Active high control input	
Pick-up voltage	Typ. 7 VDC
Drop-out voltage	Typ. 6.8 VDC
Input current (Vc = 32 V)	≤ 4 mA
Active low control input	
Pick-up voltage	Typ. Vcc - 10 VDC
Drop-out voltage	Typ. Vcc - 10 VDC
Input current (Vcc = 32 V)	≤ 4 mA

PNP alarm output	
Alarm output voltage open	≤ 0 VDC
Alarm output voltage @ 100 mA	Vcc - 2 VDC
Alarm output current	≤ 100 mA
NPN alarm output	
Alarm output voltage open	≤ 32 VDC
Alarm output voltage @ 100 mA	2 VDC
Alarm output current	≤ 100 mA

Output Specifications

		RN1S...30..	RN1S...50..
Rated operational load current			
AC 51	@T_a = 30°C	30 Arms	50 Arms
	@T_a = 40°C	30 Arms	50 Arms
	@T_a = 50°C	23 Arms	38 Arms
	@T_a = 60°C	20 Arms	30 Arms
AC 53a	@T_a = 40°C	6 Arms	12 Arms
Zero crossing detection		Yes	Yes
Min. operational current		200 mA	250 mA
Non-rep. surge current t = 10 ms (Tj init. = 25°C)		≤ 325 A_p	≤ 600 A_p
Off-state leakage current @ rated voltage and frequency (Tj. = 125°C, max.)		< 6 mA	< 6 mA
I^2t for fusing t = 10 ms		525 A^2s	1800 A^2s
Critical dV/dt off-state		500 V/µs	500 V/µs

Sense Specifications

	RN1S23.....	RN1S40.....	RN1S48.....
Current			
Sensed load current	≥ 50 mA	≥ 50 mA	≥ 50 mA
Non-sensed leakage current	≤ 20 mA	≤ 20 mA	≤ 20 mA
Voltage			
Sensed line voltage	≥ 120 Vrms	≥ 150 Vrms	≥ 180 Vrms
Non-sensed line voltage	≤ 50 Vrms	≤ 80 Vrms	≤ 100 Vrms
Timing			
Response time from fault to alarm output	≤ 100 ms	≤ 100 ms	≤ 100 ms
Short-circuit of semiconductor	Will be sensed	Will be sensed	Will be sensed

Thermal Specifications

Operating temperature	- 20° to +70°C (-4° to +158°F)
Storage temperature	- 40° to +100°C (-40° to +212°F)

Insulation

Rated impulse withstand voltage Input to output	4000 V_{imp}
Rated impulse withstand voltage Output to case	4000 V_{imp}

Housing Specifications

Mounting	DIN-rail 35 mm
Weight with RHN1	470 g
Weight with RHN2	780 g
Housing material	Noryl SEI, GFN1, Black
LED window material	PC Lexan 141R
Base plate	Aluminium, nickel plated
Potting compound	Polyurethane, Casco Nobel
Terminals	Screw with captive wire clamp
Control terminals nominal	4 mm^2 or 2 x 2.5 mm^2 AWG 12 or 2 x AWG 14
Min. cable dimenssion	0.5 mm^2, AWG 20
Mounting torque max.	0.6 Nm
Power terminals nominal	10 mm^2 or 2 x 6 mm^2 AWG 6 or 2 x AWG 10
Min. cable dimension	1 mm^2, AWG 16
Mounting torque max.	2.0 Nm
Heatsink compound used	Electrolube HTS

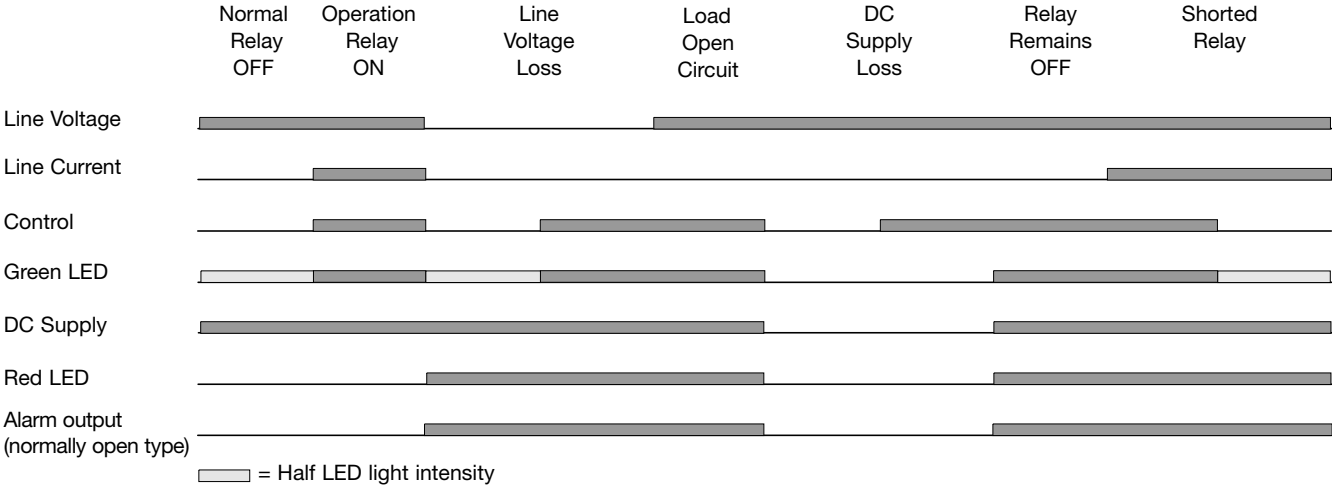
Environment Specifications

Humidity max.	95%, no condensation

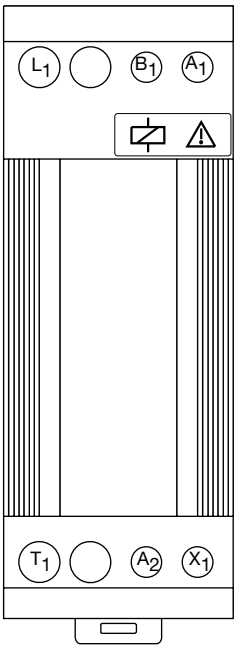
Dimensions

Dimensions	(H x W x D)
RN..30	120 x 45 x 110 mm
RN..50	120 x 90 x 110 mm

Operation Diagram



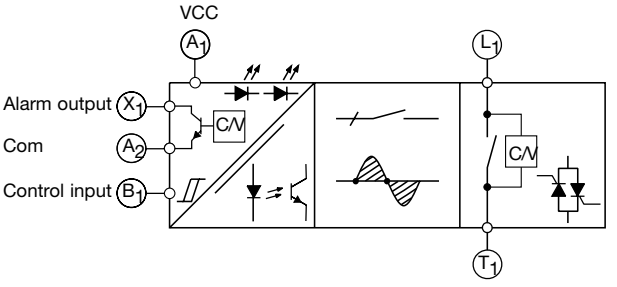
Terminal Layout



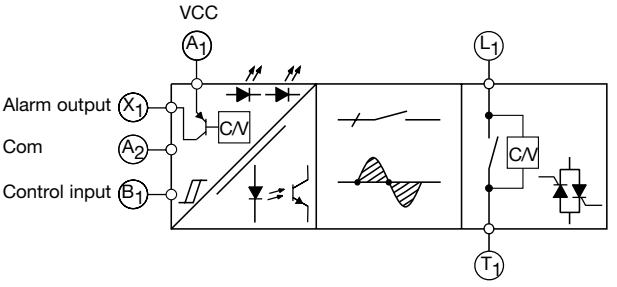
RN..30

Functional Diagrams

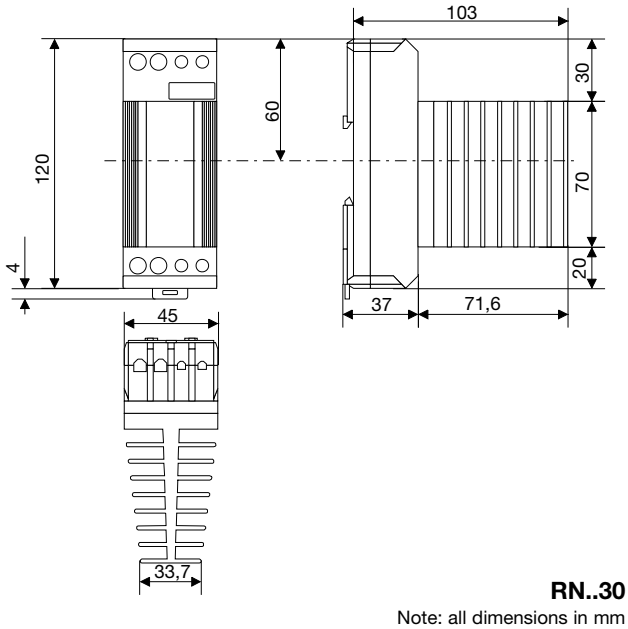
RN1S .....N.



RN1S .....P.

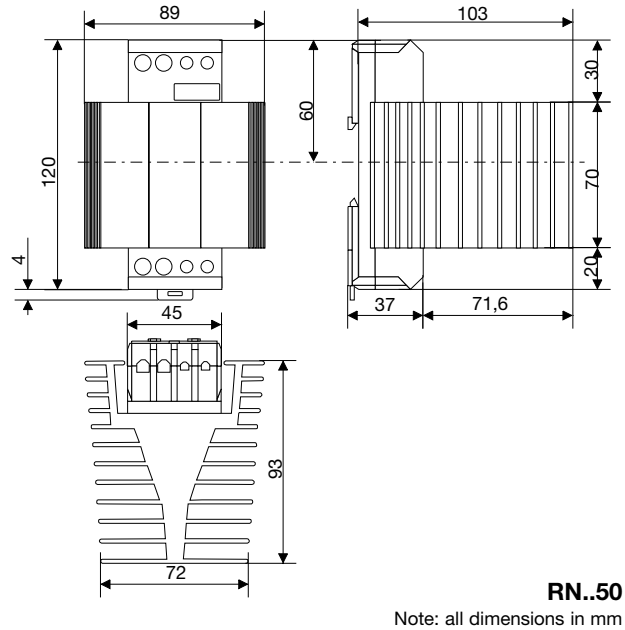


Dimensions



RN..30

Note: all dimensions in mm



RN..50

Note: all dimensions in mm

Solid State Relays
Analog Full Cycle Switching
Type RN.F

- **AC solid state relay, 1- and 2-poles**
- **Analog switching for resistive loads (heating)**
- **4-20 mA or 0-10 V controls**
- **Rated operational current: 1-pole : 30A and 50A**
  2-pole : 2 x15A and 2 x 25A
- **Rated operational voltage up to 480 VAC**
- **LED-indication for normal operation and alarm status**
- **IP 20 protection**
- **DIN-rail mountable**

Product Description

The analog switching relay provides a number of full cycles, evenly distributed over a fixed period, depending of the control input. The input of 4-20 mA or 0-10 VDC respectively, corresponds to zero and full output within a period of 1.28 s @ 50 Hz (1.07 s @ 60 Hz). This principle makes the transfer characteristics fully linear. The principle operates with zero switching, thus ensuring a reduced level of radiated and wire conducted noise. The 2-pole type has alarm LED indication by loss of master phase. The analogue Full Cycle Switching is not recommended for light control due to light-flickering.

Ordering Key

RN 1 F 40 V 30

- **Solid State Relay**
- **Number of poles**
- **Switching type**
- **Rated operational voltage**
- **Control signal**
- **Rated operational current**

Type Selection, 1-Pole

Rated operational voltage	Control input	Control supply	Rated operational current 30 A	50 A
120 VAC	4-20 mA	7-10 VDC	**RN 1F12I30**	**RN 1F12I50**
	0-10 VDC	12-32 VDC, 24 VAC	**RN 1F12V30**	**RN 1F12V50**
230 VAC	4-20 mA	7-10 VDC	**RN 1F23I30**	**RN 1F23I50**
	0-10 VDC	12-32 VDC, 24 VAC	**RN 1F23V30**	**RN 1F23V50**
480 VAC	4-20 mA	7-10 VDC	**RN 1F48I30**	**RN 1F48I50**
	0-10 VDC	12-32 VDC, 24 VAC	**RN 1F48V30**	**RN 1F48V50**

Type Selection, 2-Pole

Rated operational voltage	Control input	Control supply	Rated operational current 30 A Total (2 x 15A)	50 A Total (2 x 25A)
120 VAC	4-20 mA	7-10 VDC	**RN 2F12I30**	**RN 2F12I50**
	0-10 VDC	12-32 VDC, 24 VAC	**RN 2F12V30**	**RN 2F12V50**
230 VAC	4-20 mA	7-10 VDC	**RN 2F23I30**	**RN 2F23I50**
	0-10 VDC	12-32 VDC, 24 VAC	**RN 2F23V30**	**RN 2F23V50**
480 VAC	4-20 mA	7-10 VDC	**RN 2F48I30**	**RN 2F48I50**
	0-10 VDC	12-32 VDC, 24 VAC	**RN 2F48V30**	**RN 2F48V50**

General Specifications

	RN.F12...	RN.F23...	RN.F48...
Operational voltage range	85 to 140 VAC	85 to 265 VAC	190 to 530 VAC
Blocking voltage	800 V_p	800 V_p	1000 V_p
Varistor voltage	275 VAC	275 VAC	510 VAC
Zero voltage turn-on	< 10 V	< 10 V	< 20 V
Operational frequency range	45 to 65 Hz	45 to 65 Hz	45 to 65 Hz
Power factor at rated voltage	≥ 0.9	≥ 0.9	≥ 0.9
Average output power	0 to 100%	0 to 100%	0 to 100%
Output power resolution	1/64 of 100%	1/64 of 100%	1/64 of 100%
Approvals	UL, cUL, CSA	UL, cUL, CSA	UL, cUL, CSA
CE-marking	Yes	Yes	Yes

Norms fulfilled EN 60947-1 Low-voltage switchgear and control gear. Part 1- General Rules.
EN 61000-6-1 Generic Immunity Standard. Residential, Commercial & Light Industry Environment
EN 61000-6-2 Generic Immunity Standard. Industrial Environment

Input Specifications

	RN.F..I..
Current controlled input	
Control current range	4 - 20 mA
Allowable input current	50 mA
Reverse polarity protected	Yes
Voltage drop	10 VDC @ 20 mA

	RN.F..V..
Voltage controlled input	
Supply voltage range	21 - 27 VAC, 12 - 32 VDC
Supply current	30 mA @ 24 VAC/32 VDC
Control voltage range	0 - 10 V
Control input current	0.1 mA @ 10 VDC

Output Specifications

			RN.F..30	RN.F..50
Rated operational current				
RN1F..	AC51	@Ta=30°C	30 A	50 A
	"	@Ta=40°C	30 A	50 A
	"	@Ta=50°C	23 A	38 A
	"	@Ta=60°C	20 A	30 A
RN2F..	AC51	@Ta=30°C	30 A total sum (2 x 15A)	50 A total sum (2 x 25A)
	"	@Ta=40°C	30 A total sum (2 x 15A)	50 A total sum (2 x 25A)
	"	@Ta=50°C	23 A total sum (2 x 11.5A)	38 A total sum (2 x 19A)
	"	@Ta=60°C	20 A total sum (2 x 10A)	30 A total sum (2 x 15A)
Zero crossing detection			Yes	Yes
Min. operational current (per pole)			500 mA	500 mA
Rep. overload current t=1 s (Tj init.=25°C)			55 A (rms)	125 A (rms)
Non-rep. surge current t=10 ms (Tj init.=25°C)			< 325 A_p	< 600 A_p
Off-state leakage current, @ rated voltage and frequency (Tj.=125°C, max.)			< 6 mA	< 6 mA
I^2t for fusing t=10 ms			525 A^2s	1800 A^2s
Critical dV/dt off-state			500 V/µs	500 V/µs

Thermal Specifications

	RN.F..30	RN.F..50
Operational temperature	-20° to +70°C (-4° to +158°F)	-20° to +70°C (-4° to +158°F)
Storage temperature	-20° to +100°C (-4° to +212°F)	-20° to +100°C (-4° to +212°F)
Junction temperature	< 125°C (257°F)	< 125°C (257°F)
R_{th} junction to ambient (AC load)	2.8 K/W	1.7 K/W

Housing Specifications

Mounting	DIN-rail 35 mm
Weight with RHN1	470 g
Weight with RHN2	780 g
Housing material	Noryl SEI, GFN1, Black
LED window material	PC Lexan 141R
Base plate	Aluminium, nickel plated
Potting compound	Polyurethane, Casco Nobel
Terminals	Screw with captive wire clamp
Control terminals nominal	4 mm^2 or 2 x 2.5 mm^2 AWG 12 or 2 x AWG 14
Min.	0.5 mm^2, AWG 20
Mounting torque max.	0.6 Nm
Power terminals nominal	10 mm^2 or 2 x 6 mm^2 AWG 6 or 2 x AWG 10
Min.	1 mm^2, AWG 16
Mounting torque max.	2.0 Nm
Heatsink compound used	Electrolube HTS

Insulation

Rated impulse withstand voltage Input to output	4000 V_{imp}
Rated impulse withstand voltage Output to heatsink	4000 V_{imp}

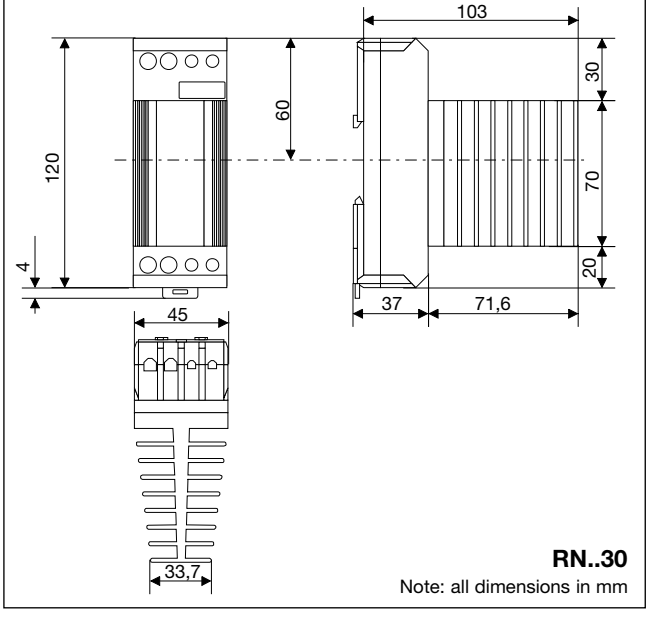
Environment Specifications

Humidity max.	95%, no condensation

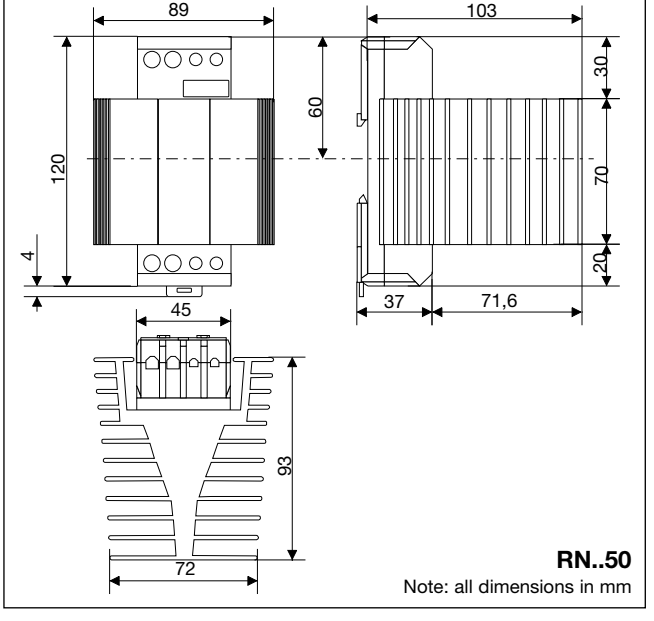
Dimensions

Dimensions	(H x W x D)
RN..30	120 x 45 x 110 mm
RN..50	120 x 90 x 110 mm

Dimensions

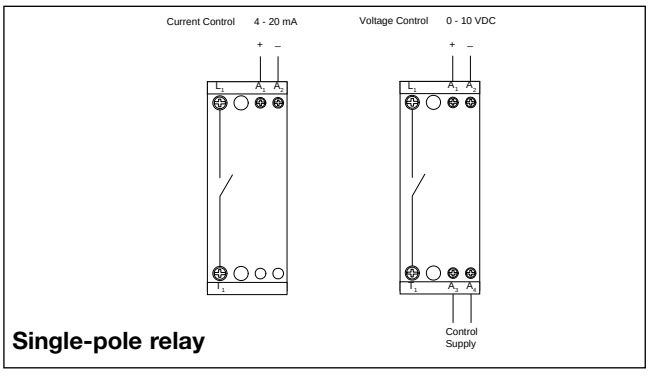


RN..30
Note: all dimensions in mm

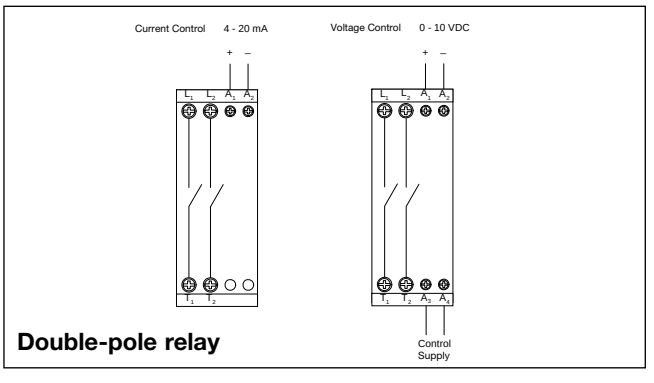


RN..50
Note: all dimensions in mm

Wiring Diagrams

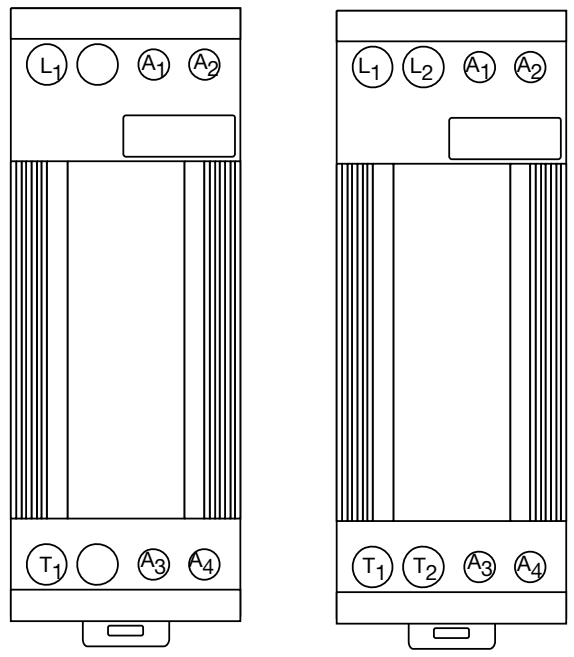


Single-pole relay



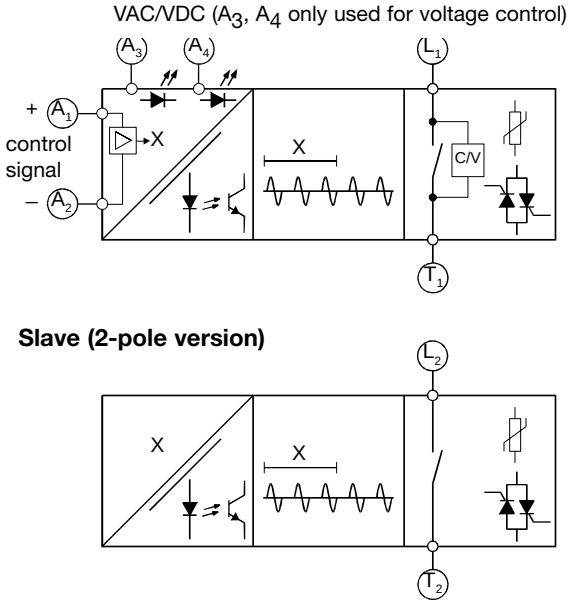
Double-pole relay

Terminal Layout



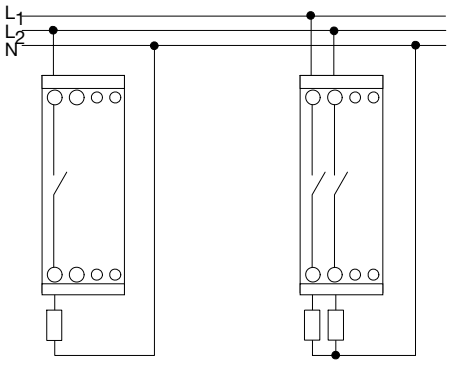
Functional Diagrams

2-pole current controlled input

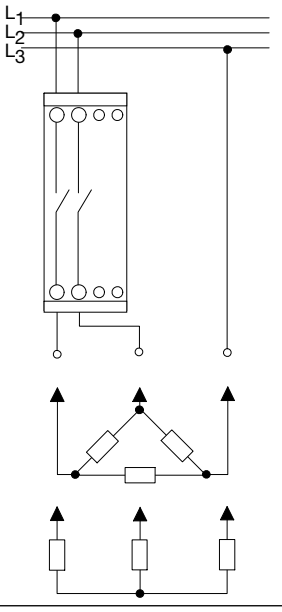


Applications

Single and double pole relay application
Line-Neutral



Double pole relay in 3-phase application
Star and delta application (Economy Switching only)



Solid State Relays
3-Phase, 2 Pole *SOLITRON*
With Integrated Heatsink

- **Zero switching AC Solid State Relay**
- **Direct copper bonding (DCB) technology**
- **LED indication**
- **Built-in varistor**
- **Input range: 5 - 32 VDC**
- **Rated operational current: 3 x 15 and 3 x 30 AACrms**
- **Rated operational voltage: 3 x 220, 400 and 480 VACrms**
- **Blocking voltage: Up to 1200 V_p**
- **Opto-isolation: > 4000 VACrms**

Product Description

The SOLITRON Solid State Contactor is designed for industrial heating and motor control applications. The Solid State Contactor is capable of switching 3-phase loads by using only 2 switching elements for loads up to 3 x 30 AACrms AC51 load in Star (excl. Neutral) or Delta connections. The Solid State Contactor is designed for DIN-rail mounting with integrated heatsink and overvoltage protection. The heatsink is moved to the front for optimal convection cooling in the panel.
The contactor elements are soldered directly to the direct copper bonded substrate (DCB-technology). DC control versions are availiable. Built-in LED status indication for applied control voltage.

Ordering Key

RN 3 A 40 D 30

- **Solid State Relay**
- **Number of phases**
- **Switching mode**
- **Rated operational voltage**
- **Control voltage**
- **Rated operational current**

Type Selection

Rated operational voltage	Control voltage	Rated operational current
22: 3 x 220 VACrms 40: 3 x 400 VACrms 48: 3 x 480 VACrms	D: 5 to 32 VDC	15: 15 AACrms 30: 30 AACrms

Selection Guide, 2 Pole Switching / 1-Pole direct

Rated operational voltage	Control voltage	Rated operational current AC51: 3 x 15 AAC AC53a: 3 x 6 AAC	 AC51: 3 x 30 AAC AC53a: 3 x 12 AAC
22: 3 x 220 VAC rms	5-32 VDC	**RN3A22D15**	**RN3A22D30**
40: 3 x 400 VAC rms	5-32 VDC	**RN3A40D15**	**RN3A40D30**
48: 3 x 480 VAC rms	5-32 VDC	**RN3A48D15**	**RN3A48D30**

General Specifications

	RN3A22...	RN3A40...	R3A48...
Operational voltage range	24 - 265 VAC	42 - 440 VAC	42 - 530 VAC
Blocking voltage	650 V_p	800 V_p	1200 V_p
Varistor voltage	275 VAC	420 VAC	510 VAC
Zero voltage turn-on	< 20 V	< 20 V	< 20 V
Operational frequency range	45 - 65 Hz	45- 65 Hz	45 - 65 Hz
Power factor	> 0.5	> 0.5	> 0.5
Approvals	UL, cUL, CSA	UL, cUL, CSA	UL, cUL, CSA
CE-marking	Yes	Yes	Yes

Norms fulfilled EN 60947-1 Low-voltage switchgear and control gear. Part 1- General Rules
EN 61000-6-2 Generic Immunity Standard. Industrial Environment

Input Specifications

Control voltage range	5-32 VDC
Pick-up voltage	4.5 VDC
Drop-out voltage	1 VDC
Input current @ 24 VDC	< 10 mA

Response time pick-up	< 10 ms
Response time drop-out	< 20 ms
Green LED indication	Yes

Output Specifications

	RN3A..D15	RN3A..D30
Rated operational current AC51, Ta = 30°C	3 x 15 AACrms	3 x 30 AACrms
AC51, Ta = 40°C	3 x 14 AACrms	3 x 27 AACrms
AC51, Ta = 50°C	3 x 12 AACrms	3 x 24 AACrms
AC51, Ta = 60°C	3 x 10 AACrms	3 x 18 AACrms
AC53a, Ta = 30°C	3 x 6 AACrms	3 x 12 AACrms
Minimum operational current	200 mA	250 mA
Rep. overload current (t = 1 s)	< 55 AACrms	< 125 AACrms
Non-rep. surge current (t = 10 ms)	325 Ap	600 Ap
Off-state leakage current at rated voltage and frequency	< 6 mA	< 6 mA
I^2t for fusing (t =10 ms)	525 A^2s	1800 A^2s
On-state voltage drop at rated current	< 1.6 Vrms	< 1.6 Vrms
Critical dV/dt	500 V/µs	500 V/µs
Zero crossing detection	Yes	Yes

Thermal Specifications

	RN3A..D15	RN3A..D30
Operating temperature range	-20° to + 70°C (-4° to + 158°F)	-20° to + 70°C (-4° to + 158°F)
Storage temperature range	-40° to + 100°C (-40° to + 212°F)	-40° to + 100°C (-40° to + 212°F)

Housing Specifications

Mounting	DIN - rail 35 mm
Weight with RHN1	470 g
Weight with RHN2	780 g
Housing material	Noryl SEI, GFN1, Black
LED window material	PC Lexan 141 R
Base plate	Aluminium, nickel plated
Potting compound	Polyurethane, Casco Nobel
Terminals	Screw with captive wire clamp
Power and control terminals	4 mm^2 or 2 x 2.5 mm^2 AWG12 or 2 X AWG 14 Min. 0.5 mm^2, AWG 20
Mounting torque max.	0.6 Nm
Heatsink compound used	Electrolube HTS

Isolation

Rated isolation voltage input to output	4000 VACrms
Rated isolation voltage output to case	4000 VACrms

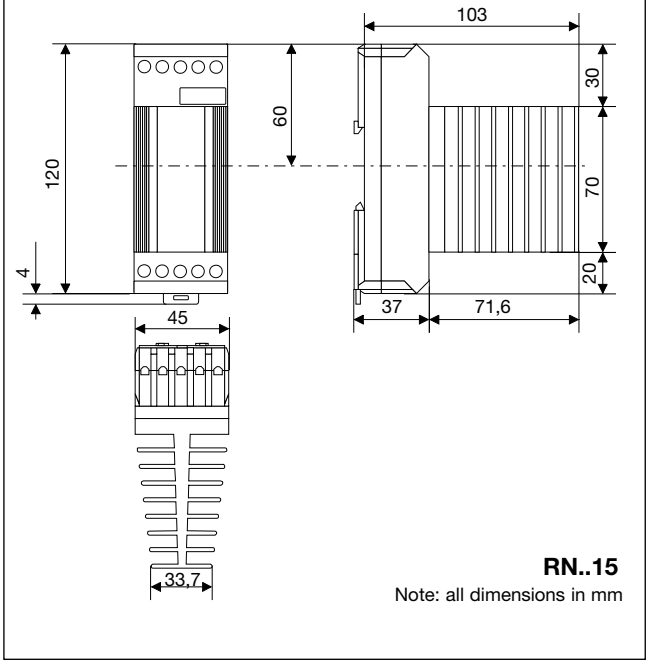
Environment Specifications

Humidity max.	95%, no condensation

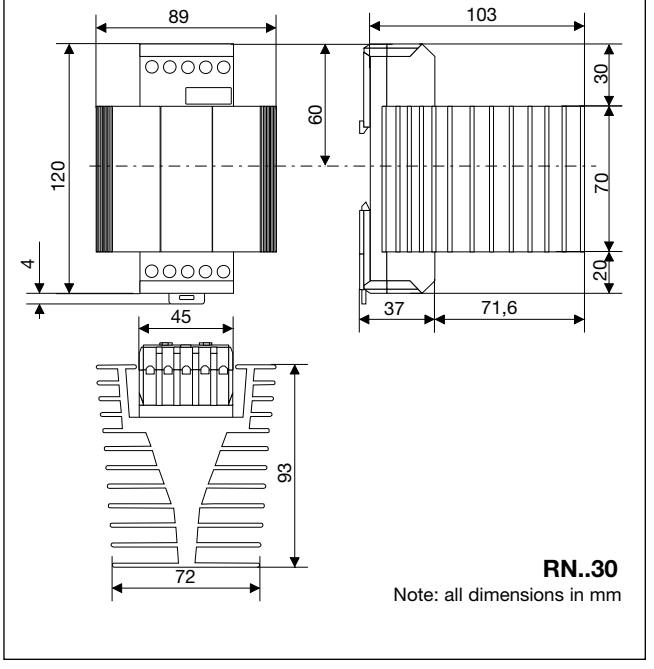
Dimensions

Dimensions	(H x W x D)
RN..15	120 x 45 x 110 mm
RN..30	120 x 90 x 110 mm

Dimensions

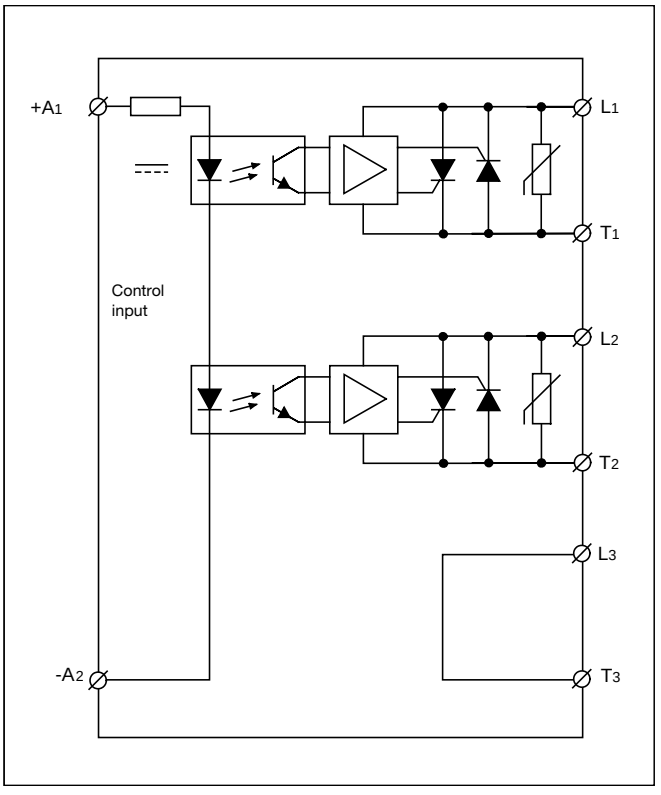


RN..15
Note: all dimensions in mm

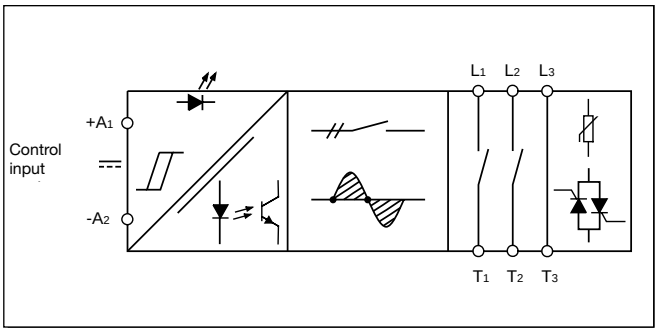


RN..30
Note: all dimensions in mm

Wiring Diagram



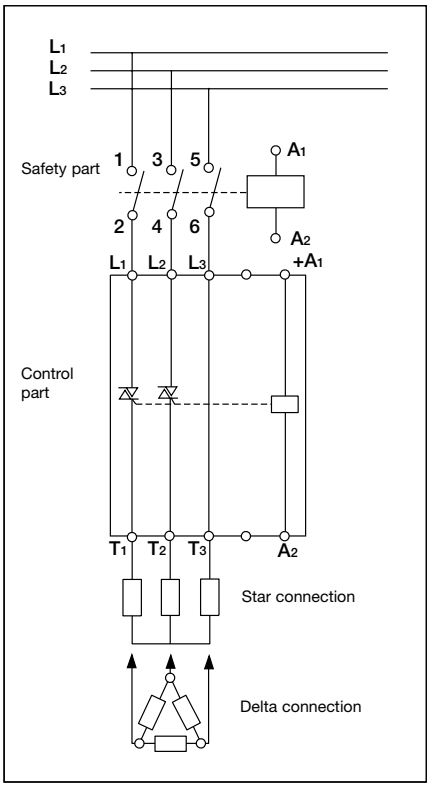
Functional Diagram



Accessories

Fuses
For further information refer to “General Accessories”.

Applications



Economic switching of inductive and resistive Loads

3-phase 2 pole switching allows a very economical handling of heavy loads which have to be run in a 3-phase configuration either as a star connection or a delta connection of the loads. With 2-pole switching and the integration of a contactor instead of switching all 3-phases a substancial space and cost saving in the panel can be achieved as one third of the heatsinks can be taken out and also the ventilation of the panel can be reduced.

3-Phase, 2 pole Switching Principle

With SOLITRON RN.3.A.. 3-phase Relays switching with 2-poles and the integration of a contactor the electric configuration is splitted into a safety part and a control part. In the safety part the isolation of the load from the mains is assured by a small contactor mounted in series with the Solid State Relay. The contactor can be a very economical type as the switching is done by the Solid State Relay. As the contactors are already switched, when the Solid State Relay is in control of the power, no burning of the contacts will occur.

CARLO GAVAZZI

Solid State Relays
Motor Controllers

Motor Controllers Overview

Motor Controller

Type	Load Current	Line Voltage	Motor Rating	Control Voltage (Power supply)	Ordering No.
RSE **Soft Start/Stop**  Page 3-11	12 A	115 VAC	1.0kW	24-110 VAC/DC & 110-480 VAC	**RSE 1112-BS**
		230 VAC	2.0kW		**RSE 2312-BS**
		400 VAC	3.5kW		**RSE 4012-BS**
RSE **Soft Start/Stop**  Page 3-15	3 A	127/220 VAC	0.55 kW	24-110 VAC/DC & 110-480 VAC	**RSE 2203-B**
		230/400 VAC	1.1 kW		**RSE 4003-B**
		277/480 VAC	1.5 kW		**RSE 4803-B**
		346/600 VAC	2.2 kW		**RSE 6003-B**
	12 A	127/220 VAC	3.0 kW	24-110 VAC/DC & 110-480 VAC	**RSE 2212-B**
		230/400 VAC	5.5 kW		**RSE 4012-B**
		277/480 VAC	5.5 kW		**RSE 4812-B**
		346/600 VAC	7.5 kW		**RSE 6012-B**
RSBS **Soft Start/Stop**  Page 3-19	25 A	230 VAC	5.5 kW	230 VAC	**RSBS2325A2V10C00**
					RSBS2325A2V10C24
RSB **Soft Start/Stop**  Page 3-21	15 A	127/220 VAC	4.0 kW	200-300 VAC	**RSB2215-B**
		230/400 VAC	7.5 kW		**RSB4015-B**
		227/480 VAC	7.5 kW		**RSB4815-B**

Motor Controller (cont.)

Type	Load Current	Line Voltage	Motor Rating	Control Voltage (Power supply)	Ordering No.
RSH MIDI **Soft Start/Stop** 	6A	127/220 VAC	1.1 kW	24-110 VAC/DC & 110-480 VAC	**RSHR2206BV20** **RSHR2206BV21**
		230/400 VAC	2.2 kW		**RSHR4006BV20** **RSHR4006BV21**
		277/480 VAC	2.2 kW		**RSHR4806BV20** **RSHR4806BV21**
		346/600 VAC	3.0 kW		**RSHR6006BV20** **RSHR6006BV21**
		190-530 VAC	according to operational voltage		**RSHRM06BV20*** **RSHRM06BV21***
	12 A	127/220 VAC	3.0 kW		**RSHR2212BV20** **RSHR2212BV21**
		230/400 VAC	5.5 kW		**RSHR4012BV20** **RSHR4012BV21**
		277/480 VAC	5.5 kW		**RSHR4812BV20** **RSHR4812BV21**
		346/600 VAC	7.5 kW		**RSHR6012BV20** **RSHR6012BV21**
		190-530 VAC	according to operational voltage		**RSHRM12BV20*** **RSHRM12BV21***
	18 A	127/220 VAC	4.0 kW		**RSHR2218BV20** **RSHR2218BV21**
		230/400 VAC	7.5 kW		**RSHR4018BV20** **RSHR4018BV21**
		277/480 VAC	7.5 kW		**RSHR4818BV20** **RSHR4818BV21**
		346/600 VAC	11.0 kW		**RSHR6018BV20** **RSHR6018BV21**
		190-530 VAC	according to operational voltage	* requires 24 VDC external supply	**RSHRM18BV20*** **RSHRM18BV21***
Page 3-24					
RSHR **Soft Start/Stop** 	25 A	127/220 VAC	5.5 kW	24-550 VAC/DC	**RSHR2225CV20** **RSHR2225CV21**
		230/400 VAC	11 kW		**RSHR4025CV20** **RSHR4025CV21**
		277/480 VAC	15 kW		**RSHR4825CV20** **RSHR4825CV21**
		346/600 VAC	18.5 kW	24-660 VAC/DC	**RSHR6025DV20** **RSHR6025DV21**
	38 A	127/220 VAC	11 kW	24-550 VAC/DC	**RSHR2238CV20** **RSHR2238CV21**
		230/400 VAC	18.5 kW		**RSHR4038CV20** **RSHR4038CV21**
		277/480 VAC	22 kW		**RSHR4838CV20** **RSHR4838CV21**
		346/600 VAC	22 kW	24-660 VAC/DC	**RSHR6038DV20** **RSHR6038DV21**
	45 A	127/220 VAC	11 kW	24-550 VAC/DC	**RSHR2245CV20** **RSHR2245CV21**
		230/400 VAC	22 kW		**RSHR4045CV20** **RSHR4045CV21**
		277/480 VAC	30 kW		**RSHR4845CV20** **RSHR4845CV21**
		346/600 VAC	30 kW	24-660 VAC/DC	**RSHR6045DV20** **RSHR6045DV21**
Page 3-31					

Motor Controller (cont.)

Type	Load Current	Line Voltage	Motor Rating	Control Voltage (Power supply)	Ordering No.
RSHP Flexy Soft Start/ Stop  Page 3-36	25 A	127/220 VAC	5.5 kW	24-550 VAC/DC	**RSHP2225CV21**
		230/400 VAC	11 kW		**RSHP4025CV21**
		277/480 VAC	15 kW		**RSHP4825CV21**
		346/600 VAC	18.5 kW	24-660 VAC/DC	**RSHP6025DV21**
	38 A	127/220 VAC	11 kW	24-550 VAC/DC	**RSHP2238CV21**
		230/400 VAC	18.5 kW		**RSHP4038CV21**
		277/480 VAC	22 kW		**RSHP4838CV21**
		346/600 VAC	22 kW	24-660 VAC/DC	**RSHP6038DV21**
	45 A	127/220 VAC	11 kW	24-550 VAC/DC	**RSHP2245CV21**
		230/400 VAC	22 kW		**RSHP4045CV21**
		277/480 VAC	30 kW		**RSHP4845CV21**
		346/600 VAC	30 kW	24-660 VAC/DC	**RSHP6045DV21**
RSHR 3-Phase Soft Start/ Stop  Page 3-42	25 A	127/220 VAC	5.5 kW	24-550 VAC/DC	**RSHR2225CV32**
			11 kW		**RSHR2225CV33**
		230/400 VAC	11 kW		**RSHR4025CV32**
			11 kW		**RSHR4025CV38**
			20 kW		**RSHR4025CV33**
		277/480 VAC	11 kW		**RSHR4825CV32**
			22 kW		**RSHR4825CV33**
		346/600 VAC	18.5 kW	24-600 VAC/DC	**RSHR6025DV32**
			30 kW		**RSHR6025DV33**
		400 - 480 VAC 220 - 480 VAC	According to operational voltage	24-550 VAC/DC	**RSHRM25CV34 *** **RSHRM25CV35 ***
	32 A	127/220 VAC	9 kW	24-550 VAC/DC	**RSHR2232CV32**
			15 kW		**RSHR2232CV33**
		230/400 VAC	15 kW		**RSHR4032CV32**
			15 kW		**RSHR4032CV38**
			22 kW		**RSHR4032CV33**
		277/480 VAC	18.5 kW		**RSHR4832CV32**
			30 kW		**RSHR4832CV33**
		346/600 VAC	22 kW	24-600 VAC/DC	**RSHR6032DV32**
			45 kW		**RSHR6032DV33**
		400 - 480 VAC 220 - 480 VAC	According to operational voltage	24-550 VAC/DC	**RSHRM32CV34 *** **RSHRM32CV35 ***
RSMR Soft Start/Stop  Page 3-52	72 A	400 VAC	37 kW	Supplied internally	**RSMR4072**
		460 VAC	40 kW		**RSMR4072**
	90 A	400 VAC	45 kW		**RSMR4090**
		460 VAC	45 kW		**RSMR4090**

* Requires 24 VAC/DC external supply

Motor Controller (cont.)

Type	Load Current	Line Voltage	Motor Rating @ 400 and 480 VAC	Control Input	Ordering No. Control Module	Ordering No. Output Module
RSC HD + RSO Soft Start/Stop	10 A	150-250 VAC	2.2 kW	10 - 32 VDC	**RSC-HD0M60**	**RSO 2210**
		220-420 VAC				**RSO 4010**
		400-510 VAC				**RSO 4810**
	25 A	150-250 VAC	4 kW			**RSO 2225**
		220-420 VAC				**RSO 4025**
		400-510 VAC				**RSO 4825**
	50 A	150-250VAC	11 kW			**RSO 2250**
		220-420 VAC				**RSO 4050**
		400-510 VAC				**RSO 4850**
		400-625 VAC				**RSO 6050**
	90 A	150-250 VAC	15 kW			**RSO 2290**
		220-420 VAC				**RSO 4090**
		400-510 VAC				**RSO 4890**
		400-625 VAC				**RSO 6090**
	110 A	150-250 VAC	22 kW			**RSO 22110**
		220-420 VAC				**RSO 40110**
		400-510 VAC				**RSO 48110**
		400-625 VAC				**RSO 60110**
Page 3-56						
RSC AA + RSO Soft Start/Stop	10 A	150-250 VAC	2.2 kW	4 - 20 mA/ 0 - 20mA	**RSC-AAM60**	**RSO 2210**
		220-420 VAC				**RSO 4010**
		400-510 VAC				**RSO 4810**
	25 A	150-250 VAC	4 kW			**RSO 2225**
		220-420 VAC				**RSO 4025**
		400-510 VAC				**RSO 4825**
	50 A	150-250 VAC	11 kW			**RSO 2250**
		220-420 VAC				**RSO 4050**
		400-510 VAC				**RSO 4850**
		400-625 VAC				**RSO 6050**
	90 A	150-250 VAC	15 kW			**RSO 2290**
		220-420 VAC				**RSO 4090**
		400-510 VAC				**RSO 4890**
		400-625 VAC				**RSO 6090**
	110 A	150-250 VAC	22 kW			**RSO 22110**
		220-420 VAC				**RSO 40110**
		400-510 VAC				**RSO 48110**
		400-625 VAC				**RSO 60110**
Page 3-62						

Type	Load Current	Line Voltage	Motor Rating	Control Voltage (Power supply)	Ordering No.
RR2A Reversing	AC53a: 5A	400 VAC	1.5 kW	10 - 40 VDC	**RR2A40D150**
		480 VAC	2.2 kW		**RR2A48D220**
	AC53a: 11A	400 VAC	4.0 kW		**RR2A40D400**
		480 VAC	5.5 kW		**RR2A48D550**
Page 3-68					

Type	Load Current	Line Voltage	Motor Rating	Control Voltage	Ordering No. Control Module	Ordering No. Output Module
RTC + RTO Braking	18.5 ADC	230-400 VAC (50Hz)		10 - 32 VDC	**RTC 40 HD 12-5**	**RTO 1210**
		220-420 VAC (60 Hz)			**RTC 40 HD 12-6**	
	30 ADC	230-400 VAC (50Hz)			**RTC 40 HD 12-5**	**RTO 1225**
		220-420 VAC (60 Hz)			**RTC 40 HD 12-6**	
	60 ADC	230-400 VAC (50Hz)			**RTC 40 HD 12-5**	**RTO 1250**
		220-420 VAC (60 Hz)			**RTC 40 HD 12-6**	
Page 3-72						

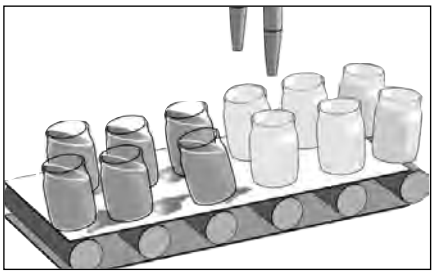
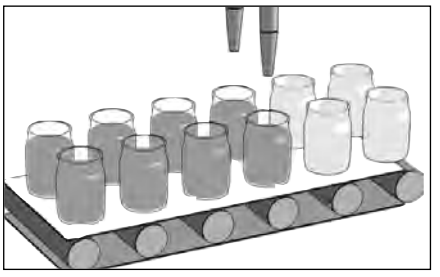
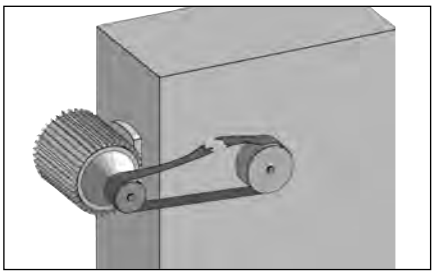
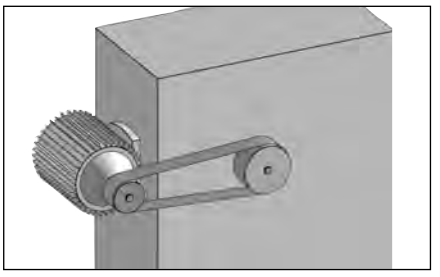
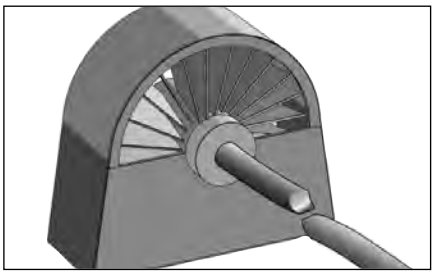
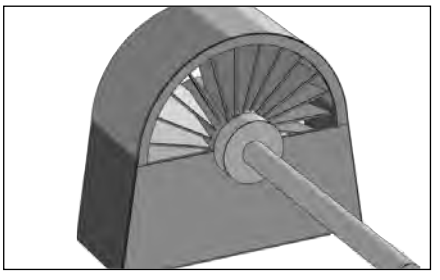
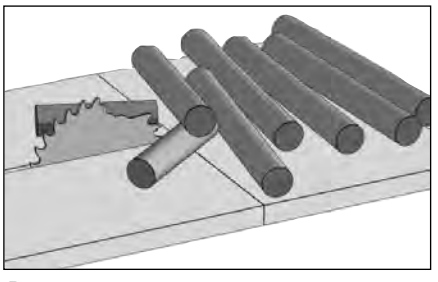
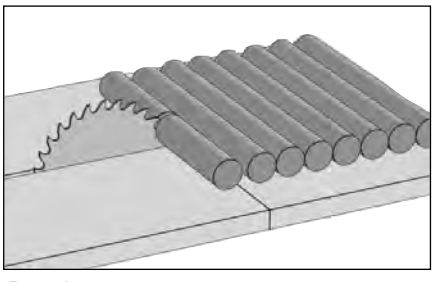
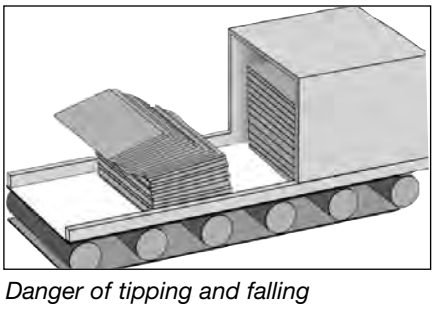
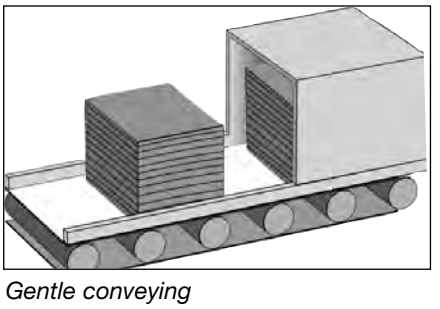
Motor Controllers
Overview

Features

RSE/RSH/RSC + RSO Soft Start - Soft Stop	RTC + RTO Dynamic Brake	RR2A Motor Reversing
Soft starting and soft stopping of 3-phase induction motors is achieved with the RSE/RSH/RSC + RSO. Softstarting is obtained by increasing the motor voltage and it is possible to adjust the ramp up time. Decreasing the motor voltage according to the adjusted ramp down time will soft stop the motor. An additional potentiometer allows the adjustment of starting torque. LEDs are always indicating the status of the motor controller.	Dynamic braking of 3-phase induction motors is possible with a control module RTC connected to the appropriate output module RTO. A direct current produces a static field through the short circuited rotor and this induced rotor current will create a torque opposite to the direction of rotation. As soon as the motor revolution is at zero, the braking current is zero. Brake time and brake current are adjustable with a potentiometer on the control unit. Two LEDs will indicate line on and break on.	• Motor reversing Solid State Relays for 3-phase induction motors up to 5.5 KW • DC control voltage • Built-in interlock function • LED indication for direction • Built-in varistor

Introduction
The range of motor controllers from Carlo Gavazzi comprises a number of high-performance motor controllers which enable the user to fulfill many application requirements.

Soft start/Soft stop - the best protection against motor and equipment wear
Direct start or star delta start are today's most common motor starters. Despite technical improvements on motors as well as contactors, jerky starting and stopping could not be eliminated. Damage to motor bearings and gearboxes, premature wear, frequent faults on conveyor belts and goods which fall over when starting transport mechanisms are only some of the consequences.

WITHOUT Soft Start/Soft Stop	**WITH RSE/RSH Soft Start/Soft Stop**
	
Ruptures and leaks	*Better handling*
	
Premature wear and tear	*Less wear*
	
Mechanical overload	*Increased lifetime*
	
Damage	*Regular process sequence*
	
Danger of tipping and falling	*Gentle conveying*

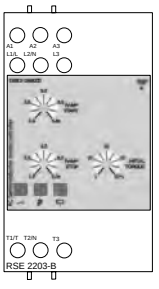
Motor Controllers
Technical Information (cont.)

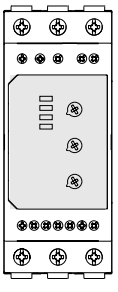
Motors and installations have a longer life - thanks to soft start/soft stop
The starting of motors with soft start/soft stop units reduces the mechanical load on motors, shafts, gearboxes and drive belts. The lifetime of soft start/soft stop controlled equipment is thereby substantially increased.

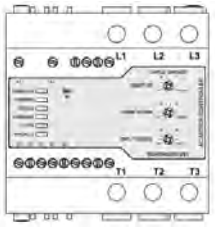
Overview

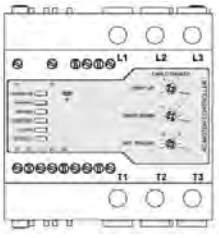
Typical fields of application:

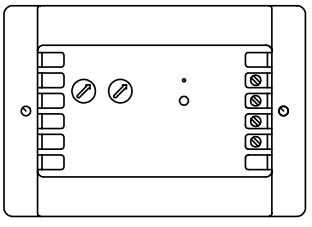
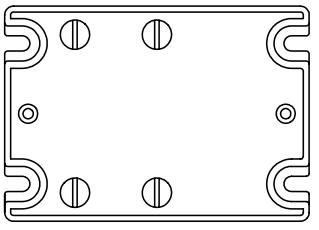
- Compressors, pumps
- Conveyor belts
- Lifting devices
- Blowers and fans
- Mixers
- Palleting devices
- Lift doors
- Garage doors

E-series	AC semiconductor motor controller			
Soft starting/ soft stopping		**Rated operational voltage**	**Rated operational current 3 A**	**12 A**
		11: 115 VAC_{eff}		RSE 1112-BS
		22: 127/220 VAC_{eff}	RSE 2203-B	RSE 2212-B
		23: 230 VAC_{eff}		RSE 2312-BS
		40: 400 VAC_{eff}		RSE 4012-BS
		40: 230/400 VAC_{eff}	RSE 4003-B	RSE 4012-B
		48: 277/480 VAC_{eff}	RSE 4803-B	RSE 4812-B
		60: 346/600 VAC_{eff}	RSE 6003-B	RSE 6012-B

RSH MIDI	AC semiconductor motor controller				
Soft starting/ soft stopping		**Rated operational voltage**	**Rated operational current 6 A**	**12A**	**18 A**
		22: 127/ 220 VAC_{eff}	RSHR2206BV2.	RSHR2212BV2.	RSHR2218BV2.
		40: 230/ 400 VAC_{eff}	RSHR4006BV2.	RSHR4012BV2.	RSHR4018BV2.
		48: 277/ 480 VAC_{eff}	RSHR4806BV2.	RSHR4812BV2.	RSHR4818BV2.
		60: 346/ 600 VAC_{eff}	RSHR6006BV2.	RSHR6012BV2.	RSHR6018BV2.
		M: 190-530 VAC_{eff}	RSHRM06BV2.	RSHRM12BV2.	RSHRM18BV2.

RSH	AC semiconductor motor controller				
Soft starting/ soft stopping		**Rated operational voltage**	**Rated operational current 25 A**	**38A**	**45 A**
		22: 127/ 220 VAC_{eff}	RSH.2225CV..	RSH.2238CV..	RSH.2245CV..
		40: 230/ 400 VAC_{eff}	RSH.4025CV..	RSH.4038CV..	RSH.4045CV..
		48: 277/ 480 VAC_{eff}	RSH.4825CV..	RSH.4838CV..	RSH.4845CV..
		60: 346/ 600 VAC_{eff}	RSH.6025DV..	RSH.6038DV..	RSH.6045DV..

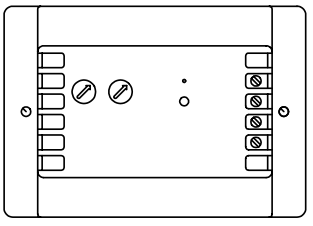
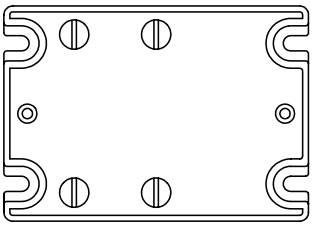
RSH 3-Phase Control	AC semiconductor motor controller			
		Rated operational voltage	Rated operational current 25 A	32A
Soft starting/ soft stopping		22: 127/ 220 VAC_{eff}	RSHR2225CV3.	RSHR2232CV3.
		40: 230/ 400 VAC_{eff}	RSHR4025CV3.	RSHR4032CV3.
		48: 277/ 480 VAC_{eff}	RSHR4825CV3.	RSHR4832CV3.
		60: 346/ 600 VAC_{eff}	RSHR6025DV3.	RSHR6032DV3.
		M: 400-480 VAC_{eff} 220-480 VAC_{eff}	RSHRM25CV34 RSHRM25CV35	RSHRM32CV34 RSHRM32CV35

RSC/RSO	Control module		Output module	
Soft starting/ soft stopping		RSC-HD0M60 RSC-AAM60		RSO

Motor Controllers
Technical Information (cont.)

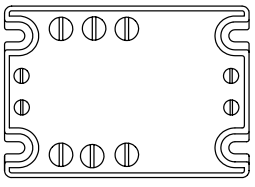
Dynamic Braking
Dynamic braking of 3-phase motors with adjustable braking time from 1 to 40 s and adjustable braking current.

Overview

RTC/RTO	Control module		Output module	
Braking		50 Hz RTC 40 HD 12-5 60 Hz RTC 40 HD 12-6		RTO 1210 RTO 1225 RTO 1250

Reversing
Reversing of 3-phase motors rated up to 5.5kW. Built in interlocking circuitry prevents the relay from switching both directions at the same time.

Overview

RR2A	2-Phase Motor Reversing				
		Rated operational voltage	**Load Power 1.5kW**	**2.2kW**	**4.0kW**	**5.5kW**
Reversing		40: 400 VACrms	RR2A40D150		RR2A40D400	
		48: 480VACrms		RR2A48D220		RR2A48D550

Combinations of the controllers perform the following functions:

- Soft starting and reversing
- Soft starting and braking
- Braking and reversing
- Soft starting, braking and reversing

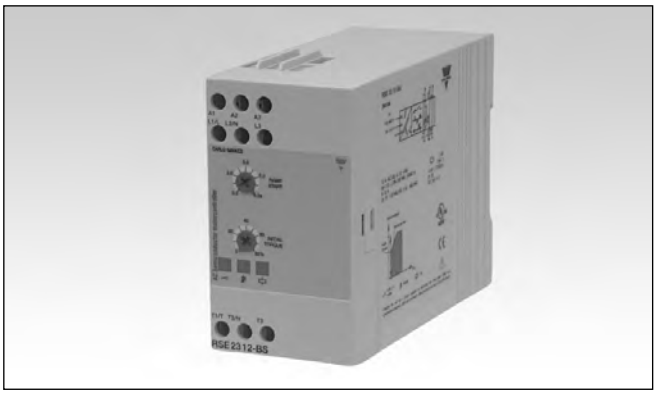
A wide range of accessories is offered together with our motor controllers:

- Heatsink assemblies
- Varistors
- Fuses and fuse holder
- Temperature limit switch
- Power supply MS1...

Standards
Carlo Gavazzi motor controllers are designed according to the following standards.

EN/IEC 60947-4-2
UL 0508
UL 0840
CSA C22.2.14

Motor Controllers, Single Phase 3-Phase Torque Reduction Types RSE 1112-BS, RSE 2312-BS, RSE 4012-BS



- **Rated operational current: 12 AAC 53 b**
- **Soft starting of most single phase motors**
- **Torque reduction by use on 3-phase motors**
- **Rated operational voltage: Up to 400 VAC, 50/60 Hz**
- **LED-indications for supply and operation**
- **Transient overvoltage protection built-in**
- **Integral bypassing of semiconductor**

Product Description

Compact easy-to-use AC semiconductor motor controller. With this controller single phase capacitor run induction motors with nominal load currents up to 12 A can be soft-started. Starting time as well as initial torque can be independently adjusted by built-in potentiometers.

Torque reduction by ramping of a single phase in 3-phase applications is also possible with this module.

Ordering Key

RSE 23 12 - BS

- **Solid State Relay**
- **Motor controller**
- **E-line housing**
- **Rated operational voltage**
- **Rated operational current**
- **Control voltage**
- **Single Phase Control**

Type Selection

Rated operational voltage U_e	**Control voltage U_C**	**Rated operational current I_e 12 A**
11: 115 VACrms, 50/60 Hz	-B: 24 to 110 VAC/DC & 110 to 480 VAC	**RSE 1112-BS**
23: 230 VACrms, 50/60 Hz		**RSE 2312-BS**
40: 400 VACrms, 50/60 Hz		**RSE 4012-BS**

Input Specifications (Control Input)

Control voltage U_C	
A1-A2:	24 - 110 VAC/DC ±15%, 12 mA
A1-A3:	110 - 480 VAC ±15%, 5 mA
Rated insulation voltage	630 V rms Overvoltage cat. III (IEC 60664)
Dielectric strength	
Dielectric voltage	2.5 kVAC (rms)
Rated impulse withstand volt.	4 kV (1.2/50 µs)

Output Specifications

Utilization category	AC-53b Integral bypassing of semiconductors		
Overload current profile overload relay trip class)	12A: AC-53b: 3-5: 180		
Max. number of soft startings per hour (at max. current for 5 s)	Startings	T_A	Inactive
	19	25ºC	180 s
	15	30ºC	225 s
	11	40ºC	315 s
Min. load current RSE ..12-BS	200 mAAC rms		

Supply Specifications

Power supply	Overvoltage cat. III (IEC 60664)
Rated operational volt. (U_e) through terminals L1/L-L2/N	(IEC 60038)
11	115 VAC rms ±15%
23	230 VAC rms ±15%
40	400 VAC rms ±15%
Voltage interruption	≤ 40 ms
Dielectric voltage	None
Rated impulse withstand volt.	4 kV (1.2/50 µs)
Rated operational power supplied from	2 VA L1/L- L2/N

General Specifications

Accuracy	
Ramp up ≤ 0.5 s on min.	5.5 - 7.5 s on max.
Initial torque 5% on min.	70 - 100% on max.
EMC Immunity	Electromagnetic Compatibility acc. to EN 61000-6-2
Indication for	
Power supply ON	LED, green
Ramp up bypassing relay	LED, yellow
Environment	
Degree of protection	IP 20
Pollution degree	3
Operating temperature	-20° to +50°C (-4° to +122°F)
Storage temperature	-50° to +85°C (-58° to +185°F)
Screw terminals	
Tightening torque	Max. 0.5 Nm acc. to IEC 60947
Terminal capacity	2 x 2.5 mm^2
CE-marking	Yes
Approvals	UL, cUL, CSA

Mode of Operation

This motor controller is in-tended to be used to softstart single phase run capacitor induction motors and thereby reduce the stress or wear on gear and belt/chain drives and to give smooth operation of machines. Soft starting is achieved by controlling the motor voltage. During running operation the semiconductor is bypassed by an internal electromechanical relay.

The initial torque can be adjusted from 0 to 85% of the nominal torque.

The softstart time can be adjusted from 0.5 to approx. 6.5 s.

A green LED indicates supply. Two yellow LEDs indicate Ramp up and Running mode.

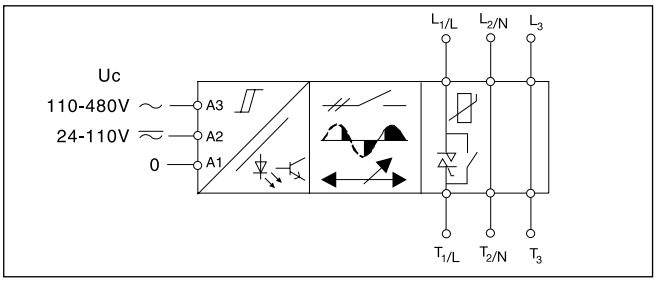
Overload protection is not provided in this motor controller and must therefore be installed separately.

The controller is only switching L1 line. The L2/N and L3 are continuously connected to the load.

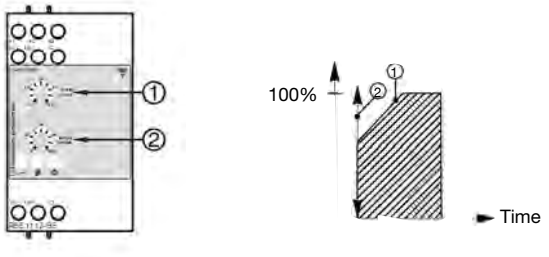
Semiconductor Data

Rated operational current	I^2t for fusing t = 1 - 10 ms	I_{TSM}	dI/dt
12 A	610 A^2s	350 A_p	50 A/µs

Functional Diagram

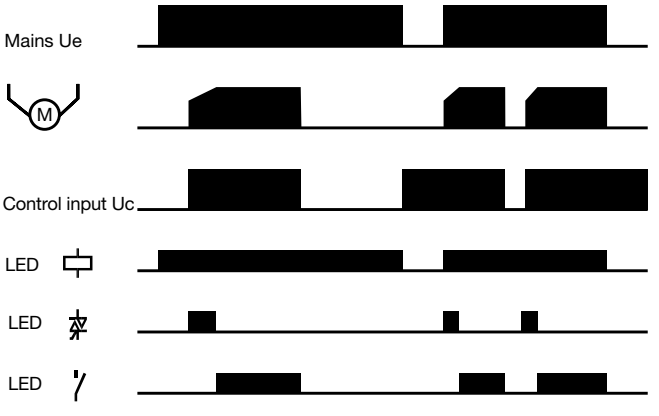


Operation Diagram 1

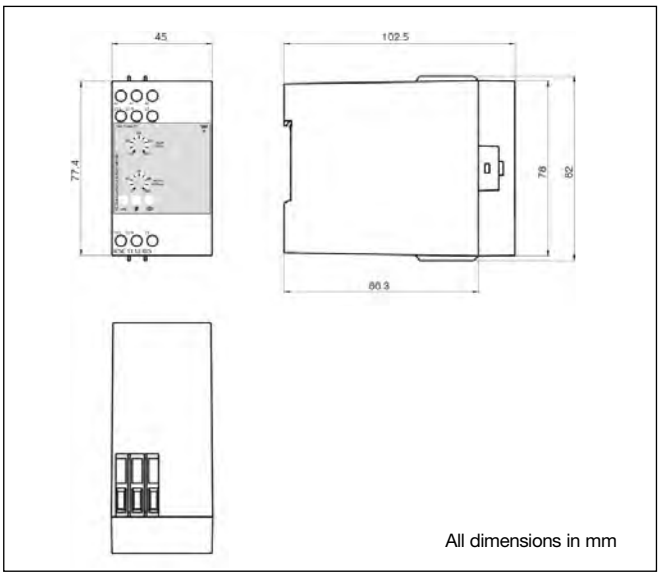


(1) Ramp-up time 0.5 to 6.5s. Time from zero load voltage to full load voltage.
(2) Initial torque 0 to 85% voltage at the start of the ramp-up function.

Operation Diagram 2



Dimensions



Housing Specifications

Weight	270 g
Housing material	PC/ABS Blend
Colour	Light grey
Terminal block	PBTP
Colour	Light grey
Bottom clip	POM
Colour	Black
Diode cover	PC
Colour	Grey Transparent
Front knob	PA
Colour	Grey

Applications for Single Phase Motors

Changing from Direct ON Line start to soft start (Line controlled soft-start)

(*Fig. 1*)

Changing a Direct On Line start into a soft start is very simple with the RSE soft-starting relay:

1) Cut the cable to the motor and insert the RSE relay.

2) Connect control input to the two mains lines. Set initial torque to minimum and ramp up potentiometer to maximum.

3) Power up again - adjust the start torque so the motor starts turning immediately after power is applied, and adjust ramp time to the appropriate value.

When C1 is operated, the motor controller will perform soft-start of the motor. When C1 is switched off, the motor will stop, the motor controller will reset and after 0.5 s a new soft-start can be performed.

Please note that the controller does not insulate the motor from the mains. Contactor C1 is therefore needed as a service switch for the motor.

Soft-start

(Fig. 2)

When S1 is closed, soft-start of the motor will be performed according to the setting of the ramp-up potentiometer and the setting of the initial torque potentiometer.

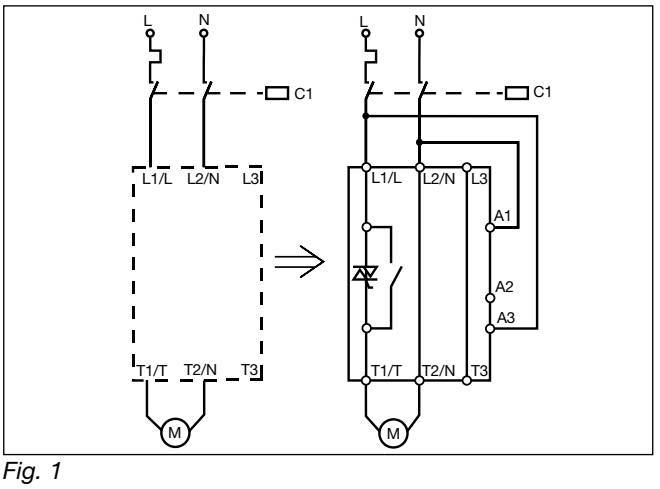


Fig. 1

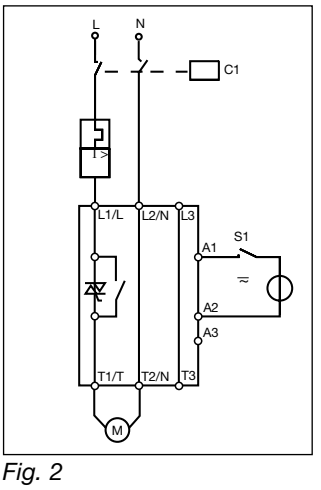


Fig. 2

Applications for Single Phase Motors (cont.)

Time between rampings
To prevent the semiconductors from overheating, a certain time between ramping should be allowed. The time between rampings depends on the motor current during ramping and ramp time (see tables below).

Note:
Table is valid for ambient temperature 25°C. For higher ambient temperature add 5%/°C to values in the tables. The shaded areas in the tables are for blocked rotor. Do not repeat rampings with blocked rotor.

RSE .. 12 -BS
Time between rampings

Ramp time (sec.) / I ramp (A)	1	2	5	10
72	2.5 min	5 min	40 min	N/A
60	1.5 min	3 min	13 min	17 min
48	50 sec	1.5 min	5 min	10 min
36	30 sec	1 min	3 min	7 min
24	15 sec	40 sec	1.5 min	2.5 min
12	10 sec	20 sec	50 sec	70 sec
6	5 sec	9 sec	20 sec	40 sec

Fusing Considerations
The motor controller provides by-passing of the semiconductor during running operation. Therefore the semiconductor can only be damaged by short-circuit currents during ramp-up and ramp-down function.

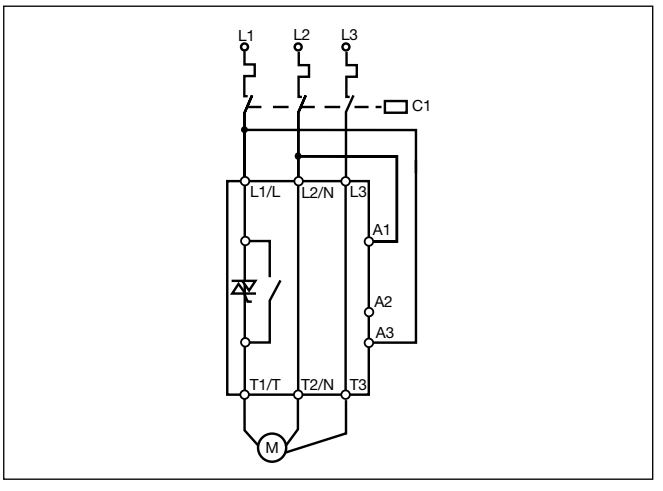
A single-phase run capacitor induction motor with correctly installed and adjusted overload protection does not short totally between lines or directly to earth as some other types of loads, e.g. heater bands. In a failing motor there will always be some part of a winding to limit the fault current. If the motor is installed in an environment where the supply to the motor cannot be damaged, the short circuit protection can be considered to be acceptable if the controller is protected by a single-pole thermal-magnetic overload relay.

If the risk of short circuit of the motor cable, the controller or the load exists, then the controller must be protected by ultrafast fuses, e.g. Ferraz 6.9 gRB 10-25. Fuseholder type CMS10 1P.

Applications for Three Phase Motors

3-phase torque reduction
When C1 is closed, a torque reduced start of the 3-phase motor will be performed according to the setting of the ramp-up potentiometer, and the setting of the initial torque potentiometer.

Warning:
When the motor is stopped C1 must be open to remove all 3 phases from the motor. This is necessary to avoid 2-phase running of the motor.



Motor Controllers
AC Semiconductor Motor Controller
Types RSE 22 .. - B, RSE 4. .. - B, RSE 60 .. - B

- **Soft starting and stopping of 3-phase squirrel cage motors**
- **Rated operational voltage: Up to 600 VACrms, 50/60 Hz**
- **Rated operational current: 3 A or 12 AAC 53 b**
- **Potential-free control input**
- **LED-indications for supply and operation**
- **Transient overvoltage protection built-in**
- **Integral bypassing of semiconductors**

Product Description

Compact easy-to-use AC semiconductor motor controller. With this controller 3-phase motors with nominal load currents up to 12 A can be soft-started and/or soft-stopped. Starting and stopping time as well as initial torque can be independently adjusted by built-in potentiometers.

Ordering Key

RSE 40 03 - B

- **Solid State Relay**
- **Motor controller**
- **E-line housing**
- **Rated operational voltage**
- **Rated operational current**
- **Control voltage**

Type Selection

Type	Rated operational voltage U_e	Rated operational current I_e	Control voltage U_C *)
RSE: E-series, motor controller	22: 127/220 VACrms, 50/60 Hz 40: 230/400 VACrms, 50/60 Hz 48: 277/480 VACrms, 50/60 Hz 60: 346/600 VACrms, 50/60 Hz	03: 3 A 12: 12 A	-B: 24 to 110 VAC/DC & 110 to 480 VAC

*) The control voltage should never be higher than the rated operational voltage.

Input Specifications (Control Input)

Control voltage U_C	
A1-A2:	24 - 110 VAC/DC ±15%, 12 mA
A1-A3:	110 - 480 VAC ±15%, 5 mA
Rated insulation voltage	630 V rms Overvoltage cat. III (IEC 60664)
Dielectric strength	
Dielectric voltage	2 kVAC (rms)
Rated impulse withstand volt.	4 kV (1.2/50 µs)

Output Specifications

Utilization category	AC-53b Integral bypassing of semiconductors
Overload current profile (overload relay trip class)	
RSE ..03-B	3A: AC-53b:3-5:30
RSE ..12-B	12A: AC-53b:3-5: 180
Min. load current	
RSE ..03-B	100 mAAC rms
RSE ..12-B	200 mAAC rms

Supply Specifications

Power supply	Overvoltage cat. III (IEC 60664)
Rated operational volt. (U_e) through terminals L1-L2-L3	(IEC 60038)
22	127/220 VAC rms ±15% 50/60 Hz -5/+5 Hz
40	230/400 VAC rms ±15% 50/60 Hz -5/+5 Hz
48	277/480 VAC rms ±15% 50/60 Hz -5/+5 Hz
60	346/600 VAC rms ±15% 50/60 Hz -5/+5 Hz
Voltage interruption	≤ 40 ms
Dielectric voltage	None
Rated impulse withstand volt.	4 kV (1.2/50 µs)
Rated operational power supplied from	2 VA L1-L3

General Specifications

Accuracy	
Ramp up	5.5 - 7.5 s on max. ≤ 0.5 s on min.
Ramp down	6 - 10 s on max. ≤ 0.5 s on min.
Initial torque	70 - 100% on max. 5% on min.
EMC	Electromagnetic Compatibility
Immunity	acc. to EN 61000-6-2
Indication for	
Power supply ON	LED, green
Ramp up/down bypassing relay	LED, yellow
Environment	
Degree of protection	IP 20
Pollution degree	3
Operating temperature	-20° to +50°C (-4° to +122°F)
Storage temperature	-50° to +85°C (-58° to +185°F)
Screw terminals	
Tightening torque	Max. 0.5 Nm acc. to IEC 60947
Terminal capacity	2 x 2.5 mm^2
Approvals	CSA (<7.5 HP @ 600 VAC),UL, cUL
CE-marking	Yes

Mode of Operation

This motor controller is in-tended to be used to softstart/ soft-stop 3-phase squirrel cage induction motors and thereby reduce the stress or wear on gear and belt/chain drives and to give smooth operation of machines. Soft starting and/or stopping is achieved by controlling the motor voltage. During running operation the semiconductor is bypassed by an internal electromechanical relay.

The initial torque can be adjusted from 0 to 85% of the nominal torque.

The soft-start and soft-stop time can be adjusted from 0.5 to approx. 7s.

A green LED indicates supply. Two yellow LEDs indicate Ramp up/down and Running mode.

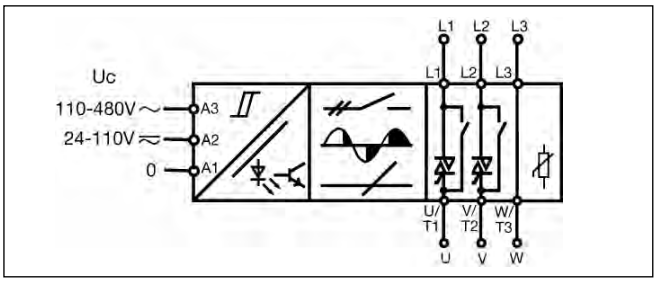
Overload protection is not provided in this motor controller and must therefore be installed separately.

The controller is switching 2 lines. The 3rd line is continuously connected to the load.

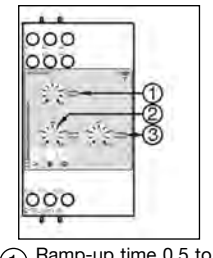
Semiconductor Data

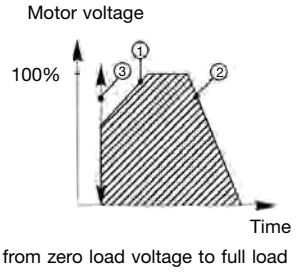
Rated operational current	I^2t for fusing t = 1 - 10 ms	I_{TSM}	dI/dt
3 A	72 A^2s	120 A_p	50 A/µs
12 A	610 A^2s	350 A_p	50 A/µs

Functional Diagram



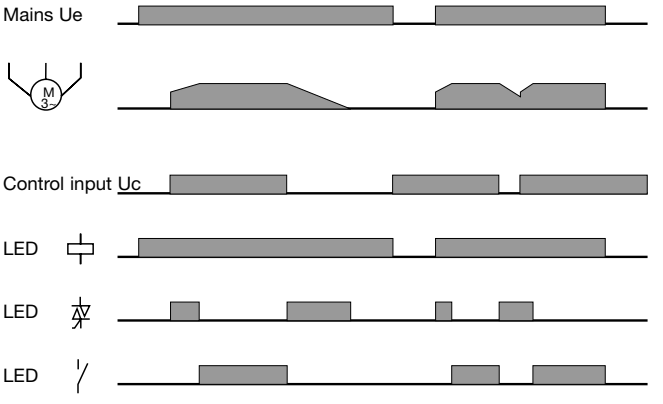
Operation Diagram 1



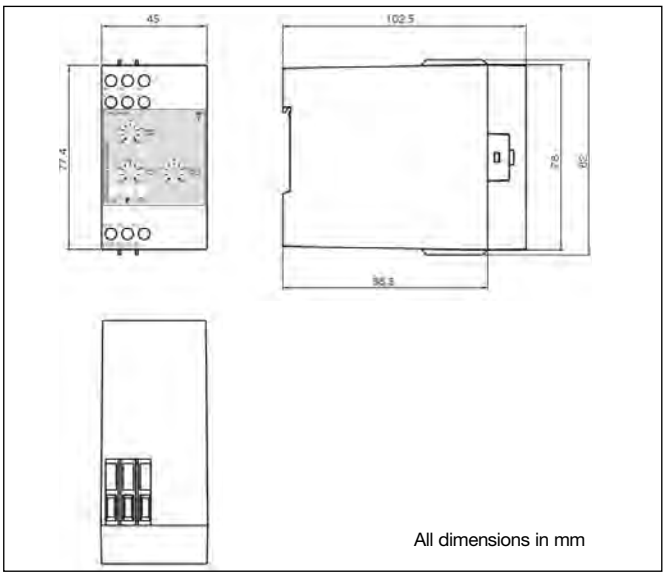


① Ramp-up time 0.5 to 6.5s. Time from zero load voltage to full load voltage.
② Ramp-down time 0.5 to 8.0s. Time from full load voltage to zero load current.
③ Initial torque 0 to 85% voltage at the start of the ramp-up function.

Operation Diagram 2



Dimensions



Housing Specifications

Weight	270 g
Housing material	PC/ABS Blend
Colour	Light grey
Terminal block	PBTP
Colour	Ligh grey
Bottom clip	POM
Colour	Black
Diode cover	PC
Colour	Grey Transparent
Front knob	PA
Colour	Grey

Applications

Changing from Direct ON Line start to soft start (Line controlled soft-start)
(*Fig. 1* & *Fig. 2*)
Changing a Direct On Line start into a soft start is very simple with the RSE soft-starting relay:

1) Cut the cable to the motor and insert the RSE relay.

2) Connect control input to two of the incoming lines. Set initial torque to minimum and ramp up and down to maximum.

3) Power up again - adjust the start torque so the motor starts turning immediately after power is applied, and adjust ramp time to the appropriate value.

When C1 is operated, the motor controller will perform soft-start of the motor. When C1 is switched off, the motor will stop, the motor controller will reset and after 0.5 s a new soft-start can be performed.

Please note that the controller does not insulate the motor from the mains. Contactor C1 is therefore needed as a service switch for the motor.

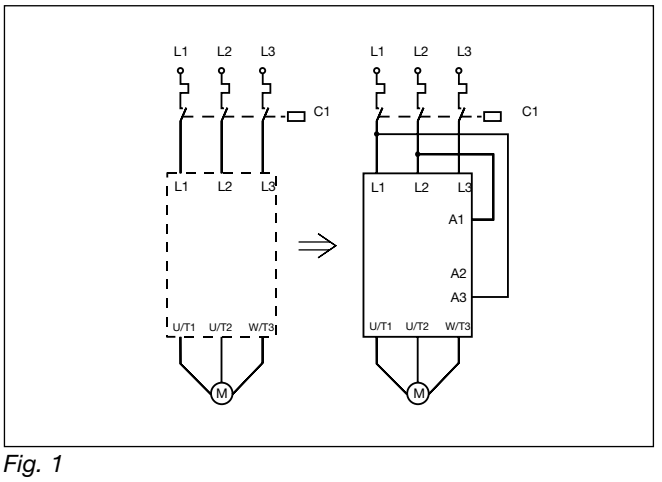


Fig. 1

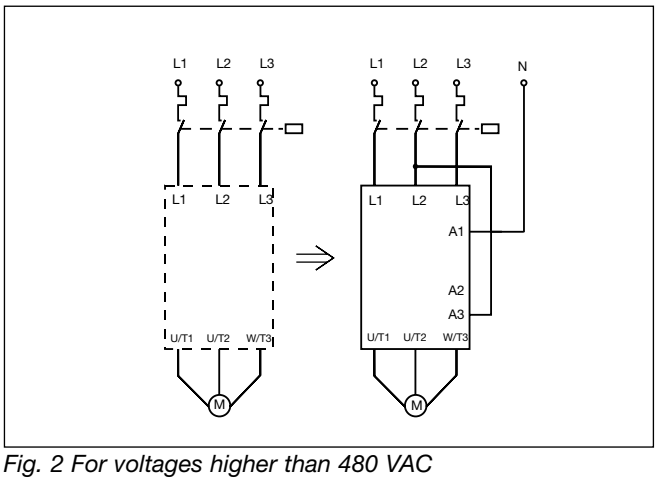


Fig. 2 For voltages higher than 480 VAC

Soft-start and soft-stop
(Fig. 3)
When S1 is closed, soft-start of the motor will be performed according to the setting of the ramp-up potentiometer and the setting of the initial torque potentiometer. When S1 is opened, soft-stop will be performed according to the setting of the ramp-down potentiometer.

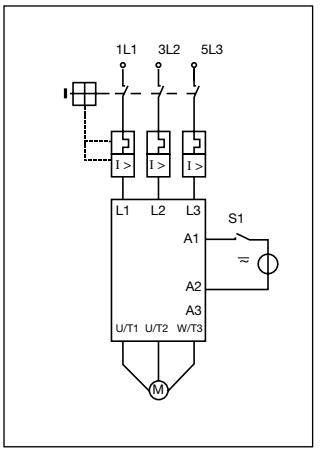


Fig. 3

CARLO GAVAZZI

Applications

Time between rampings
To prevent the semiconductors from overheating, a certain time between ramping should be allowed. The time between rampings depends on the motor current during ramping and ramp time (see tables below).

Note:
Table is valid for ambient temperature 25°C. For higher ambient temperature add 5%/°C to values in the tables. The shaded areas in the tables are for blocked rotor. Do not repeat rampings with blocked rotor.

RSE .. 03 - B
Time between rampings

Ramp time (sec.) / I ramp (A)	1	2	5	7.5
18	15 sec	30 sec	1.5 min	2.5 min
15	12 sec	20 sec	60 sec	1.5 min
12	10 sec	20 sec	50 sec	70 sec
9	8 sec	12 sec	30 sec	50 sec
6	5 sec	9 sec	25 sec	40 sec
3	2 sec	5 sec	20 sec	35 sec
1.5	1 sec	2 sec	5 sec	5 sec

RSE .. 12 - B
Time between rampings

Ramp time (sec.) / I ramp (A)	1	2	5	7.5
72	2.5 min	5 min	40 min	N/A
60	1.5 min	3 min	13 min	17 min
48	50 sec	1.5 min	5 min	10 min
36	30 sec	1 min	3 min	7 min
24	15 sec	40 sec	1.5 min	2.5 min
12	10 sec	20 sec	50 sec	70 sec
6	5 sec	9 sec	20 sec	40 sec

Fusing Considerations
The motor controller provides by-passing of the semiconductors during running operation. Therefore the semiconductors can only be damaged by short-circuit currents during ramp-up and ramp-down function.

A 3-phase induction motor with correctly installed and adjusted overload protection does not short totally between lines or directly to earth as some other types of loads, e.g. heater bands. In a failing motor there will always be some part of a winding to limit the fault current. If the motor is installed in an environment where the supply to the motor cannot be damaged, the short circuit protection can be considered to be acceptable if the controller is protected by a 3-pole thermal-magnetic overload relay (see table below).

If the risk of short circuit of the motor cable, the controller or the load exists, then the controller must be protected by ultrafast fuses, e.g. for a 3 A type: Ferraz 6.9 gRB 10-10, for an 12 A type: Ferraz 6.9 gRB 10-25. Fuseholder type CMS10 1P.

Recommended thermal-magnetic overload relay
Selection Chart
Thermal-magnetic overload relay and motor controller

Motor full load current (AACrms)	0.1 - 0.16	0.16 - 0.25	0.25 - 0.4	0.4 - 0.63	0.63 - 1.0	1.0 - 1.6	1.6 - 2.5	2.5 - 4	4 - 6.3	6.3 - 9	9 - 12
Overload relay type GV 2- Manufacturer: Telemecanique	M 01	M 02	M 03	M 04	M 05	M 06	M 07	M 08	M 10	M 14	M 16
Overload relay type MS 325- Manufacturer: ABB	0.16	0.25	0.4	0.63	1	1.6	2.5	4	6.3	9	12.5
Motor protection circuit breaker type KTA 3-25- Manufacturer: Allan-Bradley/Sprecher + Schuh	0.16	0.25	0.4	0.63	1	1.6	2.5	4	6.3	10	16
Motor controller type: 127/220 V mains 230/400 V mains 270/480 V mains 400/690 V mains	RSE 22 03 - B RSE 40 03 - B RSE 48 03 - B RSE 60 03 - B								RSE 22 12 - B RSE 40 12 - B RSE 48 12 - B RSE 60 12 - B		

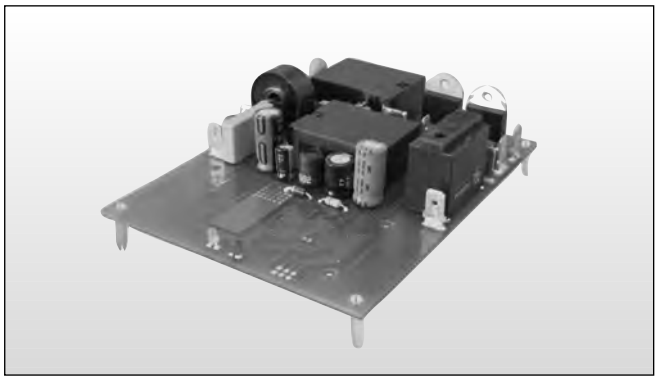
Example:
Line voltage: 230/400 V
Motor 1.5 HP: 1.1 kW
Full load current: 2.9 A

Step 1:
Select overload relay:
In this example GV 2 - M 08, MS 325 - 4 or KTA 3-25-4A must be used.

Step 2:
Select motor controller:
For line voltage 230/400 V and overload, relay GV 2 - M 08 or MS 325 - 4 with a setting of 2.9 A type RSE 40 03 -B can be selected.

N.B.: For motors with full load current from 12 A to 40 A, see types RSH and RSC/RSO.

Motor Controller
AC Semiconductor Motor Controller
Type RSBS2325A2V10C24



- **Soft starting of 1-Phase Scroll Compressors**
- **Board-level solution**
- **Integrated Current Limit**
- **Rated operational voltage: 230 VACrms, 50 Hz**
- **Rated operational current: 25 AAC 53 b**
- **Integral bypassing of semiconductors**
- **Transient overvoltage protection built-in**
- **Undervoltage protection**

Preliminary datasheet

Product Description

This motor controller, intended to be used with single phase scroll compressors can limit inrush currents to 40AACrms. Soft starting, upon closing of contact S1, is achieved within a 600ms interval. At the end of the soft start function, the semiconductors are bypassed by electromechanical relays. The device rating is based on a maximum of 12 starts per hr.

Application of supply voltage is indicated by a green LED in the full ON state. A flashing green LED indicates a fault in the internal power supply circuit. A red LED is used for alarm indication in the case of under voltage or over current.

Short circuit and Overload protection are not provided with this controller and hence must be provided separately. Starting and running capacitors are required for controller to operate as intended. For 25A nominal loads, a starting capacitor within the range 240 to 312uF is suggested.

Ordering Code

RSB S 23 25 A2 V10 C24

- Board level Motor Controller
- Scroll Compressor
- Rated operational voltage
- Rated operational current
- Control voltage
- Options
- Starting Capacitor

Type Selection

Type	Rated operational voltage Ue	Rated operational Current I_e	Control Voltage Uc	Options	Starting Capacitor
RSBS: Board level 1-Phase Motor Controller for Scroll Compressors	23: 230VACrms, 50 Hz	25: 25AAC	A2: 230VACrms, 50 Hz	V10: Circuit board	C00: No capacitor C24: 240 µF

Input Specifications (Control Input)

Control voltage (ON)	230 VACrms ± 15%
Input current	< 1 mA
Rated AC frequency	50 Hz -5/+5Hz
Rated insulation voltage	250 V rms
Response time Input to output	≤ 200 ms

Output Specifications

Rated operational current	25A AC-53b
Max. starting current	40A ACrms
No. of starts/hr.	12
I^2t for fusing t=10ms	1200 A^2s

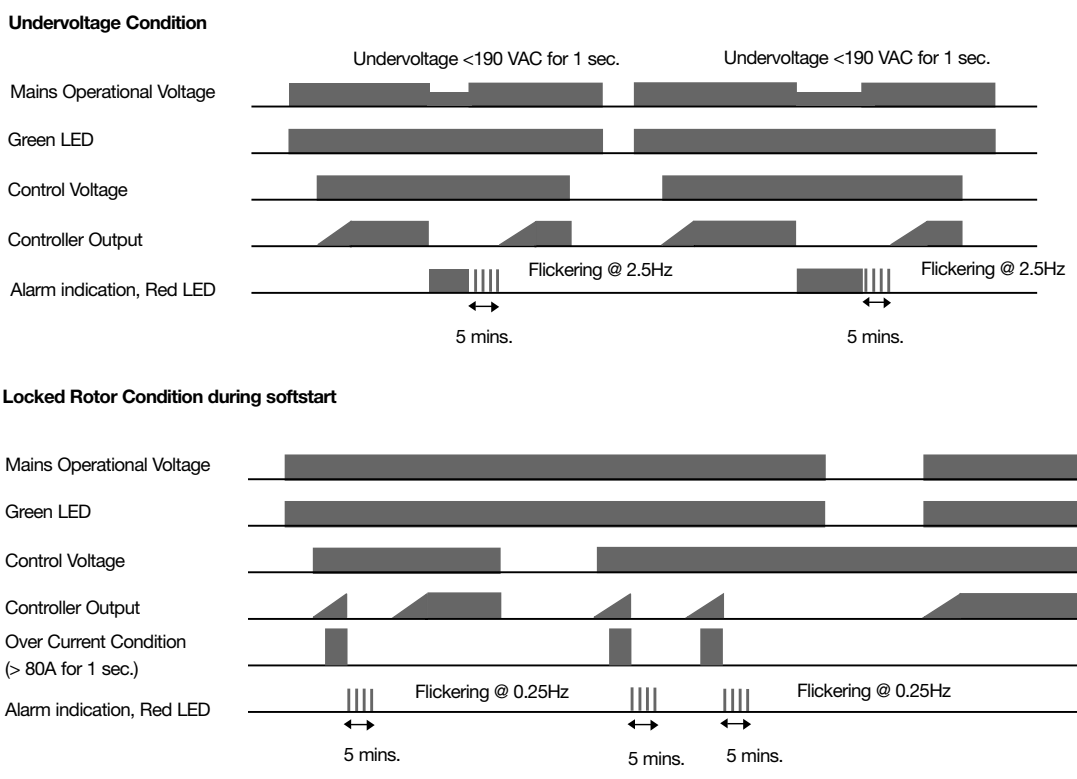
Housing Specifications

Dimensions (L x B x H)	135 x 100 x 35 mm
Weight	approx. 250 g

General Specifications

Ramp up	< 0.6 sec
EMC Immunity	Electromagnetic Compatibility acc. to EN 61000-6-2
Operating temperature	-20° to +65°C (-4° to +149°F)
Storage temperature	-30° to +70°C (-22° to +158°F)
FASTON terminals	6.3 x 0.8 mm
Approvals	UL, cUL compliant
CE marking	Yes
Degree of protection	IP00
Pollution Degree	2

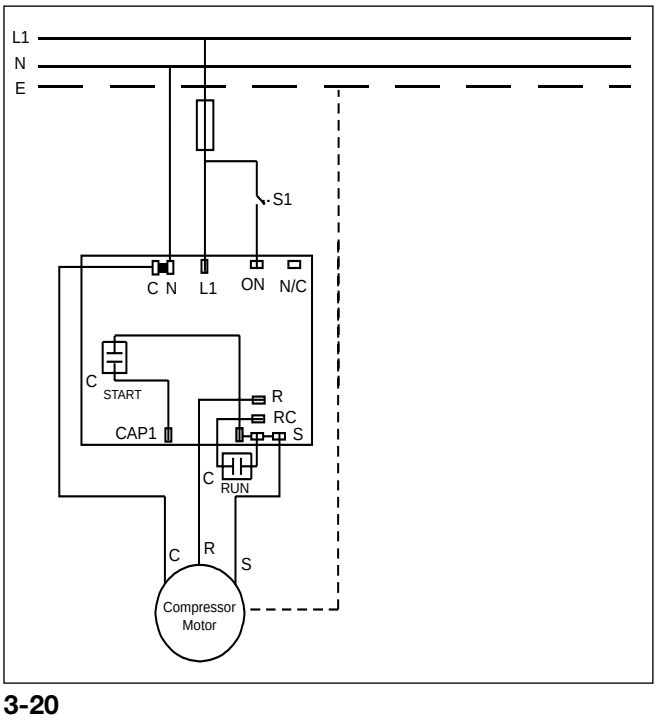
Mode of Operation



Notes:

1. Green LED will be fully ON as long as the Mains voltage is >90VAC
2. Over current protection is provided only during soft start.
3. The controller will not operate in the case an over current situation is encountered after 2 consecutive tries. Such a situation implies that a problem in the system such as a locked rotor exists. In such a case, user intervention is required after which it is required to reset the mains voltage of the controller before the controller can operate again.

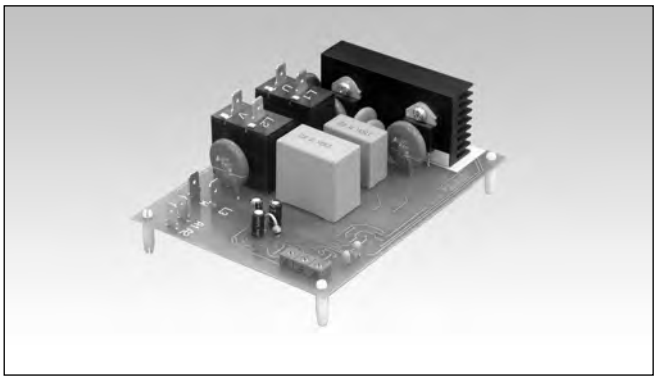
Connection Diagram



Supply Specifications

Rated operational voltage (Ue) L - N	230 VAC ± 15%
Rated AC frequency	50 Hz -5/+5 Hz
Rated insulation voltage	250 VACrms
Supply indication	Green LED
Undervoltage alarm	< 190 VACrms for 1 sec
Overcurrent alarm soft	> 80 A for 1 sec. during start
Alarm indication	Red LED

Motor Controller
AC Semiconductor Motor Controller
Types RSB..15-B



- **Soft starting and stopping of 3-phase squirrel cage motors**
- **Board-level solution**
- **Rated operational voltage: up to 480 VACrms, 50/60 Hz**
- **Rated operational current: 15 AAC 53 b**
- **Transient overvoltage protection built-in**
- **Integral bypassing of semiconductors**

Product Description

Easy-to-use AC semiconductor motor controller. With this controller 3-phase motors with nominal load currents up to 15 A can be soft-started and/or soft-stopped. Starting and stopping time as well as initial torque can be independently adjusted by built-in potentiometers.

Ordering Code

RSB 40 15 - B

Board level Motor Controller
Rated operational voltage
Rated operational current
Control voltage

Type Selection

Type	Rated operational voltage U_e	Rated operational Current I_e	Control voltage U_c
RSB: Board level Motor Controller	22: 127/220 VACrms, 50/60Hz 40: 230/400 VACrms, 50/60Hz 48: 277/480 VACrms, 50/60Hz	15: 15AAC	-B: 200…300VAC, 5 mA

Input Specifications (Control Input)

Control voltage U_c	A1-A2: 200…300VAC, 5mA
Rated AC frequency	50/60 Hz -5/+5Hz
Rated insulation voltage	630 V rms Overvoltage cat. III (IEC 60664)
Dielectric strength Dielectric voltage Rated impulse withstand volt.	 2 kVAC (rms) 4 kV (1.2/50 µs)

Supply Specifications

Power supply Rated operational volt. (U_e) through terminals L1-L2-L3	Overvoltage cat. III (IEC 60664) (IEC 60038)
22	127/220 VACrms ± 15%
40	230/400 VACrms ±15%
48	227/480 VACrms ± 15%
Rated AC frequency	50/60 Hz -5/+5 Hz
Voltage interruption	≤ 40 ms
Dielectric strength Dielectric voltage Rated impulse withstand volt.	 2 kVAC (rms) 4 kV (1.2/50 µs)

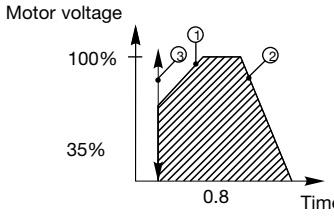
Output Specifications

Utilization category	AC-53b Integral bypassing of semiconductors
Overload current profile	15A: AC-53b:3-3:300
Min. load current	200 mAAC rms

General Specifications

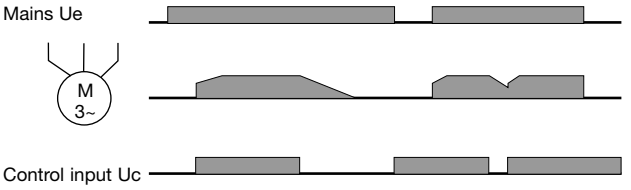
Accuracy Ramp up Ramp down Initial torque	 6.5 sec ± 10% on max. 8 sec ± 10% on max. 0 to 85% ± 10%
Equipment class	A
EMC Immunity	Electromagnetic Compatibility acc. to EN 61000-6-2
Operating temperature	-20° to +50°C (-4° to +122°F)
Storage temperature	-50° to +85°C (-58° to +185°F)
Control FASTON terminals	4.8 x 0.5 mm
Power FASTON terminals	6.3 x 0.8 mm
Approvals	UL, cUL compliant
CE marking	Yes
Norms	IEC/EN 60947-4-2
Form designation	Form 1
Degree of protection	IP00
Pollution Degree	2

Operation Diagram 1



(1) Ramp-up time 6.5s±10%. Time from zero load voltage to full load voltage.
(2) Ramp-down time 8.0s±10%. Time from full load voltage to zero load current.
(3) Initial torque 0 to 85% voltage at the start of the ramp-up function.

Operation Diagram 2



External Protection

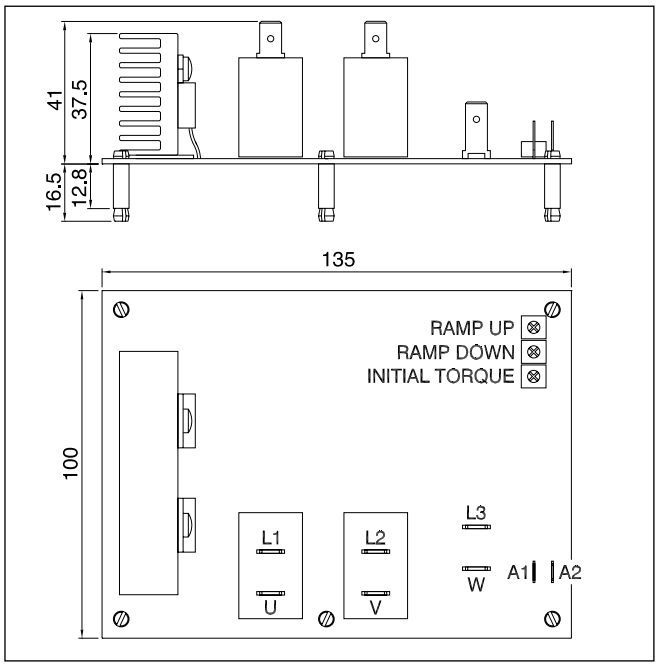
1. Recommended semiconductor protection fuses

Type: 6.921 CP URQ 27x60 / 50, Ferraz Shawmut

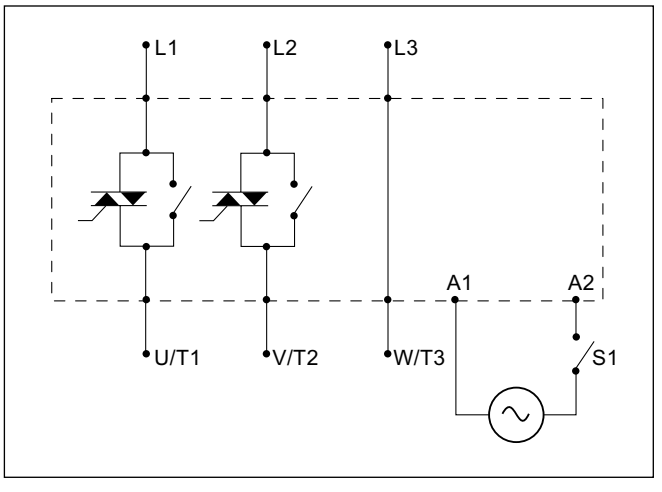
2. Recommended motor protection circuit breakers

Motor full load current (AACrms)	2.5 - 4	4 - 6.3	6.3 - 9	9 - 12.5	12 - 15
Overload relay type Telemecanique: GV 2-	M 08	M 10	M 14	M 16	M16 M20
Overload relay type ABB:MS 325-	4	6.3	9	12.5	12.5 16
Motor protection circuit breaker type Allan-Bradley: KTA 3-25-	4	6.3	10	16	16

Dimensions



Connection Diagram



Mode of Operation

This motor controller is intended to be used to soft-start 3-phase compressor induction motors and can reduce the starting currents of the system by up to 40%. Soft-starting is achieved by controlling the motor voltage. During running operation the semiconductors are bypassed by electromechanical relays.

The device rating is based on 12 starts per hour but this can be higher depending on the application. The controller is switching 2 lines. The 3rd line is continuously connected to the load. Overload protection is not provided in this motor controller and must therefore be installed separately.

CARLO GAVAZZI

Wiring Diagrams

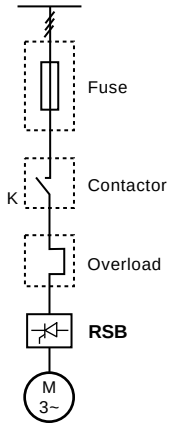


Fig. 1a

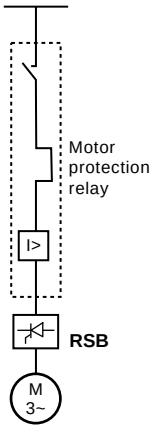


Fig. 2a

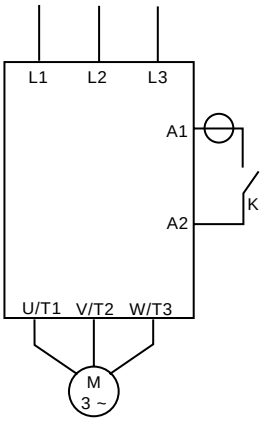


Fig. 3

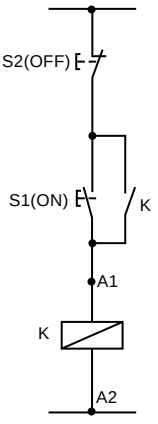


Fig. 4a

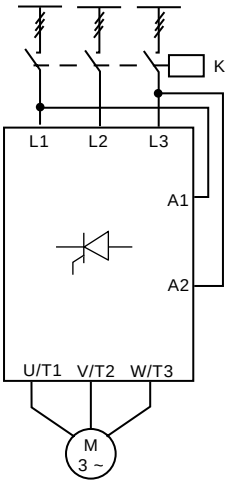


Fig. 5a

The motor controller provides by-passing of the semiconductors during running operation. Therefore the semiconductors can only be damaged by short-circuit currents during ramp-up and ramp-down. Please note that the motor controller does not insulate the motor from the mains.

Figure 1: Protection of the device when using fuses.
Protection with semiconductor fuses is intended to protect the motor feeder and motor controller from damage due to short-circuit.

Figure 2: Protection using a thermal-magnetic motor protection relay.
The motor feeder is protected but damage to the motor controller is possible. When motor failure occurs, if part of the motor winding limits the fault current and the motor feeder is protected, this type of protection can be considered acceptable.

Figure 3: Control using a 2-position switch.
When K is closed, the control input is supplied to A1, A2 and soft starting of the motor is performed. When K is opened, soft stopping is performed.

Figure 4: Control using ON and OFF push buttons
Pushing S1 soft starts the RSB. Pushing S2 soft stops the RSB. K is an auxiliary contact of the mains contactor.

Figure 5: Control using 2 phases
Connecting input A1, A2 to two of the incomming lines will soft start the motor when K is operated. When K is switched off, the motor will stop (no soft stop).
This method of control is only valid for model RSB2215-B as max. Control voltage allowed across A1, A2 is 300VAC.

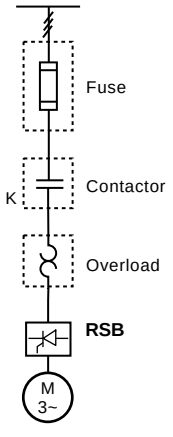


Fig. 1b

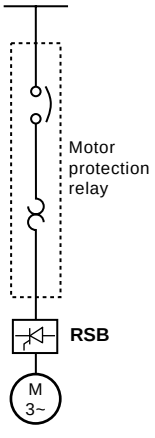


Fig.2b

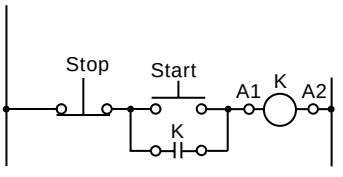


Fig. 4b

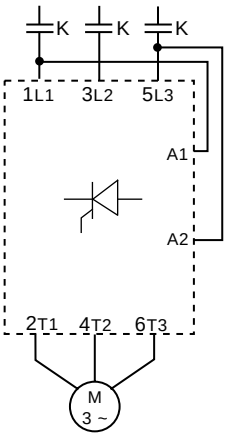


Fig. 5b

Motor Controllers
AC Semiconductor Motor Controller
Type RSHR MIDI

- **Soft starting and stopping of 3-phase induction squirrel cage motors**
- **2-phase control with integral bypassing of semiconductors**
- **Low inrush and reduced vibration during starting**
- **Rated operational voltage: up to 600 VAC, 50/60Hz**
- **Rated operational current: up to 18A AC-53b**
- **Multivoltage option with a range of 190 - 530 VAC***
- **LED status indicators**
- **Optional device over-temperature protection**
- **Optional auxiliary relay for end of ramp**
- **DIN rail mounting**

* requires external supply

Product Description

The RSHR Midi is a compact easy-to-use AC semiconductor motor controller. With this controller 3-phase motors with nominal currents up to 18A can be soft started and/or soft stopped. The RSHR Midi controls 2 phases only, one phase is continously connected to the load. Soft starting and soft stopping is achieved by controlling the motor voltage. During running operation the semiconductors are bypassed by internal electromechanical relays. Starting and stopping time as well as initial torque can be independently adjusted by built-in potentiometers.
LEDs indicate the status of the controller including an alarm status in case of over-temperature in the RSHR...V21 models. The RSHR Midi comes with an integrated heatsink and is ready to mount on DIN rail.

Ordering Key

RSH R 48 18 B V21

H-line Motor Controller
Rotary Ramp profile setting
Rated operational voltage
Rated operational current
Control voltage
Options

Type Selection

Type	Rated Operational Voltage Ue	Rated Operational Current Ie	Control Voltage Uc	Options
RSHR: H-line motor controller with rotary settings	22: 127/220VACrms, 50/60Hz 40: 230/400VACrms, 50/60Hz 48: 277/480VACrms, 50/60Hz 60: 346/600VACrms, 50/60Hz M: 190-530VACrms, 50/60Hz	06: 6A AC-53b 12: 12A AC-53b 18: 18A AC-53b	B: 24 to 110VAC/DC & 110 to 480VAC	V20: Basic V21: End of Ramp Relay & Over-Temperature Protection

Selection Guide

Rated operational voltage U_e	Rated operational current I_e 6A AC-53b	12A AC-53b	18A AC-53b
220VACrms	**RSHR2206BV20**	**RSHR2212BV20**	**RSHR2218BV20**
400VACrms	**RSHR4006BV20**	**RSHR4012BV20**	**RSHR4018BV20**
480VACrms	**RSHR4806BV20**	**RSHR4812BV20**	**RSHR4818BV20**
600VACrms	**RSHR6006BV20**	**RSHR6012BV20**	**RSHR6018BV20**
190-530VACrms	**RSHRM06BV20**	**RSHRM12BV20**	**RSHRM18BV20**

Load Ratings

RSHR60..BV..		RSHR22..BV.. RSHR40..BV.. RSHR48..BV..	RSHR2218BV.. RSHR4018BV.. RSHR4818BV.. RSHRM..BV..	RSHRM18BV..
IEC rated operational current Ie (AC-53b)	RSHR..06....	6A		6A
	RSHR..12...	12A		12A
	RSHR..18...		18A	18A
Overload cycle according to EN/IEC 60947-4-2				
@ 40°C surrounding temp.	RSHR..06...	6A: AC-53b:4-5:4		6A: AC-53b: 4-5:3
	RSHR..12...	12A: AC-53b:4-5:50		12A: AC-53b:4-5:14
	RSHR..18..		18A: AC-53b:4-5:50	18A: AC-53b:4-5:50
Overload cycle according to EN/IEC 60947-4-2				
@ 50°C surrounding temp.	RSHR..06...	6A: AC-53b:4-5:26		6A: AC-53b: 4-5:8
	RSHR..12...	12A: AC-53b:4-5:62		12A: AC-53b:4-5:26
	RSHR..18..		18A: AC-53b:4-5:62	18A: AC-53b:4-5:62
Overload cycle according to EN/IEC 60947-4-2				
@ 60°C surrounding temp.	RSHR..06...	6A: AC-53b:4-5:62		6A: AC-53b: 4-5:26
	RSHR..12...	12A: AC-53b:4-5:80		12A: AC-53b:4-5:50
	RSHR..18...		18A: AC-53b:4-5:110	18A: AC-53b:4-5:110
Number of starts per hour @40/50/60°C	RSHR..06...	250/ 100/ 50		275/ 200/ 100
	RSHR..12...		60/50/40	150/ 100/ 60
	RSHR..18...		60/ 50/ 30	60/ 50/ 30
Minimum load rating		0.25kW	0.25kW	0.25kW

Motor Ratings

IEC rated operational current Ie (AC-53b)		6A	12A	18A
Assigned motor rating @60°C/UL rating @60°C	220VACrms	1.1kW/ 1.5HP	3kW/ 3HP	4kW/ 5HP
	400VACrms	2.2kW/ 3HP	5.5kW/ 7.5HP	7.5kW/ 10 HP
	480VACrms	2.2kW/ 5HP	5.5kW/ 7.5HP	7.5kW/ 10HP
	600VACrms	3kW/ 5HP	7.5kW/ 10HP	11kW/ 15HP

General Specifications

Ramp up time	0.5…10s +/- 1.5s on max.
Ramp down time	0.5…20s +/- 4s on max.
Initial torque	0…85%
Status indicator LEDs	
Power supply ON	LED, green
Ramping	LED, yellow
Bypass relay ON	LED, yellow
Over-temperature alarm*	LED, red
Auxiliary relay*	Normally open (11, 12)
Auxiliary relay contact capacity*	3A, 250VAC 3A, 30VDC
Form designation	1
Weight	800g (approx.)
Mounting	DIN Rail 35mm
Housing material	Polyamide

Input Specifications

Rated control input voltage Uc		
	A1:A2	24 - 110VDC/AC
	A1:A3	110 - 480VAC
Rated AC frequency		50/60Hz +/-10%
Max. control input current	A1:A2	5mA
	A1:A3	5mA
Min. control input current	A1:A2	1mA
	A1:A3	1mA
Dielectric strength		
Dielectric withstand voltage		
Input to heatsink		3.5 kVrms
Rated impulse withstand voltage		6 kV (1.2/50us)

Environmental Specifications

Operating temperature	-20°C to +60°C (-4°F to +140°F)
Storage temperature	-50°C to +85°C (-58°F to +185°F)
Relative humidity	<95% non-condensing @40°C
Pollution Degree	3
Degree of Protection	IP20 (EN/IEC 60529)
Installation category	III
Installation Altitude	Above 1000m derate linearly by 1% of unit FLC per 100m to a maximum altitude of 2000m
Vibration Sinosodial (IEC 60068-2-6)	13 to 25Hz: 2.0mm peak 25 to 150Hz: 20m/s^2

Supply Specification

Rated operational voltage Ue through L1, L2 L3	RSHR22..	127/220VAC -15% / +10%
	RSHR40..	230/400VAC -15% / +10%
	RSHR48..	277/480VAC -15% / +10%
	RSHR60..	346/600VAC -15% / +10%
	RSHRM	190-530VAC
Rated AC frequency		50/60Hz +/-10%
Rated insulation voltage		630V, accord. to EN 60947-1
Dielectric strength		
Dielectric withstand voltage		
Supply to input		4 kVrms
Supply to heatsink		4 kVrms
Supply to external supply		2.5 kVrms
Rated impulse withstand voltage		6 kV (1.2/50us)

External Supply Specifications

External supply voltage Us, A4:A5*	24VDC/AC -15% / +10%
Rated AC frequency	50/60Hz +/-10%
Maximum supply current	265mAAC, 140mADC
Minimum supply current	195mAAC, 100mADC
Dielectric strength	
Dielectric withstand voltage	
Supply to input	2.5 kVrms
Supply to heatsink	2.5 kVrms

* Applicable to RSHRM models only

Conductor Data

Line conductors: L1, L2, L3, T1, T2, T3 according to EN 60947-1	
flexible	2.5 ..... 10mm^2 2.5 ..... 2 x 4mm^2
rigid (solid or stranded)	2.5 ..... 10mm^2
flexible with ferrule	2.5 ..... 10mm^2
UL/CSA rated data	
flexible	AWG14…8 AWG14…2 x 10
rigid (solid or stranded)	AWG14…8
Terminal screws	6xM4 (cage clamp)
Tightening torque	2.5Nm (22lb.in) with Posidrive bit 2
Stripping length	8.0mm

Secondary conductors: A1, A2, A3, A4, A5, 11, 12 according to EN 60998	
flexible	0.5 ..... 1.5mm^2
flexible with ferrule	0.5 ..... 1.5mm^2
rigid (solid)	0.5 ..... 2.5mm^2
UL/CSA rated data	AWG22…12
Terminal screws	7xM3 (cage clamp)
Tightening torque	0.5Nm (4.5lb.in) with Philips bit 0
Stripping length	6.0mm

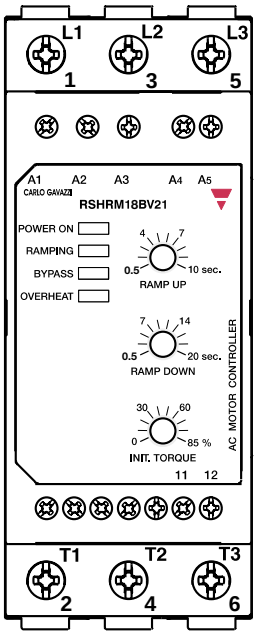
Standards

Approvals	UL, cUL listed (E172877)
Markings	CE
EMC (Electromagnetic compatability) accord. to EN/IEC 60947-4-2	
Wire conducted emission	Class A
Radiated emission	Class A
ESD Immunity (EN 61000-4-2)	4kV contact, PC2 8kV air discharge, PC1
Radiated RF immunity (EN 61000-4-3)	10V/m, PC1 (80-1000MHz)
Voltage dips and interruptions (EN 61000-4-11)	0% Ue & Uc, 20ms, PC2 40% Ue & Uc, 200ms, PC2 70% Ue & Uc, 5000ms, PC2

Fast transient immunity (EN 61000-4-4)	Output	2kV, PC1 (4kV, PC2)
	Input	2kV, PC1
Surge immunity (EN 61000-4-5)		
Output: line to line		1kV, PC1
line to ground		2kV, PC1
Input: line to line		1kV, PC2 (500V, PC1)
line to ground		2kV, PC2 (500V, PC1)
Conducted RF immunity (EN 61000-4-6)		140dBuV, PC1 (0.15-80MHz)

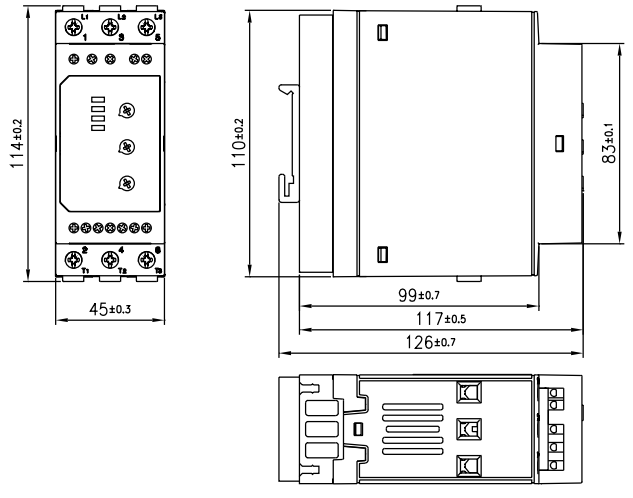
Note: EMC testing was performed with the RSHR connected to representative motor loads of 1.1/ 4.0kW. The EMC performance of the controller would eventually have to be evaluated with the controller connected and fitted as part of the complete system in the end application.

Terminal Diagram



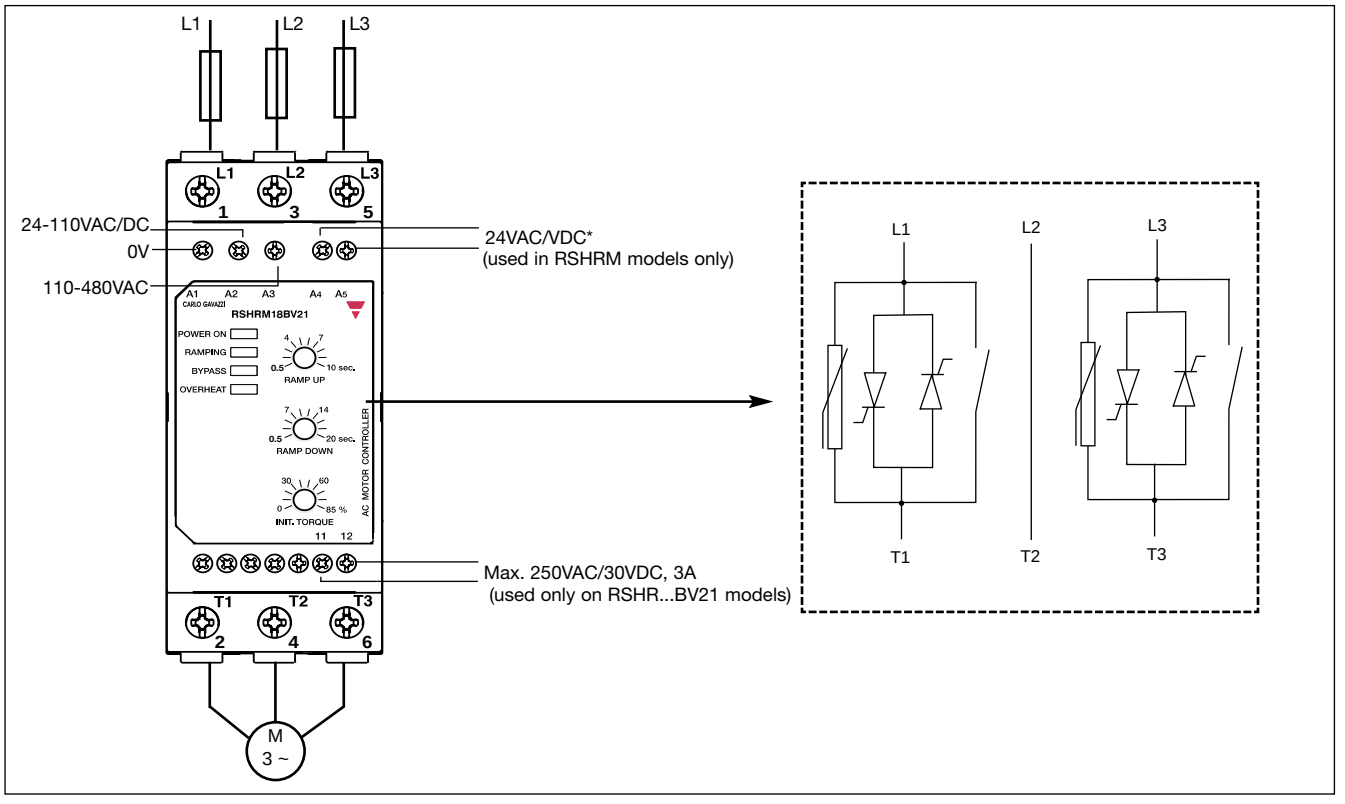
L1, L2, L3: Mains supply
T1, T2, T3: Motor supply
A1, A2, A3: Control input
A4, A5: External supply for RSHRM ... models
11, 12: End of ramp (NO) for RSHR...V21 models

Dimensions



All dimensions in mm

Connection Diagram



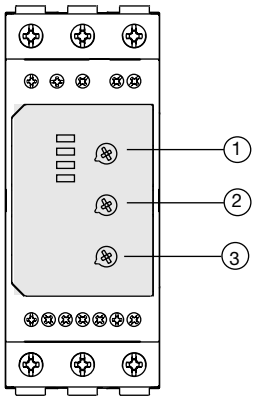
* For the 24VDC external supply, CG power supply model SPD24051 can be used

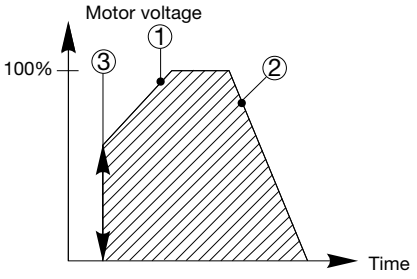
Short circuit Protection (according to EN/IEC 60947-4-2 and UL 508)

	RSHR..06BV21	RSHR..12BV21	RSHR..18BV21
Type of coordination: 1			
UL rated short circuit current	5kA when protected by RK5 fuses*	10kA when protected by RK5 fuses*	10kA when protected by RK5 fuses
RK5 fuse			
220VACrms	TRS12R 12A	TRS20R 20A	TRS30R 30A
400VACrms	TRS12R 12A	TRS30R 30A	TRS35R 35A
480VACrms	TRS12R 12A	TRS20R 20A	TRS30R 30A
600VACrms	TRS12R 12A	TRS20R 20A	TRS35R 35A
Type of coordination: 2			
Rated short circuit current	10kA when protected by semiconductor fuses	10kA when protected by semiconductor fuses	10kA when protected by semiconductor fuses
Semiconductor fuse	Ferraz Shawmut 25A, Class URC Art. No. 6.9 CP gRC 14.51 25	Ferraz Shawmut 40A, Class URC Art. No. 6.9 CP gRC 14.51 40	Ferraz Shawmut 40A, Class URC Art. No. 6.9 CP gRC 14.51 40

* 10kA for RSHR60 models

Operation Diagram





① Ramp-up time 0.5 to 10 s. Time from zero load voltage to full load voltage.

② Ramp-down time 0.5 to 20 s. Time from full load voltage to zero load voltage.

③ Initial torque 0 to 85% voltage at the start of the ramp-up function.

Operation Diagrams for RSHR MIDI

Diagram 1: Normal Operation

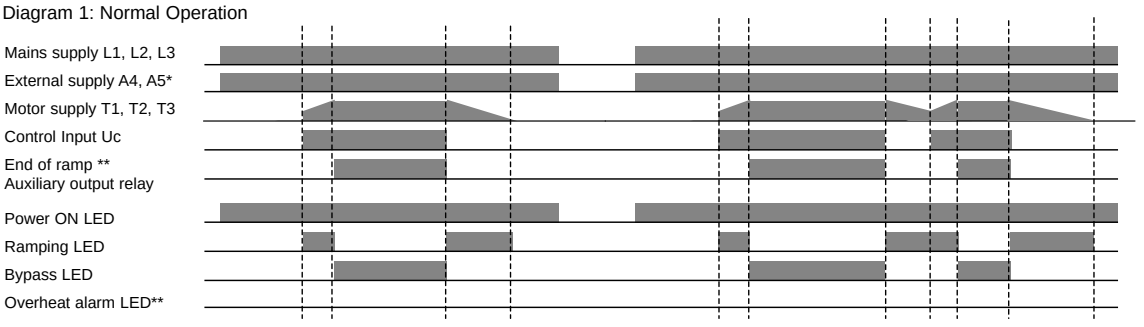


Diagram 2: Over-temperature alarm during ramping mode **

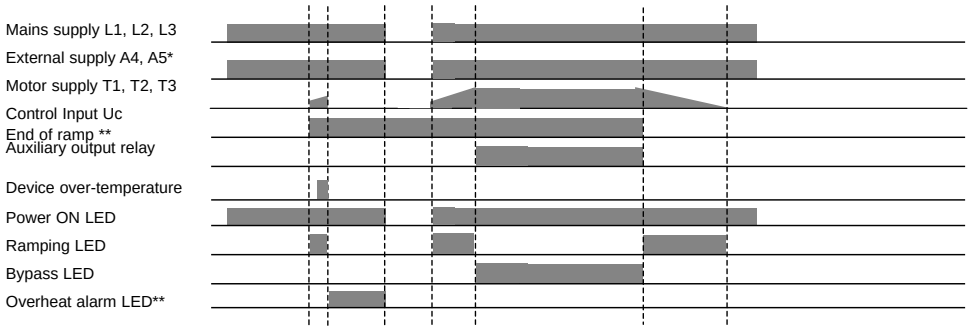
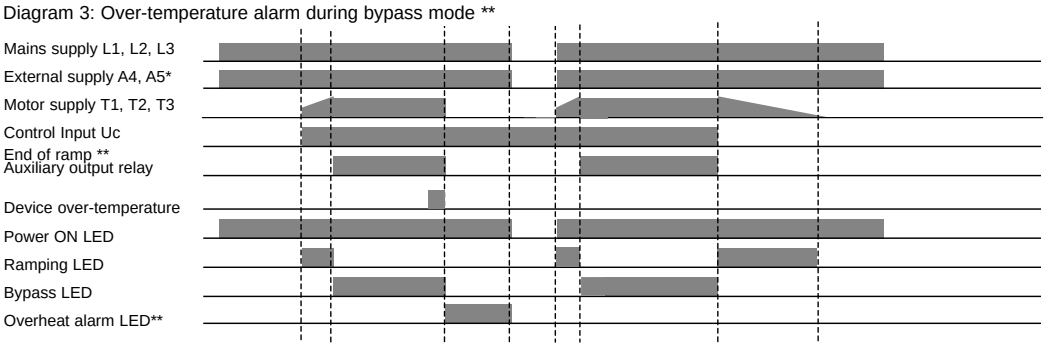


Diagram 3: Over-temperature alarm during bypass mode **



* Applicable to RSHRM models only
** Applicable to RSHR ...BV21 models only

Note: for proper operation of RSHRM models always remove mains supply voltage before switching off external power supply.

Wiring Diagram

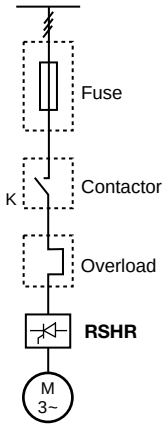


Fig. 1a

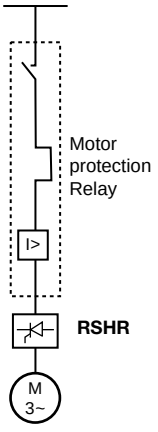


Fig. 2a

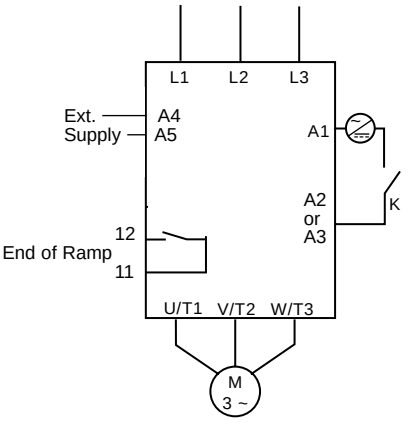


Fig. 3a

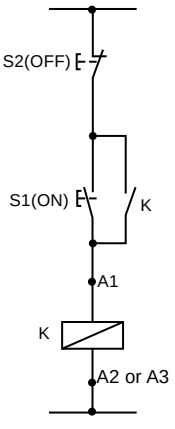


Fig. 4a

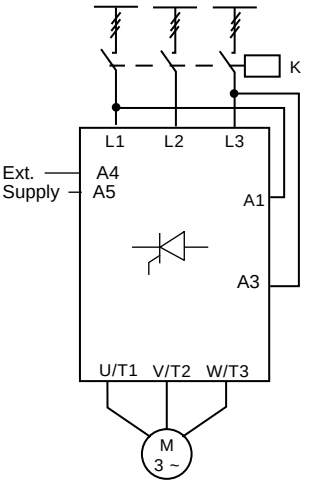


Fig. 5a

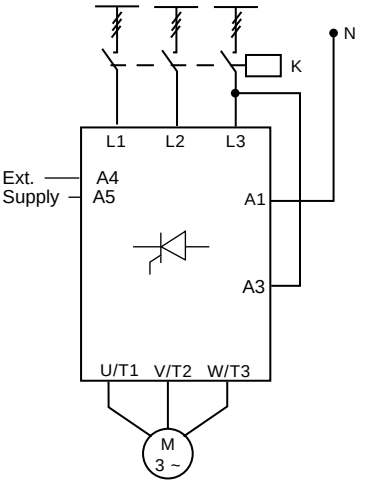


Fig. 6a

IEC

Wiring Diagram (cont.)

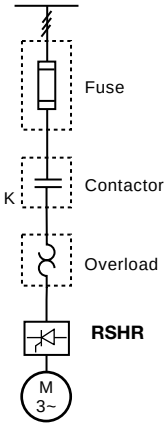


Fig. 1b

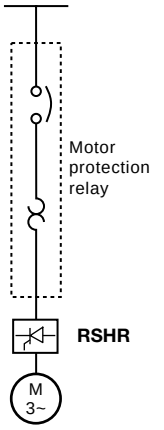


Fig. 2b

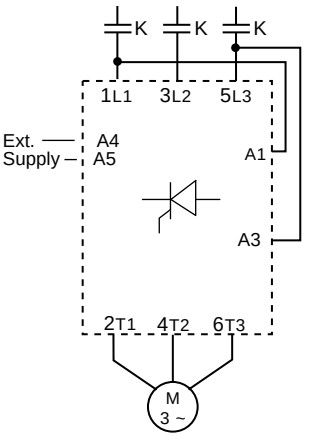


Fig. 5b

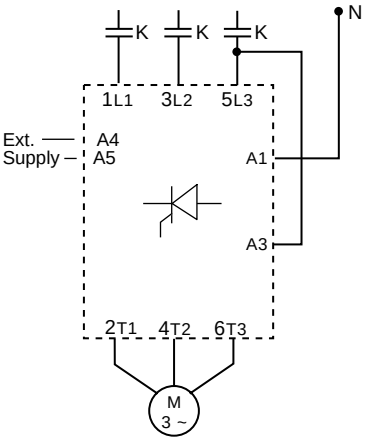


Fig. 6b

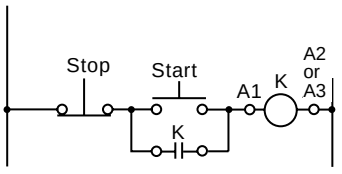


Fig. 4b

NEMA

The motor controller provides by-passing of the semiconductors during running operation. Therefore the semiconductors can only be damaged by short-circuit currents during ramp-up and ramp-down. Please note that the motor controller does not isolate the motor from the mains.

Figure 1: Protection of the device when using fuses.
Protection with semiconductor fuses is intended to protect the motor feeder and motor controller from damage due to short-circuit.

Figure 2: Protection using a thermal-magnetic motor protection relay.
The motor feeder is protected but damage to the motor controller is possible. When motor failure occurs, if part of the motor winding limits the fault current and the motor feeder is protected, this type of protection can be considered acceptable.

Figure 3: Secondary conductors.
3.1: Control using a 2-position switch.
When K is closed, the control input is supplied to A1, A2 or A3 and soft starting of the motor is performed. When K is opened, soft stopping is performed.

3.2: Auxiliary Relay
(For RSHR...BV21 models)
The End of Ramp relay 11, 12 (NO) can be used in series with the supply to the coil of an external bypass contactor.

Figure 4: Control using ON and OFF push buttons
Pushing S1 soft starts the RSHR. Pushing S2 soft stops the RSHR. K is an auxiliary contact of the mains contactor.

Figure 5: Control using 2 phases
Connecting input A1, A3 to two of the incomming lines will soft start the motor when K is operated. When K is switched off, the motor will stop (no soft stop). This configuration does not apply to the RSHR60.... versions.

Figure 6: Control when using operational voltage greater than 480V
Connecting A1 to Neutral and A3 to one of the incoming phases (or vice-versa) will soft start the motor when K is closed. When K is opened, the motor will stop (no soft stop).

Accessories - External Power Supply 24VDC - SPD 24051

Rated input voltage		100-240
Voltage range	AC	90 - 265VAC
	DC	120 - 370VDC
Frequency range		47 - 63Hz

Voltage trim range	21.6 - 28.8VDC
Output voltage accuracy	± 1%
Output current	0.21A

For further details refer to Carlo Gavazzi SPD series datasheet

Motor Controllers
AC Semiconductor Motor Controller
Type RSHR

- **Soft starting and stopping of 3-phase squirrel cage motors**
- **Low inrush and reduced vibration during starting**
- **Integrated bypassing of semiconductors**
- **Rated operational voltage: up to 600 VAC, 50/60 Hz**
- **Rated operational current up to 45A AC-53b**
- **LED status indicators**
- **Motor PTC protection**
- **Device over-temperature protection**
- **DIN rail or panel mounting**

Product Description

Compact easy-to-use AC semiconductor motor controller. With this controller 3-phase motors with nominal load currents up to 45 A can be soft-started and/or soft-stopped. Starting and stopping time as well as initial torque can be independently adjusted by built-in potentiometers.

Ordering Key

RSH R 48 45 C V20

- **H-line Motor Controller**
- **Rotary Ramp profile setting**
- **Rated operational voltage**
- **Rated operational current**
- **Control voltage**
- **Options**

Selection Guide

Rated operational voltage U_e	Rated operational current I_e 25A AC-53b	38A AC-53b	45A AC-53b	Options
220VACrms	**RSHR2225CV20**	**RSHR2238CV20**	**RSHR2245CV20**	**V20: Basic**
400VACrms	**RSHR4025CV20**	**RSHR4038CV20**	**RSHR4045CV20**	**V21: 2 auxiliary relays**
480VACrms	**RSHR4825CV20**	**RSHR4838CV20**	**RSHR4845CV20**	
600VACrms	**RSHR6025DV20**	**RSHR6038DV20**	**RSHR6045DV20**	

Supply Specification

Rated operational voltage Ue through L1, L2, L3	RSHR22..	127/220 VAC -15% /+10%
	RSHR40..	230/400 VAC -15% /+10%
	RSHR48..	277/480 VAC -15% /+10%
	RSHR60..	346/600 VAC -15% /+10%
Rated AC frequency		50/60 Hz±10%
Dielectric strength		
Dielectric voltage		2 kV (rms)
Rated impulse withstand volt.		4 kV (1.2/50µs)

Input Specifications

Rated control input voltage Uc, A1-A2:	C: 24-550 VAC/DC D:24-600 +10% VAC/DC
Rated control input current	<1.5 mA
Rated AC frequency	50/60 Hz±10%
Dielectric strength	
Dielectric voltage	2kVAC (rms)
Rated impulse withstand volt.	4kV (1.2/50 µs)

Load Ratings

		RSHR..25....	RSHR..38....	RSHR..45....
IEC rated operational current Ie (AC-53b)		25 A	38A	45 A
Assigned motor rating @ 60°C/ UL rating @ 60°C				
	RSHR22..	5.5kW / 10HP	11kW / 10HP	11kW / 15HP
	RSHR40..	11kW / 15HP	18.5kW / 20HP	22kW / 25HP
	RSHR48..	15kW / 20HP	22kW / 25HP	30kW / 30HP
	RSHR60..	18.5kW / 25HP	22kW / 30HP	30kW / 40HP
Overload cycle according to IEC/EN 60947-4-2	@ 40°C	25A:AC-53b:4-5:65	38A: AC-53b: 4-5:85	45A: AC-53b: 4-5: 115
	@ 50°C	25A:AC-53b:4-5:85	38A:AC-53b:4-5:175	45A: AC-53b: 4-5: 135
	@ 60°C	25A:AC-53b:4-5:175	38A:AC-53b:4-5:355	45A: AC-53b: 4-5: 175
Number of starts per hour @ 40°C/50°C/60°C		50/35/20	40/20/10	30/25/20
Minimum load current		500mA	500mA	500mA

Conductor Data

Line conductors:	
L1, L2, L3/T1, T2, T3	
according to IEC 60947	0.75...16mm²
maximum size	
solid	1.5...16mm²
finely stranded with end sleeve	1.5...16mm²
stranded	1.5...25mm²
UL/CSA rated data	
UL rated data	AWG 14...4
CSA rated data	AWG 14...6
Terminal screws	6xM5 (cage clamp)
Tightening torque	1.5...2.5 Nm /13...22 lb.in
CSA data	max. 3.0Nm/ 26.5 lb/in
Stripping length	10 mm
Secondary conductors:	
A1, A2, 11, 21, 22, P1, P2	
according to IEC 60947	0.75...2.5mm²
maximum size	0.5...2.5mm²
UL/CSA rated data	AWG 22...14
Terminal screws	7xM3 (cage clamp)
Tightening torque	0.3...0.5 Nm/2.7...4.5 lb.in
Stripping length	6 mm

Thermal Specifications

Operating temperature	-20° to +60°C (-4° to +140°F)
Storage temperature	-50° to +85°C (-58° to +185°F)

Standards

Approvals	UL, cUL, CSA
Markings	CE
Norms	IEC/EN 60947-4-2

General Specifications

Pollution degree	3
Weight	800g (approx.)
Degree of protection	IP20 (IEC 60529)
Relative humidity	<95% non-condensing
Ramp up time	1…10s
Ramp down time	1…30s
Initial torque	0…70%
Status indicator LEDs	
Power supply ON	LED, green (continuous)
Ramping	LED, yellow (intermittent)
Bypass relay ON	LED, yellow (continuous)
Over-temperature alarm	
Device alarm	LED, red (intermittent)
Motor PTC alarm	LED, red (continuous)
Wrong phase sequence*	LED, red (intermittent)
Phase loss	
Phase loss alarm*	LED, red (blinking at 4Hz)
Under voltage alarm	LED, red (blinking at 1.3Hz)
Motor PTC alarm input P1, P2	Acc. to DIN 44081 and DIN 44082-1
Form designation	Form 1
Auxiliary relays: (V21 option)	
Bypass relay activation	Normally open (21,22)
Over-temperature, phase sequence, phase loss alarm	Normally closed (11, 22)
Auxiliary relay contact capacity	3 A, 250 VAC 3 A, 30 VDC
Installation altitude	Above 1000m derate linearly by 1% of unit FLC per 100m to a maximum altitude of 2000m

* detection of these alarm conditions is made during power-up of the device

Recommended Protection according to IEC/EN 60 947-4-2

	RSHR..25....	**RSHR ..38....**	**RSHR..45....**
Type of coordination: 2 Semiconductor fuse	Ferraz Shawmut 63A, Class URQ, Art.No. 6.621 CP URQ27x60/63	Ferraz Shawmut 80A, Class URQ, Art.No. 6.621 CP URQ27x60/80	Ferraz Shawmut 100A, Class URQ, Art.No. 6.621 CP URQ27x60/100
Type of coordination: 1 Motor protection circuit breaker	ABB: MS325 -25 Telemecanique: GV2-M22 Sprecher+Schuh: KTA3-25-25A	ABB: MS450 -40 Telemecanique: GV3-ME40 Sprecher+Schuh: KTA3-100-40A	ABB: MS450 -45 Telemecanique: GV3-ME63 Sprecher+Schuh: KTA3-100-63A
RK5 fuse	TRS45R 45A	TRS70R 70A	TRS90R 90A

Wiring Diagram

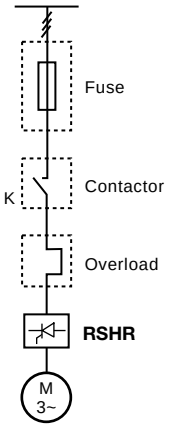


Fig. 1a

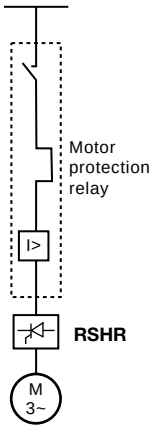


Fig. 2a

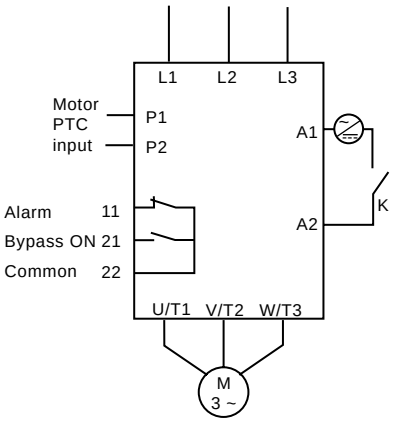


Fig. 3a

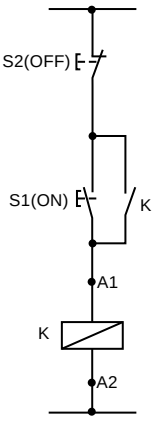


Fig. 4a

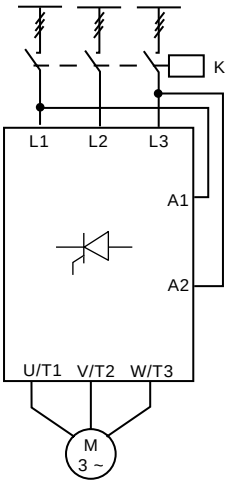


Fig. 5a

IEC

The motor controller provides by-passing of the semiconductors during running operation. Therefore the semiconductors can only be damaged by short-circuit currents during ramp-up and ramp-down. Please note that the motor controller does not isolate the motor from the mains.

Figure 1: Protection of the device when using fuses.
Protection with semiconductor fuses is intended to protect the motor feeder and motor controller from damage due to short-circuit.

Figure 2: Protection using a thermal-magnetic motor protection relay.
The motor feeder is protected but damage to the motor controller is possible. When motor failure occurs, if part of the motor winding limits the fault current and the motor feeder is protected, this type of protection can be considered acceptable.

Figure 3: Secondary conductors.
3.1: Control using a 2-position switch.
When K is closed, the control input is supplied to A1, A2 and soft starting of the motor is performed. When K is opened, soft stopping is performed.
3.2: Motor PTC input
When the motor PTC sensor is connected to P1, P2 the motor controller detects overheating of the motor windings.
3.3: Auxiliary Relays (Available on RSHR…V21 types only!)
The Alarm relay 11, 22 (NC) can be connected in series with the supply to the coil of a mains contactor. The Bypass ON relay 21, 22 (NO) can be used in series with the supply to the coil of an external bypass contactor.

Figure 4: Control using ON and OFF push buttons
Pushing S1 soft starts the RSHR. Pushing S2 soft stops the RSHR. K is an auxiliary contact of the mains contactor.

Figure 5: Control using 2 phases
Connecting input A1, A2 to two of the incomming lines will soft start the motor when K is operated. When K is switched off, the motor will stop (no soft stop).

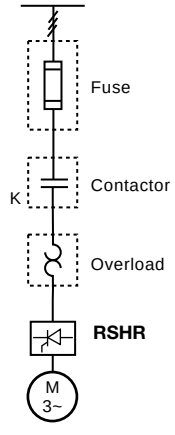


Fig. 1b

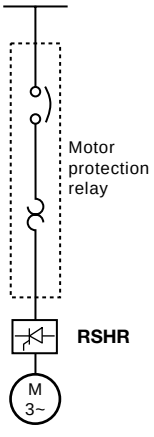


Fig. 2b

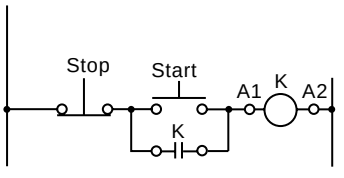


Fig. 4b

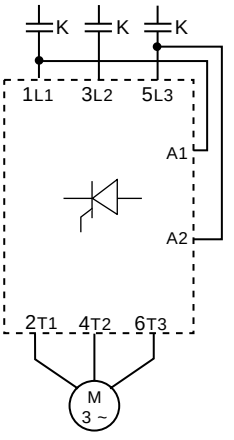
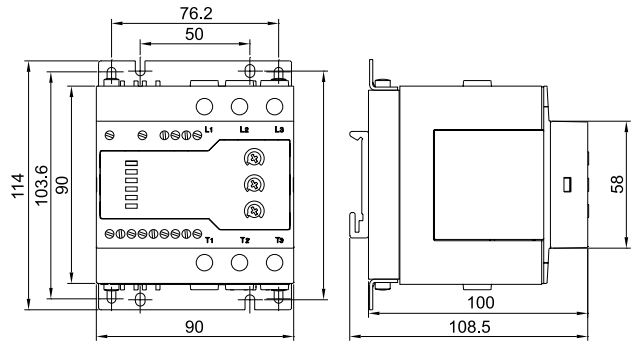


Fig. 5b

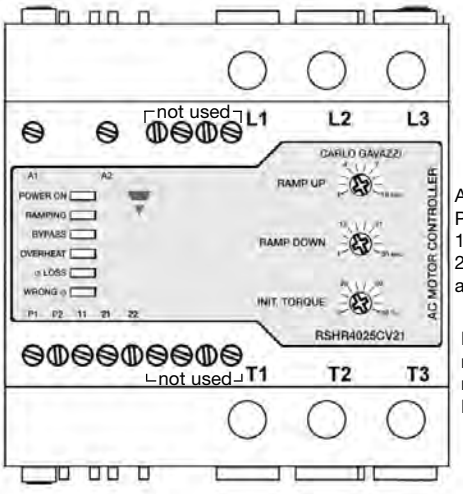
NEMA

Dimensions



All dimensions in mm

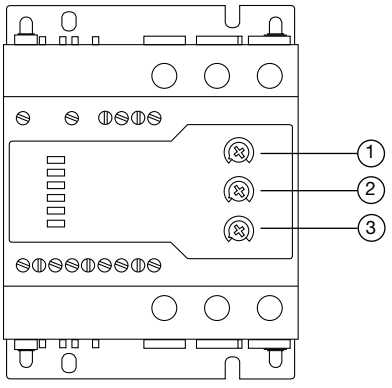
Terminal Diagram

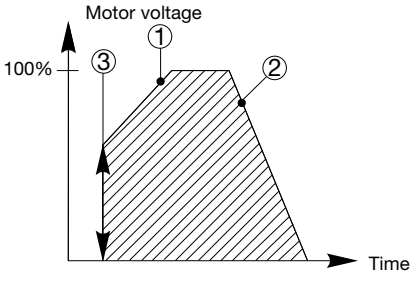


A1, A2:Control input
P1, P2:PTC input
11, 22: Alarms (NC)
21, 22: Bypass relay activation (NO)

Note: Relay terminals 11,21,22 are not used in RSHR...V20

Operation Diagram





(1) Ramp-up time 1 to 10 s. Time from zero load voltage to full load voltage.

(2) Ramp-down time 1 to 30 s. Time from full load voltage to zero load voltage.

(3) Initial torque 0 to 70% voltage at the start of the ramp-up function.

Operation Diagrams for RSHR

Diagram 1: Normal Operation

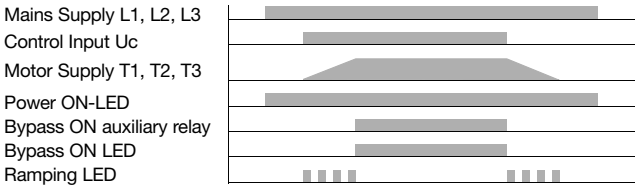


Diagram 2a: Device over-temperature alarm

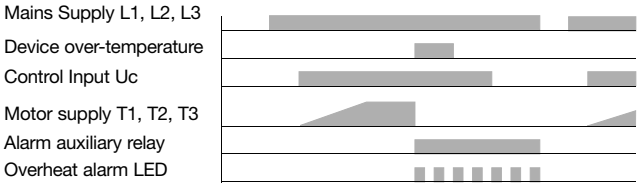


Diagram 2b: Motor PTC alarm

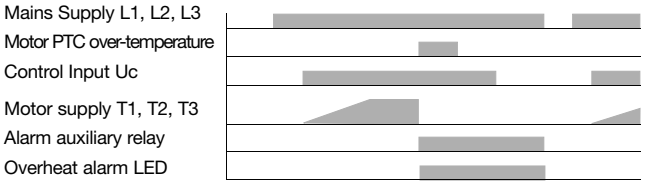


Diagram 2c: Phase loss during power up

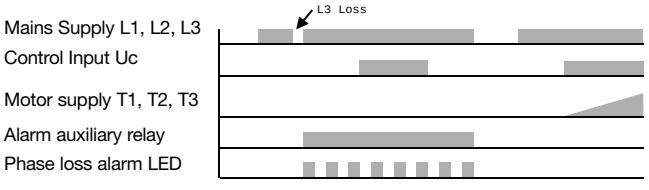


Diagram 2d: Phase loss during ramping

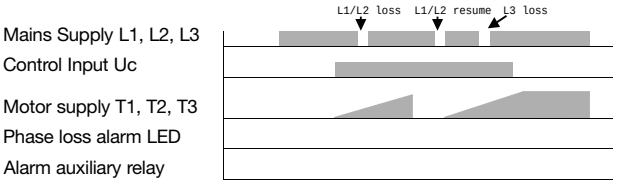


Diagram 2e: Phase loss while bypass is ON

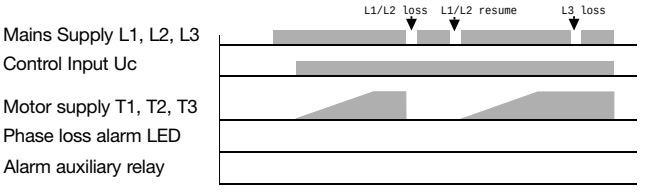
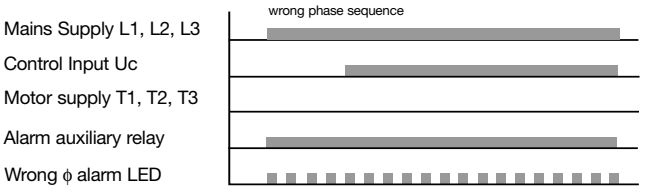


Diagram 2f: Phase loss while bypass is being activated

Diagram 2g : Wrong phase sequence alarm



Notes

Note1: After activation of the by-pass relay, there is a delay of 1 sec, during which removal of the control input will not initiate the ramp-down function.

Note 2: Cycling of the control input should be limited to a rate not exceeding 3 seconds ON and 3 seconds OFF. At faster cycling times, it is not guaranteed that the output of the unit will respond to the given input.
Important: The number of starts per hour and Overload Cycle values should always be taken into consideration when cycling is used.

Note 3: Auxiliary relays available only on RSHR...V21 types

Note 4: A phase loss on L1 or L2 causes the device to reset as these phases provide the internal power supply.

Note 5: Phase sequence and phase loss alarms are only detected if they occur during power up, when L1, L2, L3 are switched ON.

Note 6: When a motor PTC is connected, electromagnetic noise may be conducted into the unit. Thus if abnormal function is observed, the use of ferrite beads on the PTC wire (at the unit end) is recommended.

Note 7: Repetitive voltage dips on phase L1 and/or L2 during operation may lead to overheating of the motor. In case the by-pass relays are activated and the repetition rate of these dips is such that the internal supply voltage falls below a preset limit, the by-pass relays will be automatically switched off. This state is indicated by blinking of the phase loss led at 1.3Hz. Reset of the supply L1, L2 and L3 is necessary to resume normal function.

Motor Controllers
AC Semiconductor Motor Controller
Type RSHP Flexy

- **Soft starting and stopping of 3-phase induction squirrel cage motors**
- **2-phase control with integral bypassing of semi-conductors**
- **Low inrush and reduced vibration during starting**
- **User-selected ramping profiles**
- **Rated operational voltage: up to 600VAC, 50/60 Hz**
- **Rated operational current up to 45A AC-53b**
- **LED status indicators**
- **Device over-temperature protection**
- **Motor PTC protection**
- **Kickstart option for high torque loads**
- **Auxiliary relay for top of ramp and alarms**
- **DIN rail or panel mounting**

Product Description

The RSHP Flexy is a micro-processor-based softstarter for 3-phase induction motors in a compact new format. While offering versatile ramping features, Flexy is also very easy to configure. It is possible to match the start/stop ramping profiles with the functional requirements of specific motor loads. A clever push-button and LED user interface eliminates the added cost of an alphanumeric display. The RSHP Flexy uses an in-house designed system that ensures efficient power management.

Ordering Key

RSH P 40 25 C V21

- **H-line Motor Controller**
- **Push button selector**
- **Rated operational voltage**
- **Rated operational current**
- **Control voltage**
- **Options**

Selection Guide

Rated operational voltage U_e	Rated operational current I_e 25A AC-53b	38A AC-53b	45A AC-53b
220VACrms	**RSHP2225CV21**	**RSHP2238CV21**	**RSHP2245CV21**
400VACrms	**RSHP4025CV21**	**RSHP4038CV21**	**RSHP4045CV21**
480VACrms	**RSHP4825CV21**	**RSHP4838CV21**	**RSHP4845CV21**
600VACrms	**RSHP6025DV21**	**RSHP6038DV21**	**RSHP6045DV21**

Supply Specification

Rated operational voltage Ue through L1, L2, L3	RSHP22..	127/220 VAC-15% /+10%
	RSHP40..	230/400 VAC-15% /+10%
	RSHP48..	277/480 VAC-15% /+10%
	RSHP60..	346/600 VAC-15% /+10%
Rated AC frequency		50/60 Hz±10%
Dielectric strength		
Dieletric voltage		2 kV (rms)
Rated impulse withstand volt.		4 kV (1.2/50µs)

Input Specifications

Rated control input voltage Uc, A1-A2:	C: 24-550 VAC/DC
	D:24-600 +10% VAC/DC
Rated control input current	<1.5 mA
Rated AC frequency	50/60 Hz±10%
Dielectric strength	
Dielectric voltage	2kVAC (rms)
Rated impulse withstand volt.	4kV (1.2/50 µs)

Load Ratings

	RSHP..25.V21	RSHP..38.V21	RSHP..45.V21
IEC rated operational current Ie (AC-53b)	25 A	38A	45 A
Assigned motor rating @ 60°C/ UL rating @ 60°C			
RSHP22..	5.5kW / 10HP	11kW / 10HP	11kW / 15HP
RSHP40..	11kW / 15HP	18.5kW / 20HP	22kW / 25HP
RSHP48..	15kW / 20HP	22kW / 25HP	30kW / 30HP
RSHP60..	18.5kW / 25HP	22kW / 30HP	30kW / 40HP
Overload cycle according to IEC/EN 60947-4-2 @ 40°C	25A:AC-53b:4-5:65	38A: AC-53b: 4-5:85	45A: AC-53b: 4-5: 115
@ 50°C	25A:AC-53b:4-5:85	38A:AC-53b:4-5:175	45A: AC-53b: 4-5: 135
@ 60°C	25A:AC-53b:4-5:175	38A:AC-53b:4-5:355	45A: AC-53b: 4-5: 175
Number of starts per hour @ 40°C/50°C/60°C	50/35/20	40/20/10	30/25/20
Minimum load current	500mA	500mA	500mA

General Specifications

Pollution Degree	3
Weight	800g (approx.)
Degree of protection	IP20 (IEC 60 529)
Relative humidity	<95% non-condensing
Ramp up time	1...20s
Ramp down time	1...20s
Initial torque	0...70%
Kickstart	0...300ms
Status indicator LEDs:	
Power supply ON	LED, green (continuous)
Ramping	LED, yellow (intermittent)
Bypass relay ON	LED, yellow (continuous)
Over-temperature alarm	
Device alarm	LED, red (intermittent)
Motor PTC alarm	LED, red (continuous)
Wrong phase sequence*	LED, red (intermittent)
Phase loss	
Phase loss alarm*	LED, red (blinking at 4Hz)
Under voltage alarm	LED, red (blinking at 1.3Hz)
Function Parameters (ramp up etc.)	LED, yellow
Bargraph (1...10)	LED, red
Motor PTC alarm input P1, P2	Acc. to DIN 44081 and DIN 44082-1
Form designation	Form 1
Auxiliary relays:	
Bypass relay activation	Normally open (21,22)
Over-temperature, phase sequence phase loss alarm	Normally closed (11, 22)
Auxiliary relay contact capacity	3 A, 250 VAC 3 A, 30 VDC
Installation altitude	Above 1000m derate linearly by 1% of unit FLC per 100m to a maximum altitude of 2000m

* detection of these alarm conditions is made during power-up of the device

Conductor Data

Line conductors:	
L1, L2, L3/T1, T2, T3	
according to IEC 60947	0.75...16mm²
maximum size	
solid	1.5...16mm²
finely stranded with end sleeve	1.5...16mm²
stranded	1.5...25mm²
UL rated data	AWG 14...4
CSA rated data	AWG 10...6
Terminal screws	6xM5 (cage clamp)
Tightening torque	1.5...2.5 Nm /13...22 lb.in
CSA data	max. 3.0 Nm/ 26.5 lb. in
Stripping length	10 mm
Secondary conductors:	
A1, A2, 11, 21, 22, P1, P2	
according to IEC 60947	0.75...2.5mm²
maximum size	0.5...2.5mm²
UL/CSA rated data	AWG 22...14
Terminal screws	7xM3 (cage clamp)
Tightening torque	0.3...0.5 Nm/2.7...4.5 lb.in
Stripping length	6 mm

Thermal Specifications

Operating temperature	-20° to +60°C (-4° to +140°F)
Storage temperature	-50° to +85°C (-58° to +185°F)

Standards

Approvals	UL, cUL, CSA
Markings	CE
Norms	IEC/EN 60947-4-2

Recommended Protection according to IEC/EN 60 947-4-2

	RSHP..25.V21	RSHP ..38.V21	RSHP..45.V21
Type of coordination: 2 Semiconductor fuse	Ferraz Shawmut 63A, Class URQ, Art.No. 6.621 CP URQ27x60/63	Ferraz Shawmut 80A, Class URQ, Art.No. 6.621 CP URQ27x60/80	Ferraz Shawmut 100A, Class URQ, Art.No. 6.621 CP URQ27x60/100
Type of coordination: 1 Motor protection circuit breaker	ABB: MS325 -25 Telemecanique: GV2-M22 Sprecher+Schuh: KTA3-25-25A	ABB: MS450 -40 Telemecanique: GV3-ME40 Sprecher+Schuh: KTA3-100-40A	ABB: MS450 -45 Telemecanique: GV3-ME63 Sprecher+Schuh: KTA3-100-63A
RK5 fuse	TRS45R 45A	TRS70R 70A	TRS90R 90A

CARLO GAVAZZI

Wiring Diagram

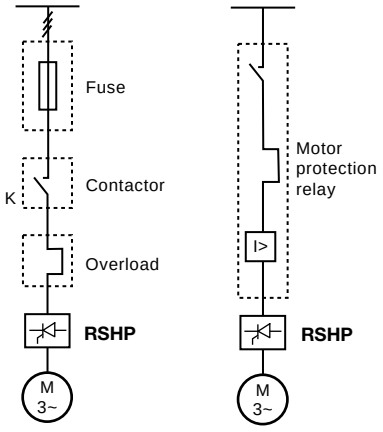


Fig. 1a

Fig. 2a

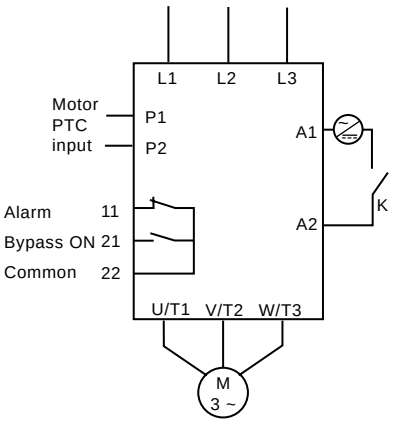


Fig. 3a

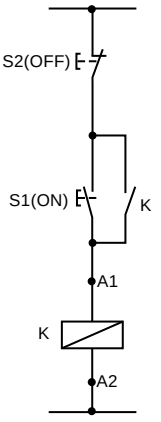


Fig. 4a

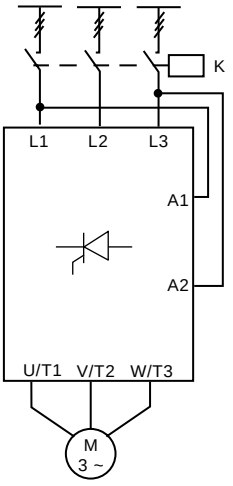


Fig. 5a

IEC

The motor controller provides by-passing of the semiconductors during running operation. Therefore the semiconductors can only be damaged by short-circuit currents during ramp-up and ramp-down. Please note that the motor controller does not isolate the motor from the mains.

Figure 1: Protection of the device when using fuses.
Protection with semiconductor fuses is intended to protect the motor feeder and motor controller from damage due to short-circuit.

Figure 2: Protection using a thermal-magnetic motor protection relay.
The motor feeder is protected but damage to the motor controller is possible. When motor failure occurs, if part of the motor winding limits the fault current and the motor feeder is protected, this type of protection can be considered acceptable.

Figure 3: Secondary conductors.
3.1: Control using a 2-position switch.
When K is closed, the control input is supplied to A1, A2 and soft starting of the motor is performed. When K is opened, soft stopping is performed.
3.2: Motor PTC input
When the motor PTC sensor is connected to P1, P2 the motor controller detects overheating of the motor windings.
3.3: Auxiliary Relays.
The Alarm relay 11, 22 (NC) can be connected in series with the supply to the coil of a mains contactor. The Bypass ON relay 21, 22 (NO) can be used in series with the supply to the coil of an external bypass contactor.

Figure 4: Control using ON and OFF push buttons
Pushing S1 soft starts the RSHP. Pushing S2 soft stops the RSHP. K is an auxiliary contact of the mains contactor.

Figure 5: Control using 2 phases
Connecting input A1, A2 to two of the incomming lines will soft start the motor when K is operated. When K is switched off, the motor will stop (no soft stop).

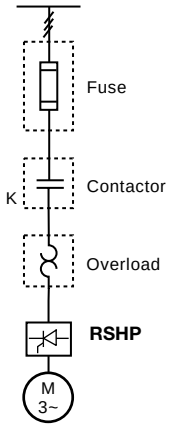


Fig. 1b

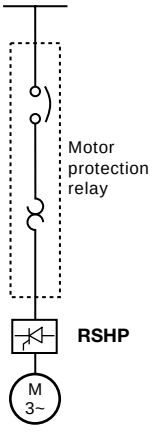


Fig. 2b

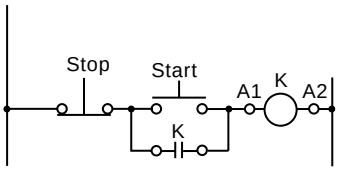


Fig. 4b

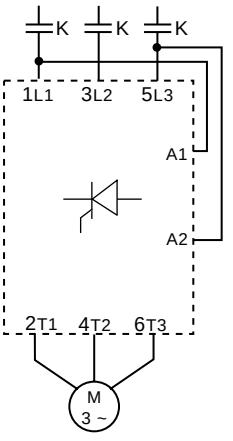
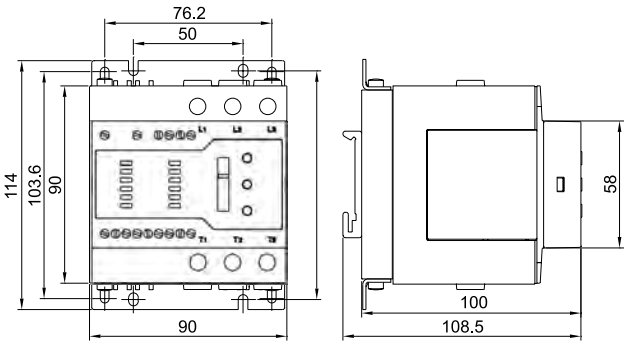


Fig. 5b

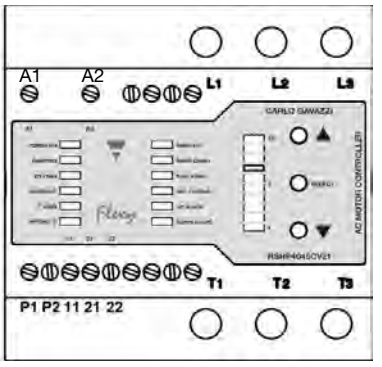
NEMA

Dimensions



All dimensions in mm

Terminal Diagram



A1, A2: Control input

21,22: Bypass relay activation (NO)

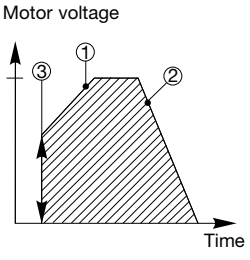
11,22: alarms (NC)

P1, P2:PTC input

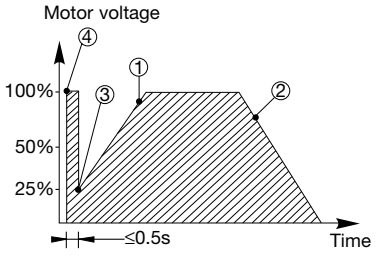
Operation Diagram

Multi ramp starting strategies suitable for all applications are designed into the RSHP

Excluding setup position [9]



Setup position [9]



① Ramp-up time: time from zero load voltage to full load voltage.

② Ramp-down time: time from full load voltage to zero load voltage.

③ Initial voltage: voltage at the start of the ramp-up function.

④ Kickstart: constant initial voltage delay before ramp-up.

Table 1: Level 1 Parameters

Bargraph LED pos.	Selection switch	Ramp-up time s	Initial voltage	Ramp-down time s
1	Default: Standard	05	30%	10
2	Pump	05	40%	15
3	Light conveyor	02	40%	10
4	Heavy conveyor	15	60%	10
5	Low inertia fan	10	30%	00
6	High inertia fan	15	50%	00
7	Piston compressor	01	50%	00
8	Screw compressor	10	40%	00
9	Kick-start	05	50%	15
10*	High Torque	05	60%	05

* These settings can be changed

Operation Diagrams for RSHP

Diagram 1: Normal Operation

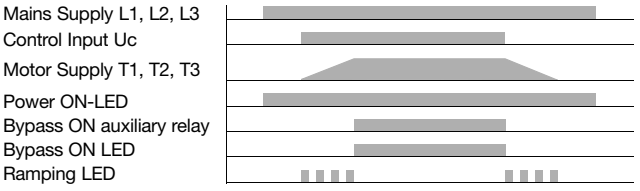


Diagram 2a: Device over-temperature alarm

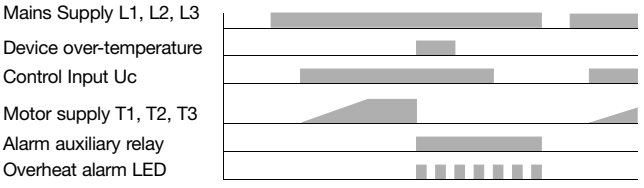


Diagram 2b: Motor PTC alarm

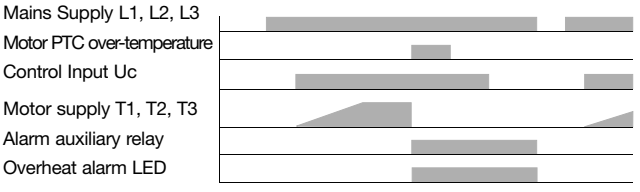


Diagram 2c: Phase loss during power up

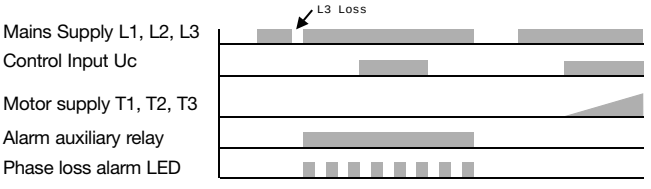


Diagram 2d: Phase loss during ramping

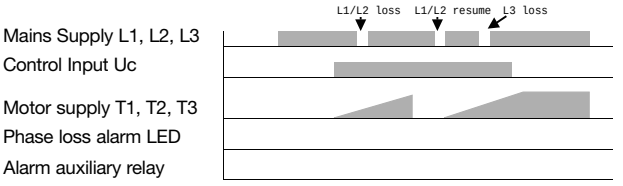


Diagram 2e: Phase loss while bypass is ON

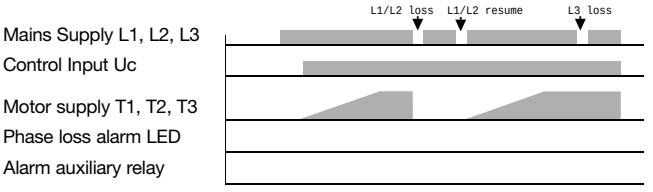
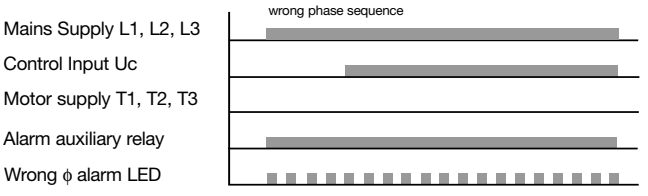


Diagram 2f: Phase loss while bypass is being activated

Diagram 2g : Wrong phase sequence alarm



Notes

Note1: After activation of the by-pass relay, there is a delay of 1 sec, during which removal of the control input will not initiate the ramp-down function.

Note 2: Cycling of the control input should be limited to a rate not exceeding 3 seconds ON and 3 seconds OFF. At faster cycling times, it is not guaranteed that the output of the unit will respond to the given input.
Important: The number of starts per hour and Overload Cycle values should always be taken into consideration when cycling is used.

Note 3: A phase loss on L1 or L2 causes the device to reset as these phases provide the internal power supply.

Note 4: Phase sequence and phase loss alarms are only detected if they occur during power up, when L1, L2, L3 are switched ON.

Note 5: When a motor PTC is connected, electromagnetic noise may be conducted into the unit. Thus if abnormal function is observed, the use of ferrite beads on the PTC wire (at the unit end) is recommended.

Note 6: Repetitive voltage dips on phase L1 and/or L2 during operation may lead to overheating of the motor. In case the by-pass relays are activated and the repetition rate of these dips is such that the internal supply voltage falls below a preset limit, the by-pass relays will be automatically switched off. This state is indicated by blinking of the phase loss led at 1.3Hz. Reset of the supply L1, L2 and L3 is necessary to resume normal function.

Ramp setting procedure

Factory DEFAULT - Plug and Play
The ramp selector is set to bargraph position 1, according to Table 1: "Level 1 Parameters".The product will be shipped with this standard ramp setting. If this setting is considered suitable, no other settings are required.

Level 1 - FACTORY PREDEFINED RAMP PARAMETERS
For this mode, the 3-phases L1,L2,L3 must be present but control A1,A2 must not be present. In this level, the user may select from 10 pre-defined ramps by selecting one of the 10 bargraph positions: 1,2,3……..9 or 10, according to Table 1: "Level 1 Parameters". Position 1 is the same as the factory DEFAULT described above. In each predefined ramp, the values for all parameters (ramp up, ramp down, initial torque, kickstart, ramp up shape and ramp down shape) are fixed by the factory against each bargraph LED position. Position 10 is factory set for "High Torque Load" (see Table 1) but can be re-programmed according to Level 2 instructions. The bargraph LED will remain ON at the selected position during operation as long as L1,L2,L3 are present, to show which ramp parameters are being used.

To enter Level 1 mode:
Press SELECT once. One bargraph LED will start flashing at the position that has been previously programmed (position 1 if the product is just out of the box).

To select the factory predefined ramp:
Use the UP and DOWN arrow buttons to move the flashing LED up or down on the bargraph.

To save and exit Level 1 mode:
To fix the new settings, press SELECT. This stores the selected ramp position and causes the device to exit Level 1. The bargraph LED remains ON at the selected position during operation as long as L1,L2,L3 are present. (If no button is pressed for several seconds, the device goes out of this setting mode automatically and above steps must be repeated).

Level 2 - RAMP CUSTOMISATION
In this level, a new combination of parameters settings (ramp up, ramp down, initial torque, kickstart, ramp up shape and ramp down shape) can be made that is not included in the pre-defined ramps of Level 1 (In Level 1 these settings have been fixed by the factory. See Table 1: Level 1 Parameters).In Level 2, each parameter of "position 10" can be re-defined individually by first selecting the parameter and then setting the bargraph level in accordance with Table 2: "Level 2 Parameters".

To enter Level 2 mode:
Press SELECT and move flashing bargaph LED to position 10. With the bargraph flashing at position 10, press and hold SELECT until the parameter LEDs scroll down twice. The Ramp Up LED will light up. Press SELECT and one bargraph LED will start flashing. Position 10 parameters can now be redefined.

To re-define position 10 parameters:
The Ramp up parameter LED must be flashing. The bargraph LED must be flashing at the position that has been previously programmed (position 7 if the product is just out of the box). Use the UP/DOWN arrow keys to move the flashing bargraph LED to the required position according to Table 2: "Level 2 Parameters" and then press SELECT. The next parameter LED (Ramp down) will start flashing to indicate that it can be adjusted.
The bargraph LED will also start flashing at the position that has been previously programmed (position 7 if the product is just out of the box). Use the arrow keys to move the flashing bargraph LED to the required position according to Table 2: "Level 2 Parameters" and then press SELECT. These steps are repeated until all parameters have been set. Ramp shapes can be selected in the same way.

To save and exit Level 2 mode:
To save and exit Level 2 selection procedure, press and hold SELECT until the parameter LEDs scroll down twice.

Running with the customised ramp:
After Level 2 procedure has been completed the device will store the parameters in position 10. The bargraph LED in position 10 will light up continuously during operation.

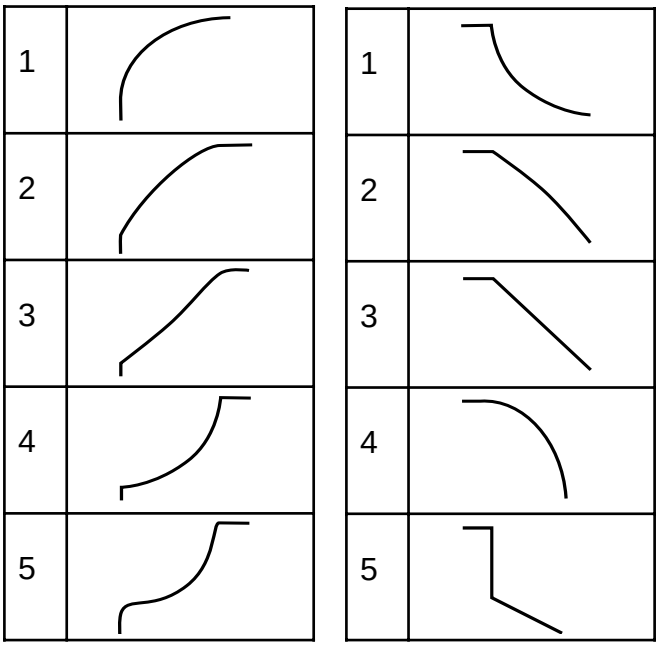
Defaults:
Enter Level 2 mode as previously described. When the bargraph LED is flashing, press and hold the UP and DOWN arrow buttons simultaneously until the parameter LEDS scroll twice. This resets all the ramp settings to factory default.

Attention!
If no button is pressed for several seconds during Level 1 or Level 2 procedures, the product goes out of the Level setting mode back to the previous ramp parameter combination.

Table 2: Level 2 Parameters

Bargraph LED pos.	Ramp up times	Rampdown times	Initial voltage	Kickstart ms	Ramp up shape	Rampdown shape
1	0.5	0.5	0%	0	1	1
2	1	1	10%	20	2	2
3	1.5	1.5	20%	40	3	3
4	2	2	30%	60	4	4
5	3	3	40%	80	5	5
6	4	4	50%	100	-	-
7	5	5	60%	150	-	-
8	10	10	70%	200	-	-
9	15	15	-	250	-	-
10	20	20	-	300	-	-

Ramp Shapes



Motor Controllers
AC Semiconductor Motor Controller
Type RSHR 3-Phase

- **Soft starting and stopping of 3-phase squirrel cage motors**
- **Control of all 3 phases**
- **In Line or In Delta motor connection**
- **Low inrush and reduced vibration during starting**
- **External power supply option for a wide operational voltage range**
- **Rated operational voltage: up to 600 VAC, 50/60 Hz**
- **Rated operational current: up to 32A AC-53a**
- **LED status indicators**
- **Motor PTC protection**
- **Device over-temperature protection**
- **DIN rail mounting***

*** Accessory for panel mounting available**

Product Description

Compact, digital AC semiconductor motor controller. When used on a typical 400VAC supply, this controller can soft-start and soft-stop 3-phase motors up to 22kW (30HP) when connected In Delta and up to 15kW (20HP) when connected In Line. All 3-phases are switched. Starting and stopping time as well as initial torque can be independently adjusted by potentiometers on the facia. A version adapted for starting Scroll Compressors is also available.

This device does not include internal bypass relays but provides a relay contact to help energise an external bypass contactor.

Ordering Key

RSHR 48 32 C V33

H-line Motor Controller
Rotary Ramp profile setting
Rated operational voltage
Rated operational current
Control voltage
Options

Type Selection

Type	Rated Operational Voltage Ue	Rated operational Current Ie	Control Voltage Uc	Options
RSHR: H-line motor controller with rotary settings	22: 127/220VACrms, 50/60Hz 40: 230/400VACrms, 50/60Hz 48: 277/480VACrms, 50/60Hz 60: 346/600VACrms, 50/60Hz M: 220-480VACrms, 50/60Hz* 400-480VACrms, 50/60Hz*	25: 25A AC-53a 32: 32A AC-53a	C: 24 - 550VAC/DC D: 24 - 660VAC/DC	V32: In Line V33: In Delta V34: In Line with external supply V35: In Delta with external supply V38: In Line, Scroll Compressors

* requires external supply

Selection Guide

Rated operational voltage Ue	Control Voltage Uc	Supply Voltage Us	Connection	Rated operational current Ie @ 40°C 25A AC-53a	32A AC-53a
220VACrms	24-550VAC/DC	-	In Line	**RSHR2225CV32**	**RSHR2232CV32**
			In Delta	**RSHR2225CV33**	**RSHR2232CV33**
400VACrms	24-550VAC/DC	-	In Line	**RSHR4025CV32**	**RSHR4032CV32**
			In Line	**RSHR4025CV38**	**RSHR4032CV38**
			(Scroll Compressors)		
		-	In Delta	**RSHR4025CV33**	**RSHR4032CV33**
480VACrms	24-550VAC/DC	-	In Line	**RSHR4825CV32**	**RSHR4832CV32**
		-	In Delta	**RSHR4825CV33**	**RSHR4832CV33**
600VACrms	24-660VAC/DC	-	In Line	**RSHR6025DV32**	**RSHR6032DV32**
		-	In Delta	**RSHR6025DV33**	**RSHR6032DV33**
400-480VACrms	24-550VAC/DC	24VAC/DC	In Line	**RSHRM25CV34**	**RSHRM32CV34**
220-480VACrms	24-550VAC/DC	24VAC/DC	In Delta	**RSHRM25CV35**	**RSHRM32CV35**

Motor Ratings - In Line

	RSHR..25.V3.	RSHR..32.V3.
Assigned motor rating / UL rating @ 40°C		
220VACrms	5.5kW / 7.5HP	9kW / 10HP
400VACrms	11kW / 10HP	15kW / 20HP
480VACrms	11kW / 15HP	18.5kW / 25HP
600VACrms	18.5kW / 20HP	22kW / 30HP
Assigned motor rating / UL rating @ 50°C		
220VACrms	5.5kW / 7.5HP	5.5kW / 7.5HP
400VACrms	11kW / 10HP	11kW / 15HP
480VACrms	11kW / 15HP	15kW / 20HP
600VACrms	15kW / 20HP	20kW / 25HP
Assigned motor rating / UL rating @ 60°C		
220VACrms	4kW / 5HP	4kW / 5HP
400VACrms	7.5kW / 10HP	7.5kW / 10HP
480VACrms	9kW / 10HP	9kW / 10HP
600VACrms	11kW / 15HP	11kW / 15HP

Motor Ratings - In Delta

	RSHR..25.V3.	RSHR..32.V3.
Assigned motor rating / UL rating @ 40°C		
220VACrms	11kW / 15HP	15kW / 20HP
400VACrms	20kW / 20HP	22kW / 30HP
480VACrms	22kW / 30HP	30kW / 40HP
600VACrms	30kW / 40HP	45kW / 50HP
Assigned motor rating / UL rating @ 50°C		
220VACrms	11kW / 10HP	11kW / 15HP
400VACrms	18.5kW / 20HP	22kW / 25HP
480VACrms	22kW / 25HP	22kW / 30HP
600VACrms	30kW / 30HP	30kW / 40HP
Assigned motor rating / UL rating @ 60°C		
220VACrms	7.5kW / 10HP	7.5kW / 10HP
400VACrms	11kW / 15HP	11kW / 15HP
480VACrms	15kW / 20HP	15kW / 20HP
600VACrms	22kW / 25HP	22kW / 25HP

Load Ratings

	RSHR2225CV3. RSHR4025CV3.	RSHR4825CV3. RSHR6025DV3. RSHRM25CV3.	RSHR..32.V3.
Rated operational current Ie (AC-53a) **@ 40°C** surrounding temp.	25 A	25 A	32 A
Overload cycle according to EN/IEC 60947-4-2 @ 40°C	25A: AC-53a: 4-4: 50-7	25A: AC53a: 4-4: 50-3	32A: AC-53 a: 4-4: 50-50
Number of starts per hour @ 40°C*	7	3	50
Rated operational current Ie (AC-53a) **@ 50°C** surrounding temp.	23 A	23 A	27 A
Overload cycle according to EN/IEC 60947-4-2 @ 50°C	23A: AC-53a: 4-4: 50-6	23A: AC-53a: 4-4: 50-3	27A: AC-53a: 4-4: 50-70
Number of starts per hour @ 50°C*	6	3	70
Rated operational current Ie (AC-53a) **@ 60°C** surrounding temp.	18 A	18 A	18 A
Overload cycle according to EN/IEC 60947-4-2 @ 60°C	18A: AC-53 a: 4-4: 50-50	18A: AC-53 a: 4-4: 50-30	18A: AC-53 a: 4-4: 50-215
Number of starts per hour @ 60°C*	50	30	215
Minimum load current	500 mA	500 mA	500 mA

* Refer to Overload Cycle and Starting Duty Section for the allowable no. of starts at various load currents

Conductor Data

Line conductors: **L1, L2, L3/T1, T2, T3**	
according to IEC 60947	0.75...16mm²
maximum size	
solid	1.5...16mm²
finely stranded with end sleeve	1.5...16mm²
stranded	1.5...25mm²
UL/CSA rated data	AWG 14...4
Terminal screws	6xM5 (cage clamp)
Tightening torque	1.5...2.5 Nm /13...22 lb.in
Stripping length	10 mm
Secondary conductors: **A1, A2, A3, A4, 11, 21, 22, P1, P2**	
according to IEC 60947	0.75...2.5mm²
maximum size	0.5...2.5mm²
UL/CSA rated data	AWG 22...12
Terminal screws	9xM3 (cage clamp)
Tightening torque	0.3...0.5 Nm/2.7...4.5 lb.in
Stripping length	6 mm

Standards

Approvals	UL, cUL (E172877) pending
Markings	CE
Norms	LVD; EN 60947-4-2 EMCD; EN 60947-4-2

Environmental Specifications

Operating temperature	-20°C to +60°C (-4°F to +140°F)
Storage temperature	-50°C to +85°C (-58°F to +185°F)
Relative humidity	<95% non-condensing @40°C
Pollution Degree	3
Degree of Protection	IP20 (EN/IEC 60529)
Installation Category	III
Installation Altitude	Above 1000m derate linearly by 1% of unit FLC per 100m to a maximum altitude of 2000m

External Supply Specifications*

External supply voltage	24VDC/AC +/-20%
Rated AC frequency	50/60Hz +/-10%
Dielectric strength	
Dielectric withstand voltage	
Supply (A3, A4) to output	2.5 kV
Supply (A3, A4) to input	4 kV
Supply (A3, A4) to heatsink	4 kV

* Applies to RSHRM models only

Supply Specification

Rated operational voltage Ue through L1, L2 L3	
RSHR22..	127/220VAC -15% / +10%
RSHR40..	230/400VAC -15% / +10%
RSHR48..	277/480VAC -15% / +10%
RSHR60..	346/600VAC -15% / +10%
RSHRM...V34	400-480VAC -15% / +10%
RSHRM…V35	220-480VAC -15% / +10%
Rated AC frequency	50/60Hz +/-10%
Rated insulation voltage	630V
Dielectric strength	
Dielectric withstand voltage	
Supply to input	4 kVrms
Supply to heatsink	4 kVrms
Rated impulse witshtand voltage	6 kV (1.2/50µs)

Input Specifications

Rated control input voltage Uc, A1:A2	
RSHR….CV3.	24 - 550VAC/DC
RSHR60..DV3.	24-600 +10% VAC/DC
Max. control input current	3.0 mA
Rated AC frequency	50/60Hz +/-10%
Response time input to output	350 ms
Dielectric strength	
Dielectric withstand voltage	
Input to heatsink	4 kVrms
Rated impulse witshtand voltage	6 kV (1.2/50µs)

General Specifications

Ramp up time	1…10s
RSHR...V38	0...1s
Ramp down time	0…30s
RSHR...V38	0...1s
Initial torque	0…70%
Status indicator LEDs	
Power supply ON	LED, green (continuous)
Ramping	LED, yellow (intermittent)
End of ramp	LED, yellow (continuous)
Ramp/ End*1 (RSHR...V38)	LED, yellow (intermittent/continuous)
Delay*1 (RSHR...V38)	LED, yellow (continuous)
Over-temperature alarm	
Device alarm	LED, red (intermittent)
Motor PTC alarm	LED, red (continuous)
Wrong phase sequence*2	LED, red (intermittent)
Phase loss	
Phase loss alarm*2, 3	LED, red (blinking at 2Hz)

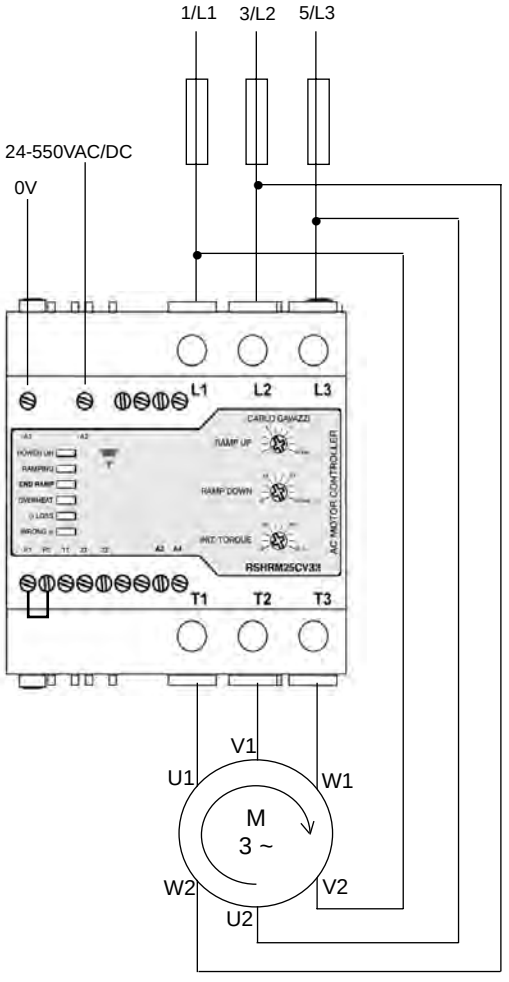
Motor PTC alarm input P1, P2	Acc. to DIN 44081 and DIN 44082-1
Form designation	Form 1
Auxiliary relays:	
End of ramp relay activation	Normally open (21,22)
Over-temperature, phase sequence, phase loss alarm	Normally closed (11, 22)
Auxiliary relay contact capacity	3 A, 250 VAC 3 A, 30 VDC
Weight	approx. 1.3kg
Housing material	conforms to UL 94 V0
Mounting	DIN Rail 35 mm

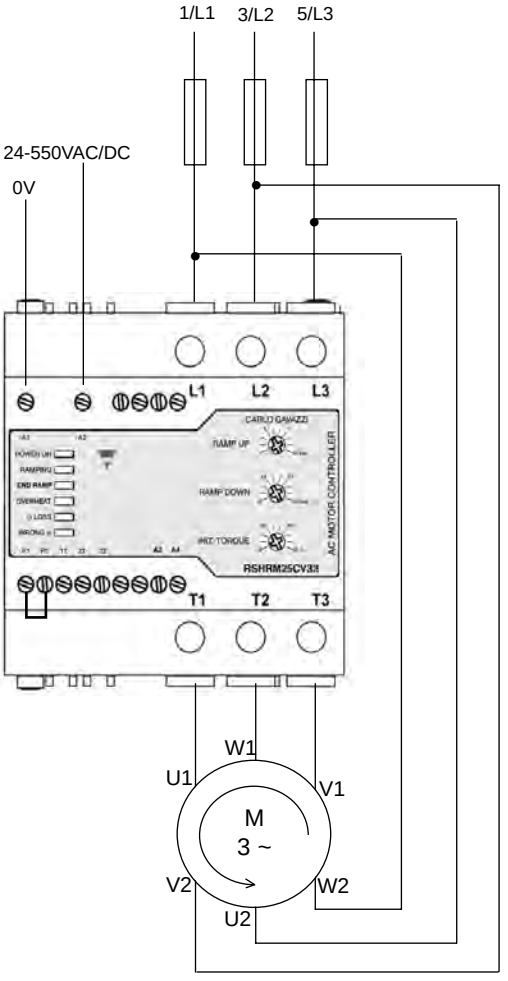
*1 In the RSHR...V38 versions, the same LED is used to indicate both Ramping and End Ramp status. When the RSHR is in ramping mode, the LED will be intermittently ON. Once the Ramping is completed, the same LED will go fully ON indicating End of Ramp. The delay feature available in the RSHR...V38 does not allow the compressor to start prior to 5 mins. from last ramp down. During this waiting period the Delay LED will be continously ON.

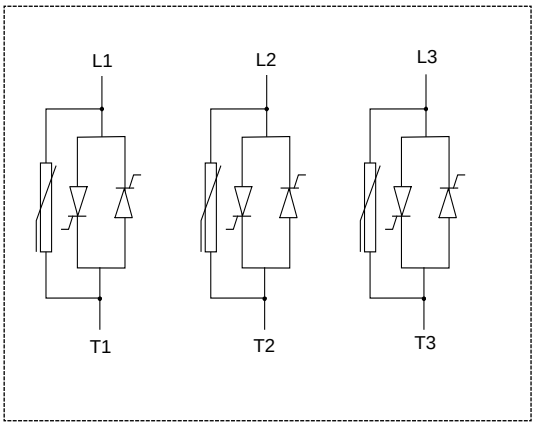
*2 Detection of these alarm conditions is made during power-up of the device.

*3 Phase loss alarm applies on loss of L3 only. For RSHRM, phase loss alarm applies on loss of any of the 3 phases (L1, L2 or L3). During operation, the RSHRM will issue an alarm and performs shut down in case ALL 3 phases are lost. This will prevent a DOL start when the supply is restored, in case the 24V external supply remains present.

Connection Diagram - In Delta

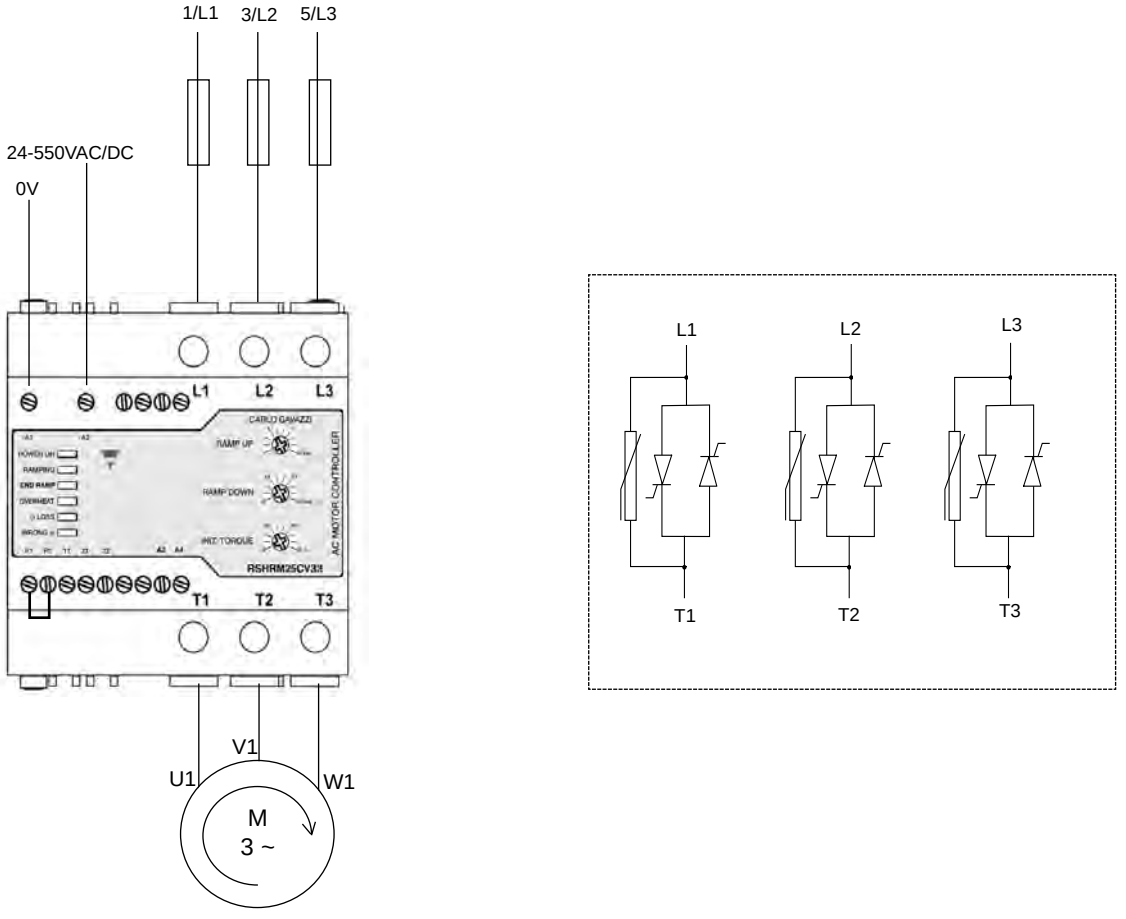






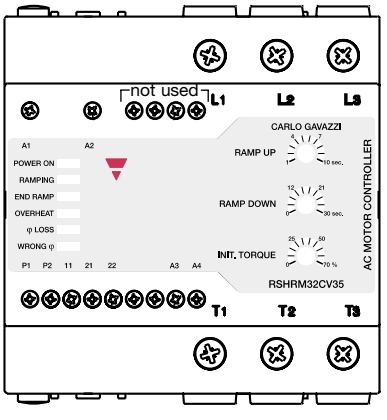
NOTES:
1. A3, A4 24VAC/DC used only for RSHRM models
2. A1, A2 24-660VAC/DC for RSHR60..DV33 models
3. In order to have the motor rotating in an another direction it is necessary to swap 2 motor windings as indicated.

Connection Diagram - In Line



NOTES:
1. A3, A4 24VAC/DC used only for RSHRM models
2. A1, A2 24-660VAC/DC for RSHR60..DV32 models

Terminal Diagram



A1, A2:Control input

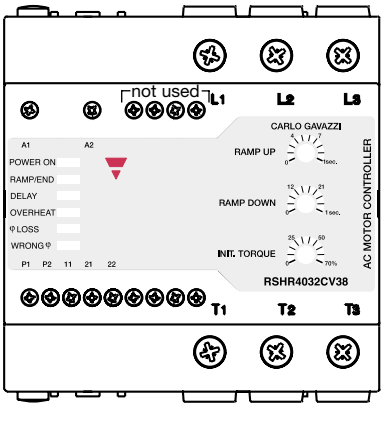
A3, A4: External supply

P1, P2:PTC input

11, 22: Alarms (NC)

21, 22: End Ramp relay activation (NO)

Note: A3, A4 are only used for the RSHRM... versions



A1, A2:Control input

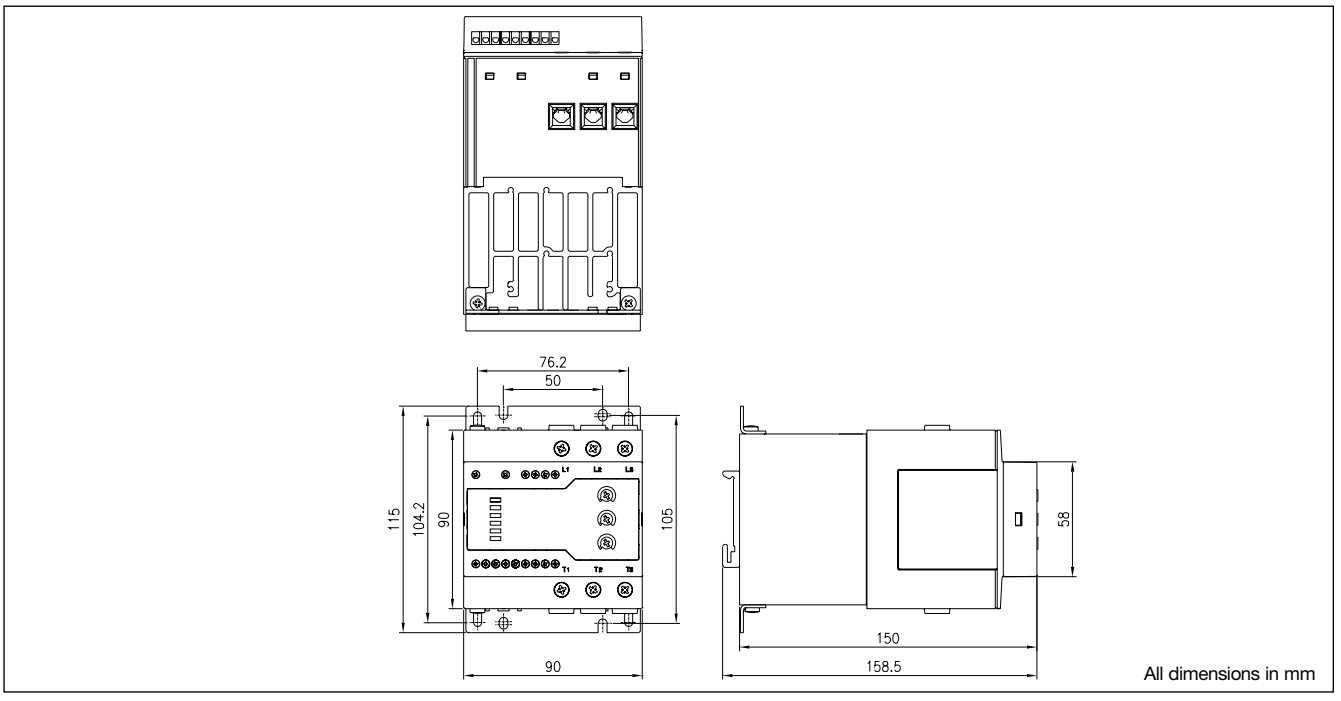
P1, P2:PTC input

11, 22: Alarms (NC)

21, 22: End Ramp relay activation (NO)

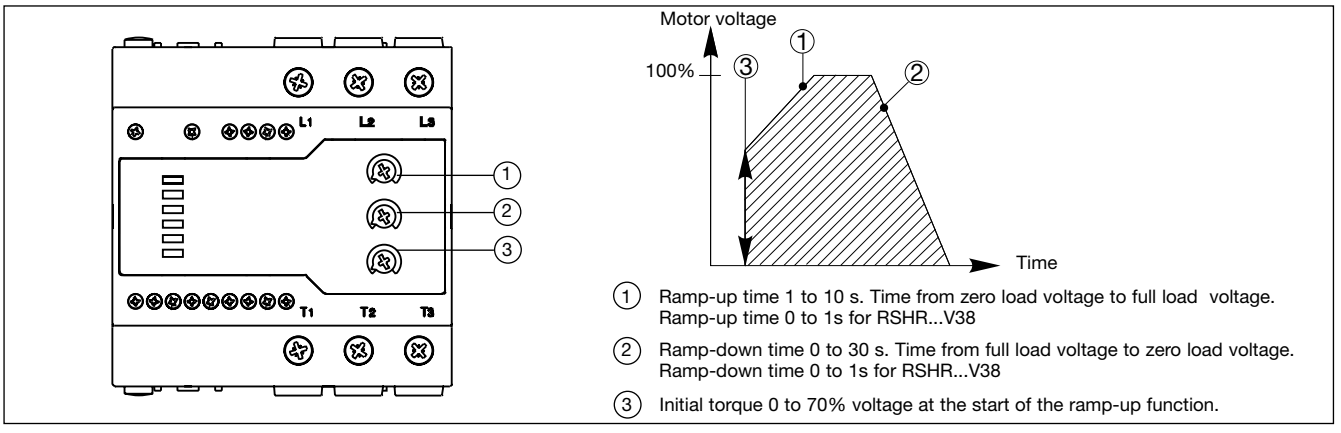
Note: Applies only to RSH...V38 versions

Dimensions



NOTE: Panel mounting bracket is an accessory that has to be ordered separately

Operation Diagram



(1) Ramp-up time 1 to 10 s. Time from zero load voltage to full load voltage.
Ramp-up time 0 to 1s for RSHR...V38

(2) Ramp-down time 0 to 30 s. Time from full load voltage to zero load voltage.
Ramp-down time 0 to 1s for RSHR...V38

(3) Initial torque 0 to 70% voltage at the start of the ramp-up function.

Short circuit protection

	RSHR..25.V3.	RSHR..32.V3.
Type of coordination: 2 Rated short circuit current	10 kA when protected by semiconductor fuse	10 kA when protected by semiconductor fuse
Semiconductor fuse	Ferraz Shawmut model, A70 QS60-4	Ferraz Shawmut model, A70 QS100-4

Wiring Diagram

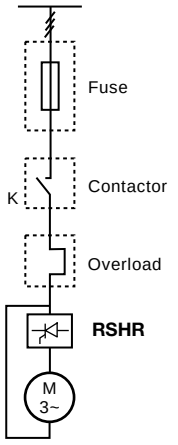


Fig. 1a

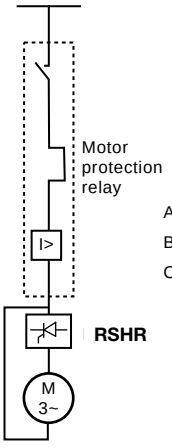


Fig. 2a

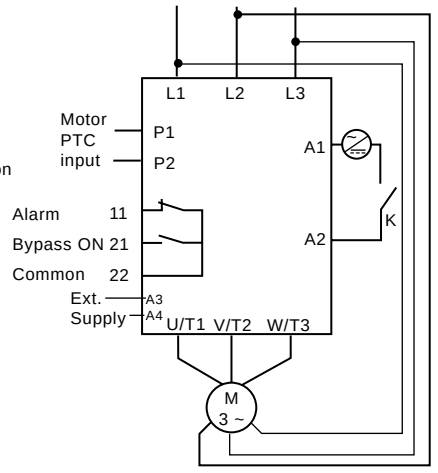


Fig. 3a

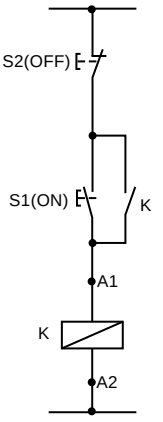


Fig. 4a

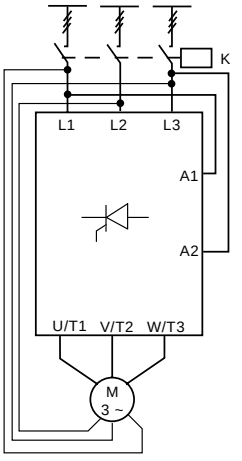


Fig. 5a

IEC

The RSHR 3-Phase does not include internal bypass relays. As such semiconductors can be damaged by short-circuit currents during Ramp up, Ramp Down and Running. Please note that the motor controller does not isolate the motor from the mains.

Figure 1: Protection of the device when using fuses.
Protection with semiconductor fuses is intended to protect the motor feeder and motor controller from damage due to short-circuit.

Figure 2: Protection using a thermal-magnetic motor protection relay.
The motor feeder is protected but damage to the motor controller is possible. When motor failure occurs, if part of the motor winding limits the fault current and the motor feeder is protected, this type of protection can be considered acceptable.

Figure 3: Secondary conductors.
3.1: Control using a 2-position switch
When K is closed, the control input is supplied to A1, A2 and soft starting of the motor is performed. When K is opened, soft stopping is performed.

3.2: Motor PTC input
When the motor PTC sensor is connected to P1, P2 the motor controller detects overheating of the motor windings.

3.3: Auxiliary Relays
The Alarm relay 11, 22 (NC) can be connected in series with the supply to the coil of a mains contactor. The End of Ramp relay 21, 22 (NO) can be used in series with the supply to the coil of an external bypass contactor.

Figure 4: Control using ON and OFF push buttons
Pushing S1 soft starts the RSHR. Pushing S2 soft stops the RSHR. K is an auxiliary contact of the mains contactor.

Figure 5: Control using 2 phases
Connecting input A1, A2 to two of the incomming lines will soft start the motor when K is operated. When K is switched off, the motor will stop (no soft stop).

Note: In the indicated wiring diagram the RSHR is configured In Delta. Models RSHR...V32/V34/V38 should be configured In Line as shown in the Connection diagram

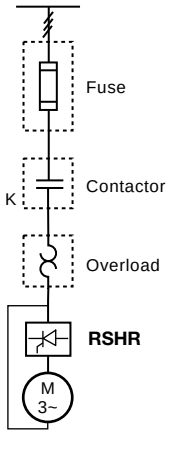


Fig. 1b

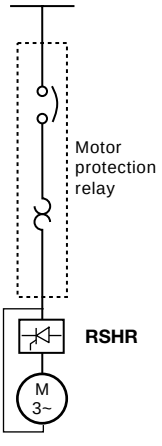


Fig. 2b

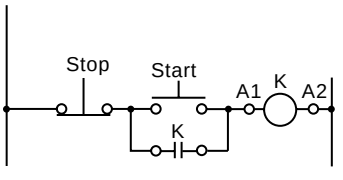


Fig. 4b

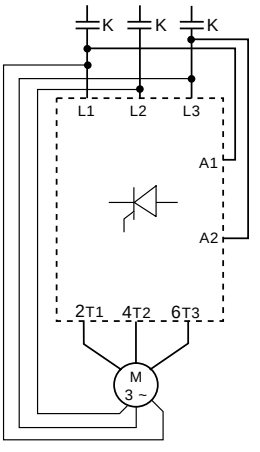


Fig. 5b

NEMA

Operations diagram for RSHR 3-Phase

Diagram 1a: Normal Operation

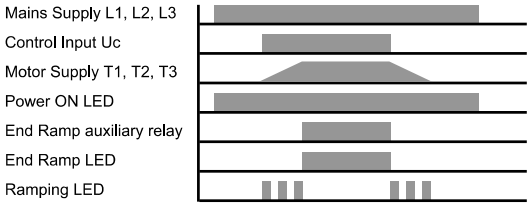


Diagram 1b: Normal Operation for RSHRM models

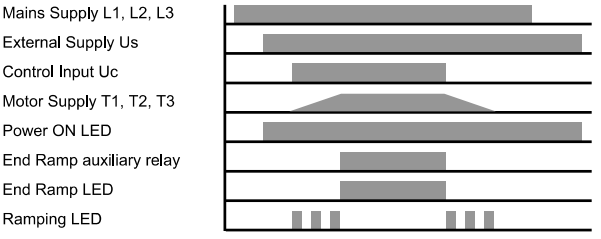


Diagram 2a: Device over-temperature alarm

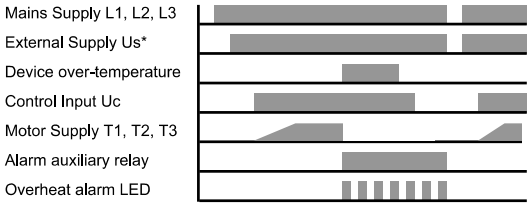


Diagram 2b: Motor PTC alarm

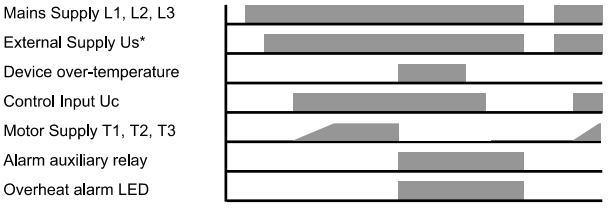


Diagram 2c: Phase sequence

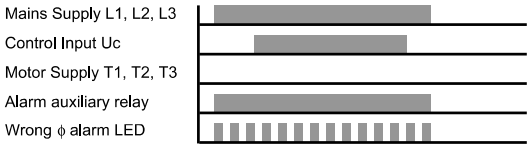


Diagram 2d: Phase sequence for RSHM models

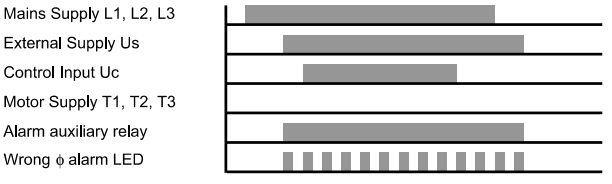


Diagram 2e: Phase loss on POWER UP

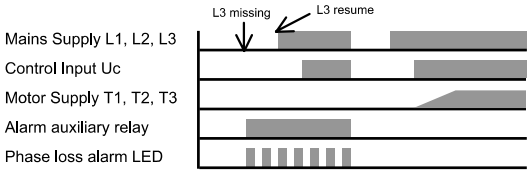


Diagram 2f: Phase loss on POWER UP for RSHRM models

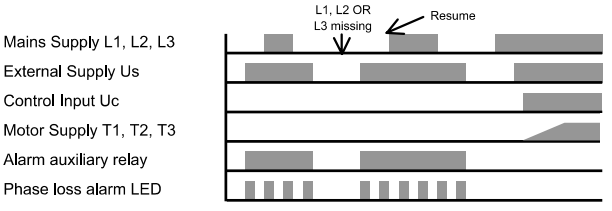


Diagram 2g: Phase loss during OPERATION

Diagram 2h: Phase loss during OPERATION for RSHM models

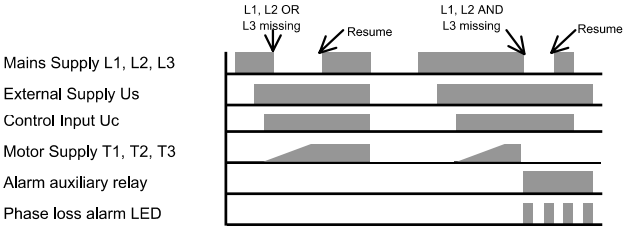


Diagram 3a: Normal Operation for RSHR..V38 models

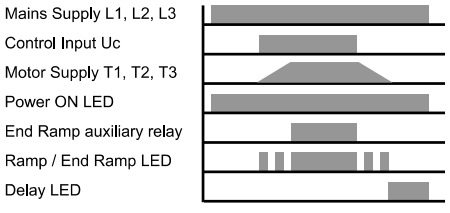
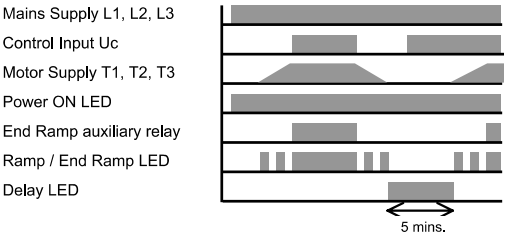


Diagram 3b: Delay ON



* External supply applies to RSHRM models only

Operations diagram for RSHR 3-Phase (cont.)

Notes:

Note 1: In the RSHRM models, the POWER ON Led does not give any indication to the presence of the mains voltage at L1, L2 and L3, since it goes ON only once the external supply is applied.

Note 2: The number of starts per hr. and overload cycle values should always be taken in consideration when the control input is cycled.

Note 3: Over-temperature is checked before Phase loss and Phase sequence alarms. The alarms will be activated as soon as the supply is applied.

Note 4: Apart from the RSHRM models, a Phase loss on L1 or L2 will cause the device to reset.

Note 5: When a motor PTC is connected, electromagnetic noise may be conducted into the unit. Thus if abnormal function is observed, the use of of ferrite beads on the PTC wire (at the unit end) is recommended.

Note 6: Phase loss and Phase sequence are only checked on start up. In the case of the RSHRM, a phase loss of ALL 3 phases is detected during operation (ramping and running).

Note 7: Following Ramp Down, the Delay LED remains on for 5 mins. or until the mains supply is present, whichever is the shortest. The compressor will not start in case of an attempt to start during the Delay period. Once the 5 mins. have elapsed the compressor will start as long as the control signal remains present.

Overload Cycle & Starting Duty

Overload profile

In: AC-53a: x- Tx : F-S
where: In = nominal current through RSHR
x = overload current as a multiple of In
Tx = duration time for the controlled overload currents during starting
F = duty cycle (expressed as a percentage)
S = no of starts/hr.

The following tables indicate the allowable no. of starts as per Overload profile: In: AC-53a: 4-4: 50-S

Table 1: RSHRxx25CV3., where xx = 22 or 40

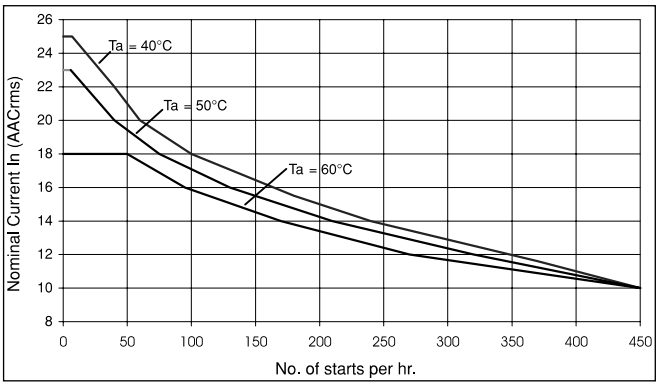


Table 2: RSHRxx25yV3., where xx = 48, 60 or M and y = C or D

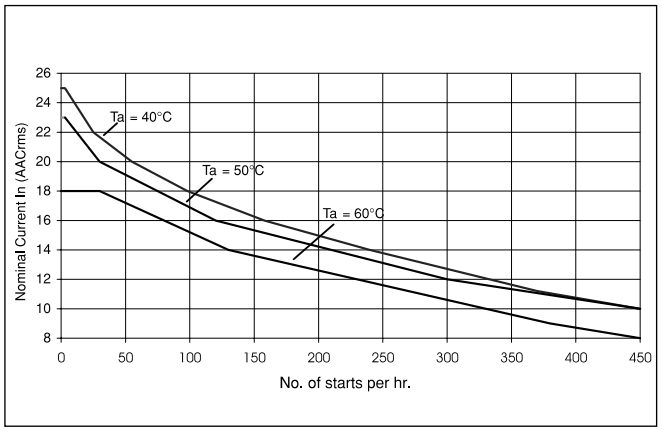
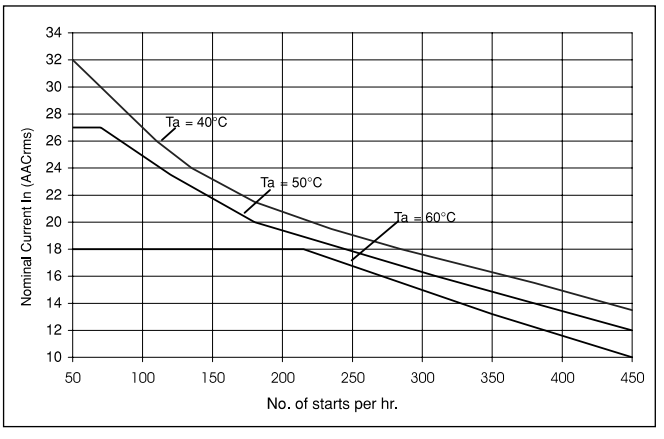
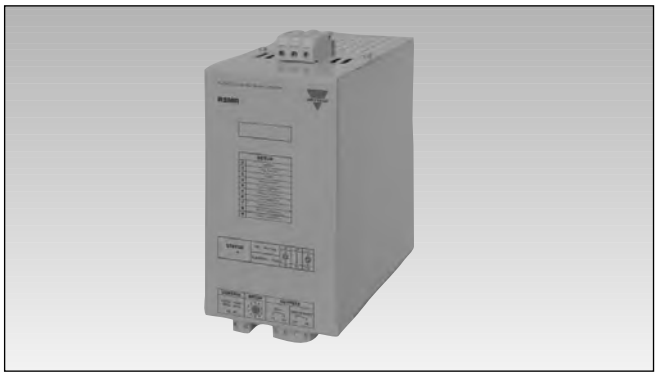


Table 3: RSHRxx32yV3., where xx = 22, 40, 48, 60 or M and y = C or D



Motor Controllers
AC Semiconductor Motor Controller
Type RSMR



- **Soft starting and stopping of 3-phase squirrel cage motors**
- **2 Phase controlled (without bypass relay)**
- **Reliable microprocessor control**
- **10 pre-programmed ramping profiles**
- **Rated operational voltage up to 480VAC, 50/60 Hz**
- **Rated operational current up to 90A AC-53a**
- **LED status indicator**
- **Kickstart option for high torque loads**
- **Auxiliary relays for top of ramp and run**
- **Phase loss protection at starting**
- **Over-current "shear-pin" protection**

Product Description

The RSMR is a microprocessor based soft starter for 3-phase induction motors. A rotary knob enables selection from 10 pre-programmed ramping profiles. The choice is suggested by a list of popular applications that corresponds to the positions of the selector. No external supply is necessary as starting and stopping are controlled by closing and opening a contact.

Ordering Key

RSM R 40 90

M-line Motor Controller
Rotary ramp selector
Rated operational voltage
Rated operational current

Selection Guide

Rated operational voltage U_e	Rated operational current I_e 72A AC-53a	90A AC-53a
340-506 VAC, 50/60 Hz	**RSMR4072**	**RSMR4090**

Supply Specification

Rated operational voltage Ue through L1, L2, L3	340-506VAC rms
Rated AC frequency	50/60 Hz ±2Hz

Input Specifications

Control supply	Internal
Control contacts S0, S1	close to start, open to stop
Soft Stop Control	no more than 3m from enclosure

Load Ratings

		RSMR4072	RSMR4090
IEC rated operational current Ie (AC-53a) @ 40/50/60°C		72/57/43 A	90/72/54 A
Assigned motor rating @ 40°C			
	400V	37kW/50HP	45kW/60HP
	460V	40kW/54HP	45kW/60HP
Overload cycle to IEC/EN 60 947-4-2		72A: AC-53a: 5-4: 99-10	90A: AC-53a: 5-4: 99-10
Power dissipation at rated operational current		119W	144W
Number of starts per hour @ 40°C		10 (starting interval 6 minutes)	
Start duty		5 x FLC for 4 seconds 4 x FLC for 6 seconds 3 x FLC for 12 seconds 2 x FLC for 26 seconds	
Shear-pin cut-off level		currents in excess of 5 x FLC for 500ms	

General Specifications

Degree of protection	IP20 (IEC 60529)
Relative humidity max.	85% non-condensing, not exceeding 50% @ 40°C
Rated insulation voltage Ui	460V
Pollution degree	3
Ramp up time	1 to 15s
Ramp down time	0 to 15s
Application selection	10 position rotary switch
Status indicator LED	red continuous: active, red intermittent: fault
Auxiliary relay contacts	
Run 13,14	Normally open
Top of ramp 23,24	Normally open
Auxiliary relay contact capacity	5A, 250V AC1
Installation altitude	Above 1000m derate linearly by 1% of unit FLC per 100m to a maximum altitude of 2000m
Form Designation	Form 1
Rated Short Circuit Current (Iq)	20kA
Short Circuit Co-ordination	Type 1

Conductor Data

Power conductors	
Size	16mm² to 35mm² (AWG 6 to 2)
Tightening torque	≤2.5Nm
Screw driver	Flat, size 7
Auxiliary conductors	
Size	0.5mm² to 2.5mm² (AWG 20 to 14)
Tightening torque	≤0.5Nm
Screw driver	Flat, size 3
Ground/earth conductor	1.0mm² or 5mm earth stud

Thermal Specifications

Operating temperature*	0° to +40°C (32° to +140°F)
Storage temperature	-25° to +60°C (-13° to +140°F)

* Above 40°C derate linearly by 1% of unit FLC per 100m to a max. of 40% at 60°C.

EMC Emission and Immunity Levels

ESD immunity	IEC 61000-4-2 6kVcontact or 8kV air discharge
R F immunity	IEC 61000-4-6 140dBuV over 0.15-80MHz
R F immunity	IEC 61000-4-3 10V/m over 80/1000MHz
Fast transient immunity	IEC 61000-4-4 2kV/5kHz
Surge immunity	IEC 61000-4-5 2kV line to gound 1kV line to line
Conducted RF emissions	EN55011 Class A
Radiated RF emissions	EN55011 Class A

Standards

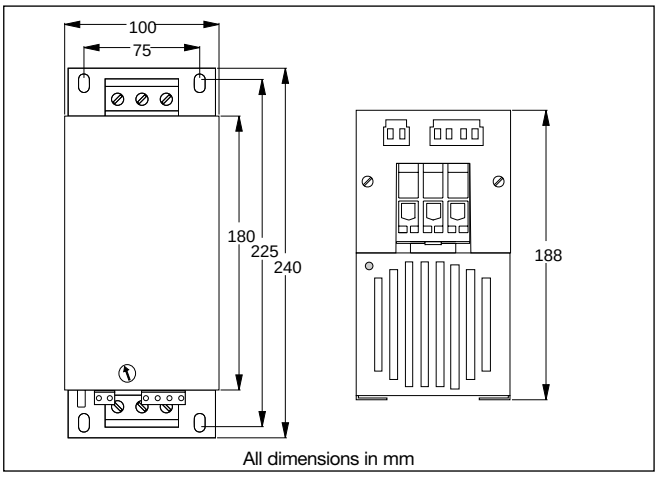
Markings	CE
Norms	IEC/EN 60947-4-2

Recommended Protection

	RSMR..72
Semiconductor fuse	Ferraz Shawmut, type PSC 250 A, body size 31, Art.No. 6,6URD31D11A0250 or 6,6URD31EF0250
	Bussmann, type Zilox, 250 A, body size 1, Art.No. 170M3116

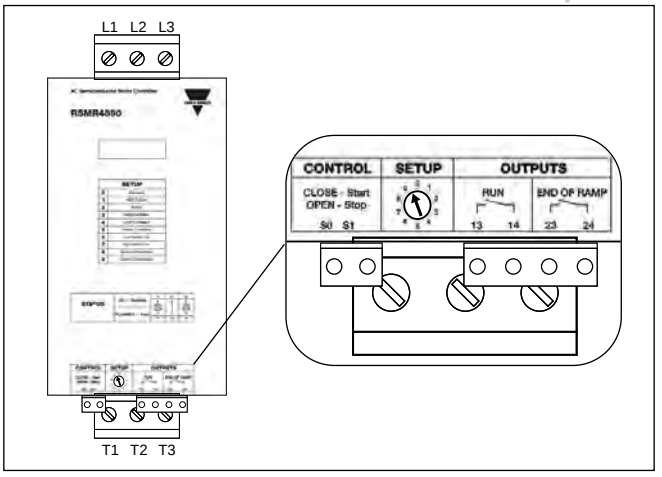
	RSMR..90
Semiconductor fuse	Ferraz Shawmut, type PSC 250 A, body size 31, Art.No. 6,6URD31D11A0250 or 6,6URD31EF0250
	Bussmann, type Zilox, 250A, body size 1, Art.No. 170M3116

Dimensions



All dimensions in mm

Terminal Diagram



Control Diagrams and Applications

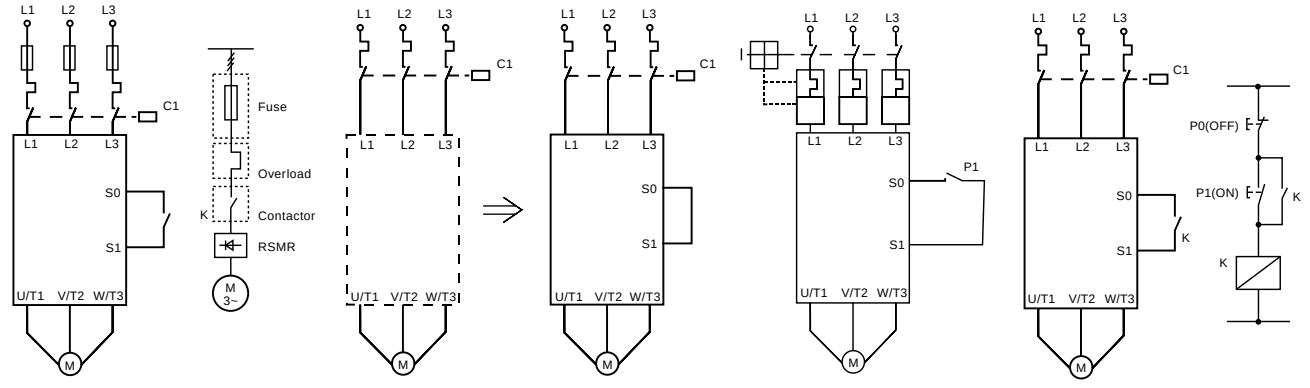


Fig. 1 Main circuit with fuse

Fig. 2 Starting via mains contactor

Fig. 3 Control by external switch

Fig.4 Control via auxiliary contact

Fusing Considerations
(Fig.1)
This motor controller uses semiconductors during running operation. Therefore the semiconductors can be damaged by short-circuit currents. The best protection is with semiconductor fuses.

Changing from Direct ON Line start to soft start (Line controlled soft-start)
(Fig. 2)
Changing a Direct On Line start into a soft start is very simple with the RSMR soft starter:

1) Cut the cable to the motor and insert the RSMR soft starter.
2) Short the control input S0, S1 with the link provided
3) Power up again - adjust the start torque so the motor starts turning immediately after power is applied.

When C1 is operated, the motor controller will perform soft-start of the motor. When C1 is switched off, the motor will stop (no soft-stop), the motor controller will reset and a new soft-start can be performed.
Please note that the controller does not insulate the motor from the mains. A mains contactor C1 is therefore needed.

Soft-start and stop with 2 position switch
(Fig. 3)
When P1 is closed, soft-start of the motor will be performed according to the setting of the rotary setup knob. When P1 is opened, soft-stop will be performed according to the setting of the rotary setup knob.

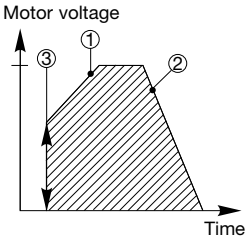
Soft-start and stop with push-to-make and push-to-break switches
(Fig. 4)

Pushing P1 soft-starts the RSMR. Pushing P0 soft-stops the RSMR. K is the auxiliary contact of an external mains contactor.

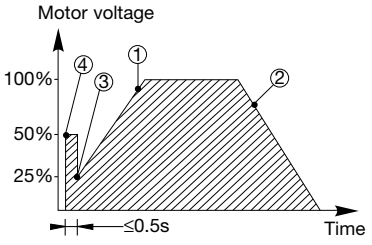
Operation Diagram

Multi ramp starting strategies suitable for all applications are designed into the RSMR

Excluding setup position [3]



Setup position [3]



Setup position	Selection switch	Ramp-up time s	Initial voltage	Ramp-down time s
0	Standard	05	30%	10
1	High Torque	05	60%	05
2	Pump	05	40%	15
3	Pump kick-start	05	50%	15
4	Light conveyor	02	40%	10
5	Heavy conveyor	15	60%	10
6	Low inertia fan	10	30%	00
7	High inertia fan	15	50%	00
8	Recip. compressor	01	50%	00
9	Screw compressor	10	40%	00

① Ramp-up time: time from zero load voltage to full load voltage.

② Ramp-down time: time from full load voltage to zero load voltage.

③ Initial voltage: voltage at the start of the ramp-up function.

④ Kickstart: constant initial voltage delay before ramp-up.

Motor Controllers
Soft Starting/Soft Stopping
Types RSC -HD0M60/RSO.....

- **Control and output modules for soft starting/stopping of 3-phase induction motors**
- **Rated operational current: 3 x 10, 25, 50, 90, 110 AACrms**
- **Rated operational voltage: Up to 600 VACrms**
- **Control voltage range: 10 to 32 VDC**
- **LED-indication for line ON and load ON**
- **Varistor protection**

Product Description

The microprocessor based control module RSC-HD0M60 is used with output modules RSO.... to achieve full wave soft starting and soft stopping of 3-phase induction motors. When the motor is fully operating, the module delivers a signal which can be used to connect a contactor in parallel with the output module, thereby limiting the power dissipation of the device and eliminating the need for a large heatsink. The power supply unit MS1* has a built-in control relay for shunting the motor controller when soft starting is performed. The standard control module is multivoltage compatible and features LED indication for line ON and load ON.

* refer to MS1 datasheet

Ordering Key

RSC-HD 0 M 60

Solid State Relay
Soft starting/stopping
Control module
Output module
Control input type
Shape of ramp
Multivoltage
Max. operational current
Max. operational voltage

RSO 4050

Type Selection, Control Module

Control voltage	Shape of Ramp	Mains	Max. operational voltage	Type Number
10 - 32 VDC	Linear	Multivoltage	600 VAC	**RSC-HD 0 M 60**

Type Selection, Output Module

Rated operational voltage	Rated operational current 10 A	25 A	50 A	90 A	110 A
3 x 220 VAC	**RSO 2210**	**RSO 2225**	**RSO 2250**	**RSO 2290**	**RSO 22110**
3 x 400 VAC	**RSO 4010**	**RSO 4025**	**RSO 4050**	**RSO 4090**	**RSO 40110**
3 x 480 VAC	**RSO 4810**	**RSO 4825**	**RSO 4850**	**RSO 4890**	**RSO 48110**
3 x 600 VAC			**RSO 6050**	**RSO 6090**	**RSO 60110**

General Spec., Control Module

Operational voltage range Line to line	150 to 660 VACrms
Operational frequency range	45 to 65 Hz
Supply current @ no output current @ max. output current	 < 30 mA < 180 mA
CE-marking	Yes
Approvals	UL, CSA

Control Output Specifications

Minimum output voltage	Power supply minus 8 VDC
Output current short-circuit protected	≤ 150 mA DC

Thermal Specifications

Operating temperature	-20° to +70°C (-4° to +158°F)
Storage temperature	-40° to +100°C (-40° to 212°F)

Control Input Specifications

Control voltage range	10 to 32 VDC
Ramp up function	≥ 8 VDC
Ramp down function	≤ 3 VDC
Input current	≤ 1 mA @ 32 VDC
Adjust. starting torque	10 to 75%
Adjust. ramp up time	0.5 to 30 s
Adjust. ramp down time	0.5 to 30 s
Response time (input to trigger outputs)	≤ 50 ms
Time to initialize after powerloss	< 300 ms

Isolation Control Module

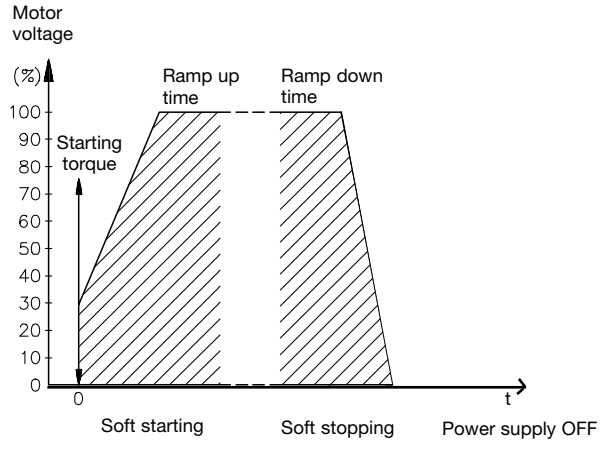
Rated isolation voltage Input to trigger outputs	≥ 4000 VACrms

Accessories

Heatsinks
Fuses
Temperature limit switch
Power supply

For further information refer to “General Accessories”.

Operation Diagram



Mode of Operation

The control module RSC-HD0M60 is used with the output module RSO.. to achieve soft starting and soft stopping of 3-phase induction motors. Soft starting is achieved by increasing the motor voltage in accordance with the setting of the ramp up time potentiometer within the range of 0.5 to 30 s. Soft stopping is achieved by decreasing the motor voltage in accordance with the setting of the ramp down time potentiometer within the range of 0.5 to 30 s.

The starting torque potentiometer makes it possible to adjust the starting level of the motor voltage to a value at which the motor starts to rotate immediately when soft starting is initiated. When the motor is fully operating, an output signal appears which can be used to connect a by-passing relay or contactor in parallel to the output module, thus limiting the need for cooling.
Note: Only delta/star without neutral.

General Specifications, Output Module

	RSO 22...	RSO 40...	RSO 48...	RSO 60...
Operational voltage range Line to line	150 to 250 VACrms	220 to 420 VACrms	400 to 510 VACrms	400 to 625 VACrms
Blocking voltage	1200 V_p	1200 V_p	1200 V_p	1600 V_p
Varistor voltage	275 VAC	420 VAC	510 VAC	625 VAC
CE-marking	Yes	Yes	Yes	Yes

Output Specifications, Output Module

	RSO ..10	RSO ..25	RSO ..50	RSO ..90	RSO ..110
Rated operational current AC 51 AC 53a	16 Arms 3 Arms	25 Arms 5 Arms	50 Arms 15 Arms	90 Arms 30 Arms	110 Arms 40 Arms
Off-state leakage current	≤ 10 mArms	≤ 10 mArms	≤ 10 mArms	≤ 25 mArms	≤ 25 mArms
On-state voltage drop	≤ 1.6 Vrms	≤ 1.6 Vrms	≤ 1.6 Vrms	≤ 1.8 Vrms	≤ 1.8 Vrms
I^2t for fusing t=10 ms	≤ 130 A^2s	≤ 525 A^2s	≤ 1800 A^2s	≤ 6600 A^2s	≤ 18000 A^2s
Non-rep. surge current t=10 ms	160 A_p	325 A_p	600 A_p	1150 A_p	1900 A_p

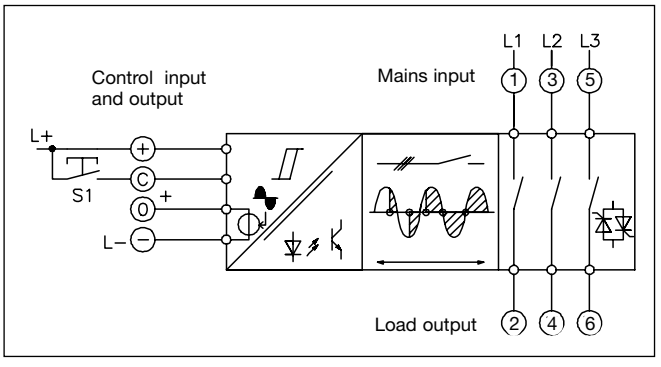
Thermal Specifications Output Module

	RSO ..10	RSO ..25	RSO ..50	RSO ..90	RSO ..110
Operating temperature	-20° to +70°C (-4° to +158°F)	-20° to +70°C (-4° to +158°F)	-20° to +70°C (-4° to +158°F)	-20° to +70°C (-4° to +158°F)	-20° to +70°C (-4° to +158°F)
Storage temperature	-40° to +100°C (-40° to +212°F)	-40° to +100°C (-40° to +212°F)	-40° to +100°C (-40° to +212°F)	-40° to +100°C (-40° to +212°F)	-40° to +100°C (-40° to +212°F)
Junction temperature	≤ 125°C	≤ 125°C	≤ 125°C	≤ 125°C	≤ 125 °C
R_{th} junction to case	≤ 0.7 K/W	≤ 0.5 K/W	≤ 0.25 K/W	≤ 0.1 K/W	≤ 0.09 K/W

Insulation Output Module

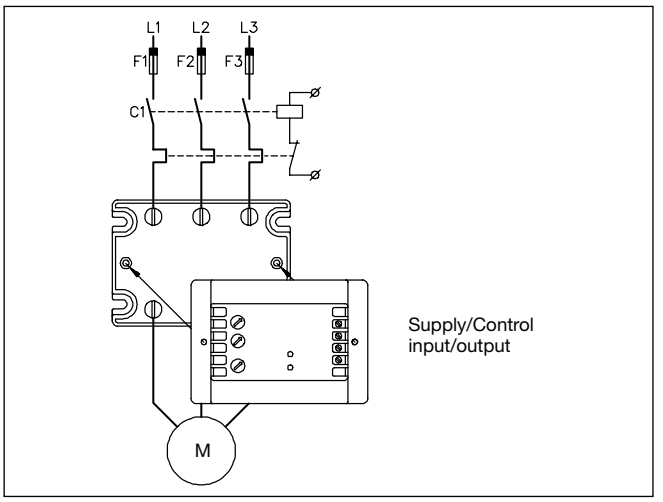
Rated insulation voltage
Output to case ≥4000 VACrms

Functional Diagram



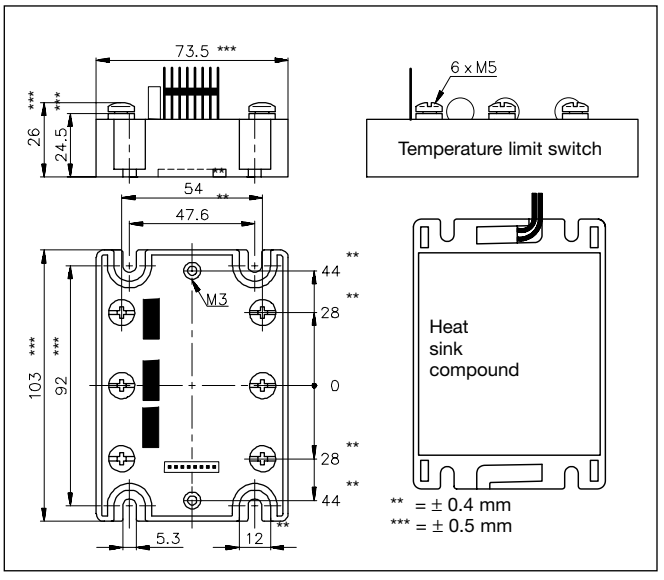
Wiring Diagram

Mounting and connection of control module



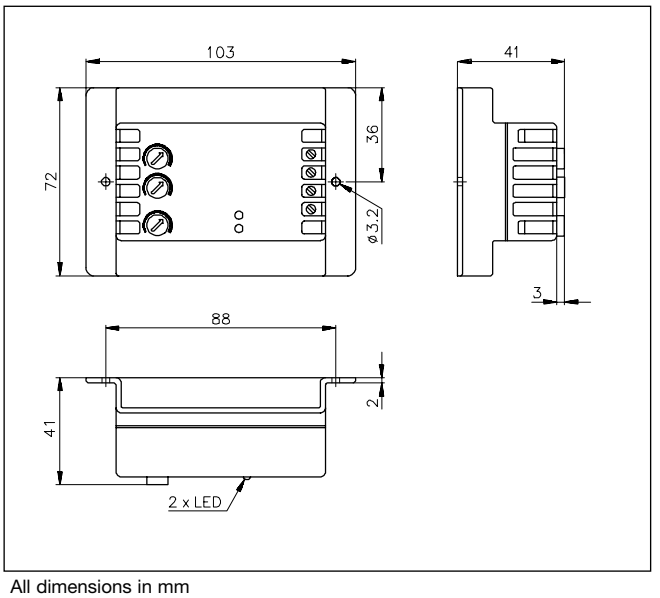
Dimensions

RSO .....



All dimensions in mm

RSC-HD0M60



All dimensions in mm

Heatsink Dimensions (load current versus ambient temperature)

RSO ..10

Load current [A]	Thermal resistance [K/W]				Power dissipation [W]	Temp. protection [°C]
16	0.97	0.81	0.65	0.48	0.32	62
15	1.1	0.88	0.71	0.53	0.35	57
14	1.2	0.97	0.77	0.58	0.39	52
13	1.3	1.1	0.85	0.64	0.43	47
12	1.4	1.2	0.95	0.71	0.47	42
11	1.6	1.3	1.1	0.80	0.53	38
10	1.8	1.5	1.2	0.90	0.60	33
9	2.1	1.7	1.4	1	0.69	29
7	2.8	2.3	1.9	1.4	0.93	21
5	4.2	3.5	2.8	2.1	1.4	14
3	7.4	6.2	4.9	3.7	2.5	8
1	23.8	19.8	15.9	11.9	7.9	3
	20	30	40	50	60	T_A

80°C

Ambient temp. [°C]

RSO ..25

Load current [A]	Thermal resistance [K/W]				Power dissipation [W]	Temp. protection [°C]
25	0.66	0.55	0.44	0.33	-	91
22.5	0.76	0.63	0.51	0.38	0.25	79
20	0.88	0.74	0.59	0.44	0.29	68
17.5	1.1	0.87	0.70	0.52	0.35	57
15	1.3	1.1	0.85	0.63	0.42	47
12.5	1.6	1.3	1.1	0.79	0.53	38
10	2.1	1.7	1.4	1	0.69	29
7.5	2.9	2.4	1.9	1.4	0.96	21
5	4.5	3.8	3	2.3	1.5	13
2.5	9.4	7.8	6.3	4.7	3.1	6
	20	30	40	50	60	T_A

80°C

Ambient temp. [°C]

RSO ..50

Load current [A]	Thermal resistance [K/W]				Power dissipation [W]	Temp. protection [°C]
50	0.33	0.28	-	-	-	181
45	0.38	0.32	0.25	-	-	158
40	0.44	0.37	0.29	-	-	136
35	0.52	0.43	0.35	0.26	-	116
30	0.63	0.52	0.42	0.31	-	96
25	0.78	0.65	0.52	0.39	0.26	77
20	1	0.84	0.67	0.50	0.34	60
15	1.4	1.2	0.93	0.69	0.46	43
10	2.2	1.8	1.4	1.1	0.72	28
5	4.5	3.8	3	2.3	1.5	13
	20	30	40	50	60	T_A

80°C

Ambient temp. [°C]

RSO ..90, RSO ..110

Load current [A]	Heatsink/Thermal resistance [K/W]				Power dissipation [W]	Temp. protection [°C]
90	-	-	-	-	-	304
80	-	-	-	-	-	260
70	0.27	-	-	-	-	219
60	0.33	0.28	-	-	-	181
50	0.41	0.35	0.28	-	-	145
40	0.54	0.45	0.36	0.27	-	111
30	0.75	0.63	0.50	0.38	0.25	80
20	1.2	0.99	0.79	0.59	0.39	51
10	2.5	2.1	1.7	1.2	0.83	24
	20	30	40	50	60	T_A

80°C

Ambient temp. [°C]

Heatsink Selection

Carlo Gavazzi Heatsink (see Accessories)	**Thermal resistance**
No heatsink required RHS 300 Assy or backplate RHS 301 Assy RHS 301 F Assy Consult your distributor	$R_{th\ s\text{-}a}$ > 8.0 K/W 5.0 K/W 0.8 K/W 0.25 K/W < 0.25 K/W

Compare the value found in the load current versus temperature chart with the standard heatsink values and select the heatsink with the next lower value.

It is recommended to protect the solid state relay against overheating. Therefore the chart also states the maximum switching temperature (70, 80 or 90 °C) for the optional temperature limit switch.

CARLO GAVAZZI

Housing Specifications

Weight	
RSO ..10, ..25, ..50	Approx. 275 g
RSO ..90, ..110	Approx. 385 g
Housing material	Noryl, glass-reinforced
Colour	Black
Base plate	
@ ≤ 50 A	Aluminium, nickel-plated
@ ≥ 90 A	Copper, nickel-plated
Potting compound	Polyurethane, black

Relay	
Mounting screws	M5
Mounting torque	≤ 1.5 Nm
Control terminal	
Mounting screws	M3
Mounting torque	≤ 0.5 Nm
Power terminal	
Mounting screws	M5 x 6
Mounting torque	≤ 1.5 Nm

Applications

The output module RSO ..110 is recommended for motors up to 22 kW @ 400 V. The RSO ..110 is designed for use in applications with high surge current conditions. Care must be taken to ensure proper heat-sinking when the output modules are to be used at high nominal currents. Adequate electrical connection between relay terminals and cable must be ensured.

Example 1:
Power dissipation -
RSO 40110:
I_{load} = 40 Arms = 111 W
See previous page.

Example 2:
Motor: 3 kW, ns = 1500 rpm, 3 x 400 VAC, 4-pole
T_A: 50°C
Starting time: ≤ 5 s

The RSC-HD0M60 is used for both applications. The RSO ..50, RSO ..25, RSO ..10 modules can be used: RSO ..50, if the starting current is unknown for 5 s (starting time) and a large safety margin is required, RSO ..25/..10, if during starting the current is lower. For RSO ..10 the maximum current is 17 A for 5 s, and for RSO ..25 the maximum current is 39 A for 5 s.
In this application the start-ing current is measured to be only 17 A with a starting time of 5 s. Consequently, an RSO ..10 is selected.

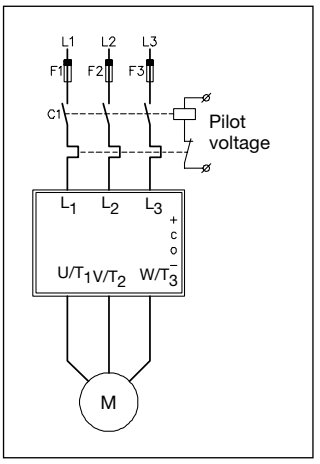
The min. heatsink is 1K/W, and the power dissipation is 25 W.

This gives:
Control module:
RSC-HD.M60
Output module: RSO 4010
Heatsink:1K/W

Note: The thermal conditions have now been designed for the nominal motor current. This means that the starting time should be less than 10% of the operating time of the motor.

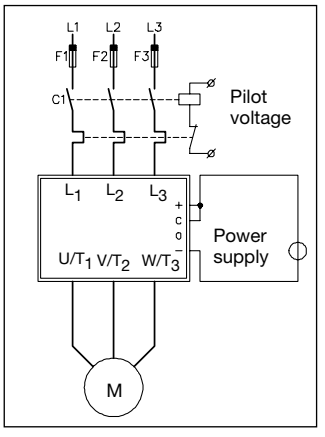
Connection to the mains
Since no motor protective circuitry is included in the RSC/RSO, the motor must be protected in the usual way, i.e. either by a thermal relay, a PTC-resistor or a Klixon bimetal temperature switch near the motor windings.

If short circuit protection is required, fuses F1 to F3 should be ultrafast and selected according to the load integral (I^2t) of the RSO output module and the motor load.



Overload protection by thermal relay

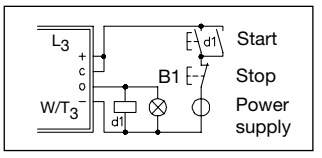
Mains-controlled soft starting



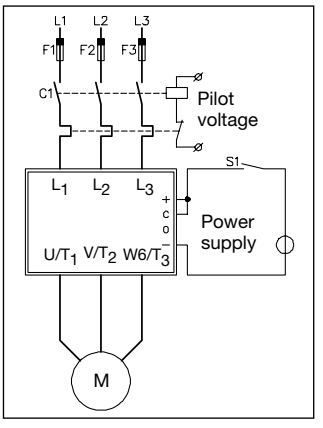
When the main contactor C1 switches on, the motor will soft-start. When C1 switches off, the SSR automatically resets.

Note: The induced voltage from the motor will prolong the reset, depending on motor type and load.

Manual start - stop function
If desired, an external control circuit for manual starting and stopping can be created by using push buttons. When the start button is pressed and held until the lamp B1 is lit (indicating that the motor is now running), a holding contact is made. The motor will stop after activating the stop button.

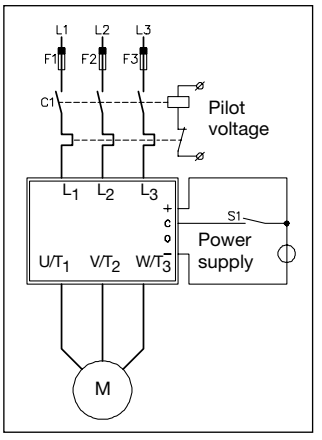


Input-controlled soft starting



When the main contactor C1 switches ON, and the control switch S1 is closed, the motor will soft-start. When either C1 or S1 switches OFF, the SSR will automatically reset.

Soft-starting and soft stopping



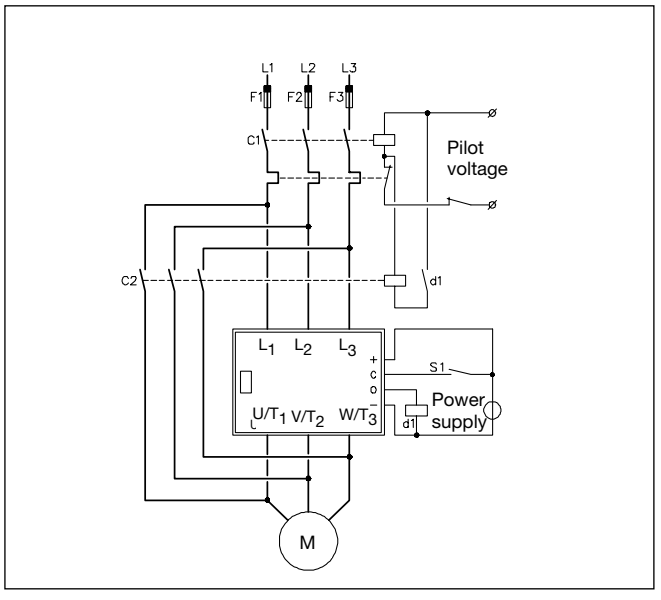
When the main contactor C1 switches on, and the control switch S1 is closed, the motor will soft-start. When S1 is opened, the motor will soft-stop.

Applications (cont.)

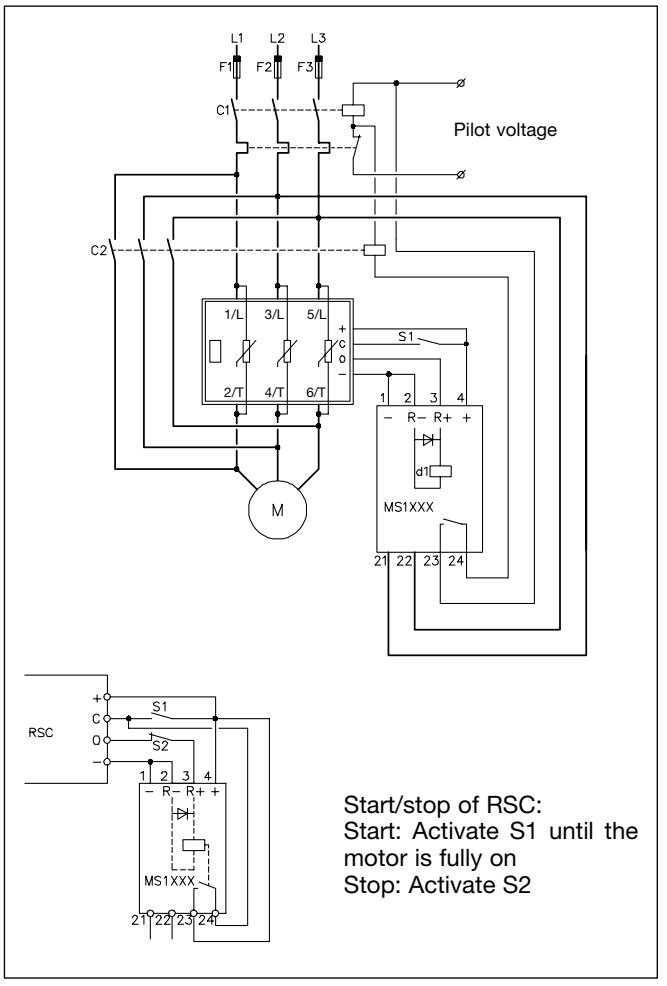
Shunting the output module

This circuit limits the power dissipation of the SSR and consequently eliminates the need for a large heatsink, i.e. the power dissipation is limited to the starting and stopping periods. This is achieved by switching a contactor with the output signal from the control module RSC. In this case C2 is carrying - not switching - the current and can therefore be rated on the basis of the thermal current data of the contacts, which will result in a smaller contactor.

Note: However, if C2 fails, the temperature on the output module RSO heatsink may rise to an unacceptable level. It is therefore advisable to protect the RSO by means of an optional temperature limiting switch T1, which can be inserted in the housing of the output module.



The MS1 .. Power Supply connected to a motor controller (RSC) for soft starting/soft stopping of an induction motor.



Start/stop of RSC:
Start: Activate S1 until the motor is fully on
Stop: Activate S2

Selection Guide

400 VACrms and 480 VACrms motors

Output module	RSO 4.10	RSO 4.25	RSO 4.50	RSO 4.90	RSO 4.110
Max. motor size	3 HP/2.2 kW	5 HP/4 kW	15 HP/11 kW	20 HP/15 kW	30 HP/22 kW

600 VACrms motors

Output module			RSO 6050	RSO 6090	RSO 60110
Max. motor size			15 HP	30 HP	40 HP

Motor Controllers
3-Phase Analog Power Controller
Types RSC-AAM60/RSO .....

- **Control and output modules for analogue control of 3-phase induction motors or heaters**
- **Rated operational current: 3 x 10, 25, 50, 90, 110 AACrms**
- **Rated operational voltage: Up to 600 VACrms**
- **Supply voltage range: 10 to 32 VDC**
- **Control current range: 0 to 20 mA/4 to 20 mA**
- **LED-indication for line ON and load ON**
- **Varistor protection**

Product Description

The micro processor based control module RSC-AAM60 is used with output modules RSO... to achieve a voltage controlled soft start/soft stop of 3-phase motors and a possibility for energy reduction when e.g. a fan is running with a variable capacity. This function is achieved by controlling the control module with a current between 4 and 20 mA (0 and 20 mA). The output module can be selected according to the rated operational voltage and the size of the load.

This phase angle controlled soft-start unit can be used for pumps, fans, heaters, lights and many other applications.

LED indications for line ON and load ON gives a clear status indication.

Ordering Key

RSC-AA M 60

Solid State Relay
Soft starting/stopping
Control module
Output module
Control input type
Multivoltage
Rated operational voltage
Rated operational current

RSO 4050

Type Selection, Control Module

Control current	Mains	Max. operational voltage	Type Number
0-20 mA/4-20 mA	Multivoltage	600 VAC	**RSC-AA M 60**

Type Selection, Output Module

Rated operational voltage	Rated operational current				
	10 A	**25 A**	**50 A**	**90 A**	**110 A**
3 x 220 VAC	**RSO 2210**	**RSO 2225**	**RSO 2250**	**RSO 2290**	**RSO 22110**
3 x 400 VAC	**RSO 4010**	**RSO 4025**	**RSO 4050**	**RSO 4090**	**RSO 40110**
3 x 480 VAC	**RSO 4810**	**RSO 4825**	**RSO 4850**	**RSO 4890**	**RSO 48110**
3 x 600 VAC			**RSO 6050**	**RSO 6090**	**RSO 60110**

General Spec., Control Module

Operational voltage range Line to line	150 to 660 VACrms
Operational frequency range	45 to 65 Hz
Supply current @ no output current @ max. output current	 < 30 mA < 180 mA
Supply voltage range	10 to 32 VDC
CE-marking	Yes
Approvals	UL, CSA

Control Specifications

Minimum output voltage	Power supply minus 8 VDC
Output current short-circuit protected	≤ 150 mA DC

Thermal Specifications

Operating temperature	-20° to +70°C (-4° to +158°F)
Storage temperature	-40° to +100°C (-40° to +212°F)

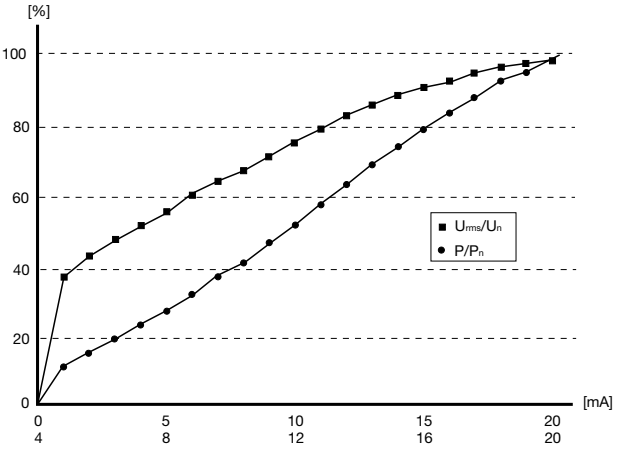
Control Input Specifications

Control current A-input B-input	 0 to 20 mA 4 to 20 mA
Input impedance	250 Ω
Power supply reset time	≤ 300 ms
Response time (input to trigger outputs)	≤ 1 cycle

Isolation Control Module

Rated isolation voltage Input to trigger outputs	≥ 4000 VACrms

Operation Diagram



Output as a function of control current @cos(ø) = 0.9

Mode of Operation

The control module RSC-AAM60 is used with the output module RSO..... to achieve analog control of 3-phase induction motors.

Soft starting is achieved by increasing the motor voltage in accordance with the input current. Soft stopping is achieved by decreasing the motor voltage in accordance with the input current.
When the motor is running idle, the motor voltage can be reduced by lowering the input current, whereby energy is saved.

Heating elements can also be controlled with the RSC/RSO with the use of appropriate filters.

General Specifications, Output Module

	RSO 22...	RSO 40...	RSO 48...	RSO 60...
Operational voltage range Line to line	 150 to 250 VACrms	 220 to 420 VACrms	 400 to 510 VACrms	 400 to 625 VACrms
Blocking voltage	1200 V_p	1200 V_p	1200 V_p	1600 V_p
Varistor voltage	275 VAC	420 VAC	510 VAC	625 VAC
CE-marking	Yes	Yes	Yes	Yes

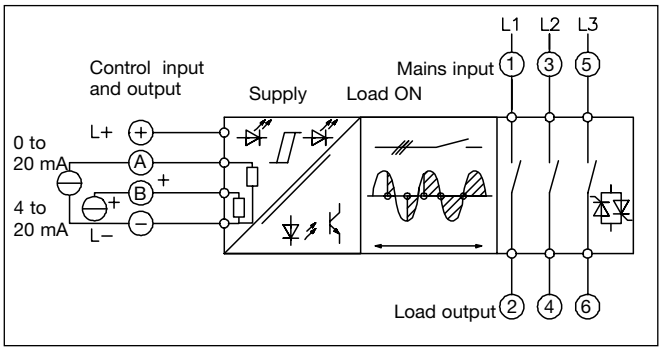
Output Specifications, Output Module

	RSO ..10	RSO ..25	RSO ..50	RSO ..90	RSO ..110
Rated operational current AC 51 AC 53a	 16 Arms 3 Arms	 25 Arms 5 Arms	 50 Arms 15 Arms	 90 Arms 30 Arms	 110 Arms 40 Arms
Off-state leakage current	≤ 10 mArms	≤ 10 mArms	≤ 10 mArms	≤ 25 mArms	≤ 25 mArms
On-state voltage drop	≤ 1.6 Vrms	≤ 1.6 Vrms	≤ 1.6 Vrms	≤ 1.8 Vrms	≤ 1.8 Vrms
I^2t for fusing t=10 ms	≤ 130 A^2s	≤ 525 A^2s	≤ 1800 A^2s	≤ 6600 A^2s	≤ 18000 A^2s
Non-rep. surge current t=10 ms	 160 A_p	 325 A_p	 600 A_p	 1150 A_p	 1900 A_p

Thermal Specifications Output Module

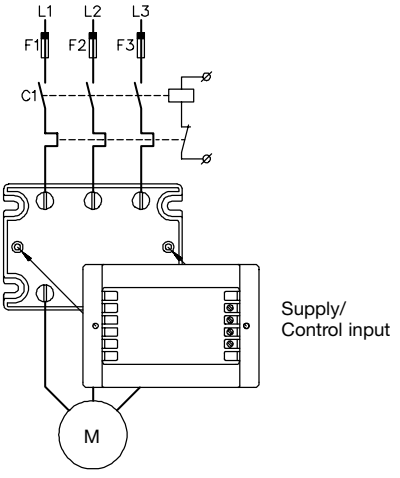
	RSO ..10	RSO ..25	RSO ..50	RSO ..90	RSO ..110
Operating temperature	-20° to +70°C (-4° to +158°F)	-20° to +70°C (-4° to +158°F)	-20° to +70°C (-4° to +158°F)	-20° to +70°C (-4° to +158°F)	-20° to +70°C (-4° to +158°F)
Storage temperature	-40° to +100°C (-40° to +212°F)	-40° to +100°C (-40° to +212°F)	-40° to +100°C (-40° to +212°F)	-40° to +100°C (-40° to +212°F)	-40° to +100°C (-40° to +212°F)
Junction temperature	≤ 125°C	≤ 125°C	≤ 125°C	≤ 125°C	≤ 125 °C
R_{th} junction to case	≤ 0.7 K/W	≤ 0.5 K/W	≤ 0.25 K/W	≤ 0.1 K/W	≤ 0.09 K/W

Functional Diagram



Wiring Diagram

Mounting and connection of control module



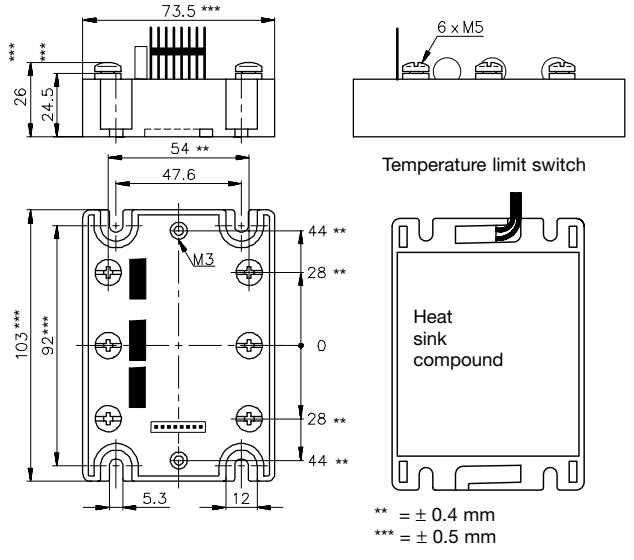
Accessories

Heatsinks
Fuses
Temperature limit switch
Power supply

For further information refer to “General Accessories”.

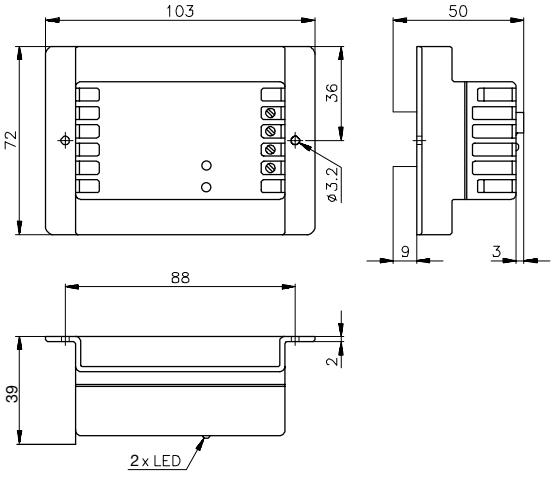
Dimensions

RSO .....



All dimensions in mm

RSC-AAM60



All dimensions in mm

Heatsink Dimensions (load current versus ambient temperature)

RSO ..10

Load current [A]	Thermal resistance [K/W]				Power dissipation [W]	Temp. protection [°C]
16	0.97	0.81	0.65	0.48	0.32	62
15	1.1	0.88	0.71	0.53	0.35	57
14	1.2	0.97	0.77	0.58	0.39	52
13	1.3	1.1	0.85	0.64	0.43	47
12	1.4	1.2	0.95	0.71	0.47	42
11	1.6	1.3	1.1	0.80	0.53	38
10	1.8	1.5	1.2	0.90	0.60	33
9	2.1	1.7	1.4	1	0.69	29
7	2.8	2.3	1.9	1.4	0.93	21
5	4.2	3.5	2.8	2.1	1.4	14
3	7.4	6.2	4.9	3.7	2.5	8
1	23.8	19.8	15.9	11.9	7.9	3
	20	30	40	50	60	T_A

80°C

Ambient temp. [°C]

RSO ..25

Load current [A]	Thermal resistance [K/W]				Power dissipation [W]	Temp. protection [°C]
25	0.66	0.55	0.44	0.33	-	91
22.5	0.76	0.63	0.51	0.38	0.25	79
20	0.88	0.74	0.59	0.44	0.29	68
17.5	1.1	0.87	0.70	0.52	0.35	57
15	1.3	1.1	0.85	0.63	0.42	47
12.5	1.6	1.3	1.1	0.79	0.53	38
10	2.1	1.7	1.4	1	0.69	29
7.5	2.9	2.4	1.9	1.4	0.96	21
5	4.5	3.8	3	2.3	1.5	13
2.5	9.4	7.8	6.3	4.7	3.1	6
	20	30	40	50	60	T_A

80°C

Ambient temp. [°C]

RSO ..50

Load current [A]	Thermal resistance [K/W]				Power dissipation [W]	Temp. protection [°C]
50	0.33	0.28	-	-	-	181
45	0.38	0.32	0.25	-	-	158
40	0.44	0.37	0.29	-	-	136
35	0.52	0.43	0.35	0.26	-	116
30	0.63	0.52	0.42	0.31	-	96
25	0.78	0.65	0.52	0.39	0.26	77
20	1	0.84	0.67	0.50	0.34	60
15	1.4	1.2	0.93	0.69	0.46	43
10	2.2	1.8	1.4	1.1	0.72	28
5	4.5	3.8	3	2.3	1.5	13
	20	30	40	50	60	T_A

80°C

Ambient temp. [°C]

RSO ..90, RSO ..110

Load current [A]	Heatsink/Thermal resistance [K/W]				Power dissipation [W]	Temp. protection [°C]
90	-	-	-	-	-	304
80	-	-	-	-	-	260
70	0.27	-	-	-	-	219
60	0.33	0.28	-	-	-	181
50	0.41	0.35	0.28	-	-	145
40	0.54	0.45	0.36	0.27	-	111
30	0.75	0.63	0.50	0.38	0.25	80
20	1.2	0.99	0.79	0.59	0.39	51
10	2.5	2.1	1.7	1.2	0.83	24
	20	30	40	50	60	T_A

80°C

Ambient temp. [°C]

Heatsink Selection

Carlo Gavazzi Heatsink (see Accessories)	**Thermal resistance**
No heatsink required	$R_{th\ s\text{-}a}$ > 8.0 K/W
RHS 300 Assy or backplate	5.0 K/W
RHS 301 Assy	0.8 K/W
RHS 301 F Assy	0.25 K/W
Consult your distributor	< 0.25 K/W

Compare the value found in the load current versus temperature chart with the standard heatsink values and select the heatsink with the next lower value.

It is recommended to protect the solid state relay against overheating. Therefore the chart also states the maximum switching temperature (70, 80 or 90 °C) for the optional temperature limit switch.

CARLO GAVAZZI

Housing Specifications

Weight	
RSO ..10, ..25, ..50	Approx. 275 g
RSO ..90, ..110	Approx. 385 g
Housing material	Noryl, glass-reinforced
Colour	Black
Base plate	
@ ≤ 50 A	Aluminium, nickel-plated
@ ≥ 90 A	Copper, nickel-plated
Potting compound	Polyurethane, black

Relay	
Mounting screws	M5
Mounting torque	≤ 1.5 Nm
Control terminal	
Mounting screws	M3
Mounting torque	≤ 0.5 Nm
Power terminal	
Mounting screws	M5 x 6
Mounting torque	≤ 1.5 Nm

Applications

The output module RSO ..110 is recommended for motors up to 22 kW @ 400 V. The RSO ..110 is designed for use in applications with high surge current conditions. Care must be taken to ensure proper heatsinking when the relays are to be used at high nominal currents. Adequate electrical connection between relay terminals and cable must be ensured.

Example 1:
Power dissipation -
RSO 40110:
I_{load} = 40 Arms = 111 W
See previous page.

Example 2:
Motor: 3 kW, 4 HP
3 x 400 VAC, 4-pole
T_A: 50°C
Starting time: ≤ 5 s

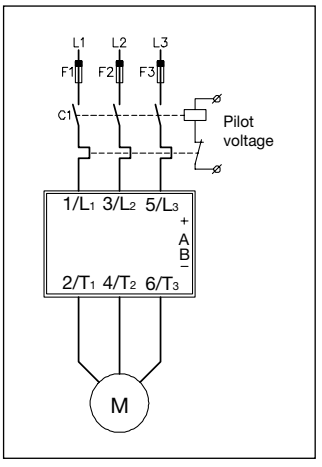
For this application RSC-AAM60 must be used. The output module RSO4025 is selected according to the Selection Guide.

The smallest heatsink required is 1 K/W, and the power dissipation is 25 W.

This gives:
Control module:
RSC-AAM60
Output module: RSO 4025
Heatsink:1K/W

Connection to the mains
Since no motor protective circuitry is included in the RSC/RSO, the motor must be protected in the usual way, i.e. either by a thermal relay, a PTC-resistor or a Klixon bimetal temperature switch near the motor windings.

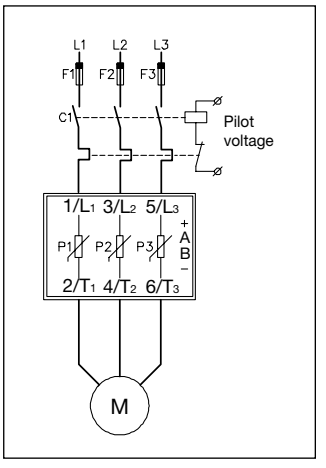
If short circuit protection is required, fuses F1 to F3 should be ultrafast and selected according to the load integral (I^2t) of the RSO output module and the motor load.



Overload protection by thermal relay

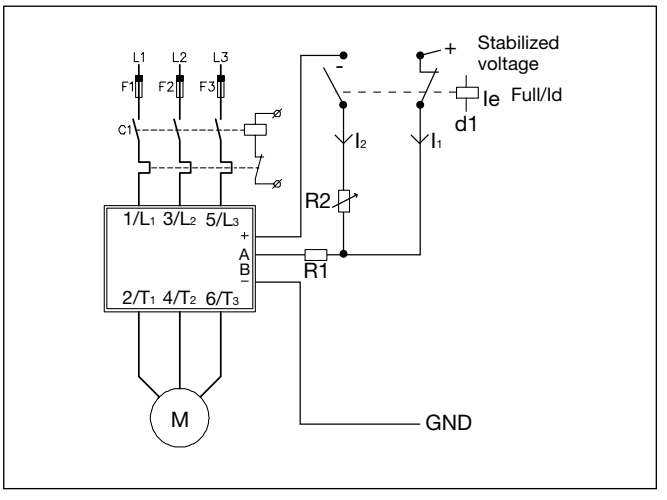
Transient voltage protection
With an unfiltered main supply, voltage transient may occur. Since these transients could have a high energy content, it is advisable to use varistors to protect the output module.

The varistors are already mounted in the RSO output module and they are selected according to the rated operational voltage.



Energy saving for motors in idle mode
When motors are running idle, it not necessary to maintain a full magnetic field, as is the case when the motor has to produce full torque. By lowering the motor voltage, power losses inside the motor are also reduced.

When the motor is idle, d1 will switch the control current from I_1 > 20 mA to I_2, which is adjusted to a value at which the motor is still running at full speed, but at a lower voltage. Please remark that this type of phase-angle controlled voltage reduction, demands additional filtering to fulfill EMC regulations.



Applications (cont.)

In order to achieve a 4 to 20 mA signal from a 12 or 24 VDC source, a resistor and a potentiometer should be connected in series with the voltage source and the RSC controller.

We define the $I_{max.}$ to be e.g. 24 mA, which means that the series resistors must be:

R_1 (12 V) = U/I - Rint =
12 V/24 mA - 250 Ω = 250 Ω

R_1 (24 V) = U/I - Rint =
24 V/24 mA - 250 Ω = 750 Ω

If the minimum current is defined to be e.g. 2.4 mA and the 250 Ω Rint input resistance of the RSC is also calculated in:

R_2 (12 V) = U/I - R_1 - Rint =
12/2.4 - 250 - 250 = 4500 Ω

R_2 (24 V) = U/I - R_1 - Rint =
24/2.4 - 750 - 250 = 9000 Ω

Selection Guide

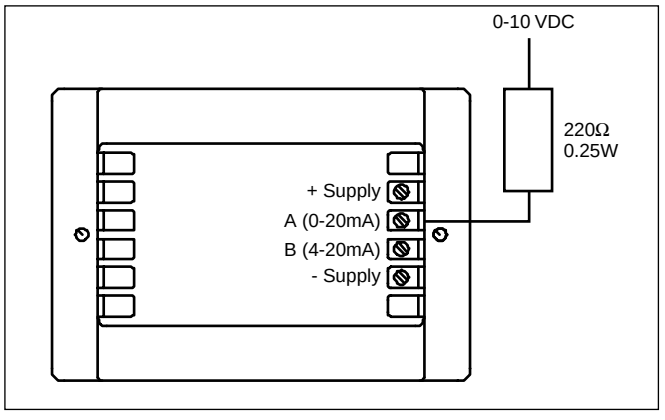
400 VACrms and 480 VACrms motors

Output module	RSO ..10	RSO ..25	RSO ..50	RSO ..90	RSO ..110
Max. motor size	3 HP/2.2 kW	5 HP/4 kW	15 HP/11 kW	20 HP/15 kW	30 HP/22 kW

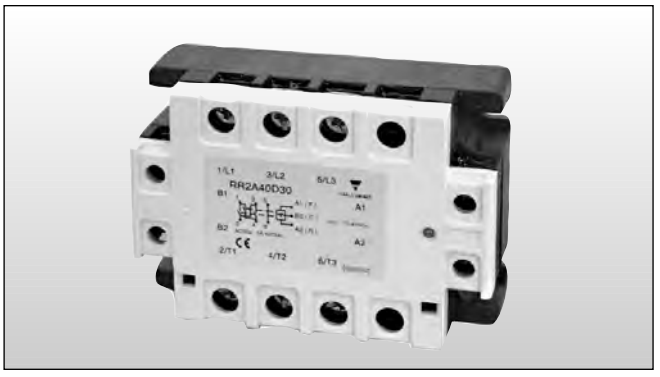
600 VACrms motors

Output module			RSO 6050	RSO 6090	RSO 60110
Max. motor size			15 HP	30 HP	40 HP

Wiring Diagram (0-10 VDC control)



Motor Controllers
Industrial, 2-Phase Motor Reversing
Type RR2A



- **Motor reversing for 3-phase induction motors up to 5.5 kW**
- **Rated operational voltage: Up to 480 VACrms**
- **Built-in interlock function**
- **DC control voltage**
- **Built-in voltage transient protection**
- **LED indication for direction**
- **Isolation: Optocoupler (input-output) 4000 VACrms**
- **Direct copper bonding technology**

Product Description

This family of 2-Phase Motor Reversing Controller is designed to switch 3-phase motors rated up to 5.5 kW. The built-in interlocking circuitry prevents the relay from switching both directions at the same time. A dual colour LED indicates direction "forward" when green and direction "reverse" when red. The output is protected from excessive voltage fluctuations (transients) by built-in varistors. Furthermore, optimum reliability is achieved by soldering the output thyristor chips directly on to the ceramic substrate (Direct Copper Bonding).

The housing is designed to incorporate a temperature limit switch. It is recommended to install an appropriate semiconductor fuse in series with the relay.

Ordering Key

RR 2 A 40 D 150

- **Motor reversing**
- **Number of phases**
- **Switching mode**
- **Rated operational voltage**
- **Control input type**
- **Motor power rating**

Type Selection

Switching mode	Rated operational voltage, Ue	Control voltage	Motor rating
A: Zero Switching	40: 400 VACrms 48: 480 VACrms	D: 10 - 40 VDC	150: 1.5 kW, 2 HP 220: 2.2 kW, 3 HP 400: 4.0 kW, 5 HP 550: 5.5 kW, 7.5 HP

Selection Guide

Rated operational voltage	Control voltage	Motor rating 1.5 kW	2.2 kW	4.0 kW	5.5 kW
400 VACrms	10 to 40 VDC	**RR2A40D150**		**RR2A40D400**	
480 VACrms	10 to 40 VDC		**RR2A48D220**		**RR2A48D550**

General Specifications

	RR2 A 40D	RR2 A 48 D 220	RR2 A 48 D 550
Operational voltage range	40 to 440 VACrms	40 to 530 VACrms	40 to 530 VACrms
Blocking voltage	≤ 1200 V_p	≤ 1200 V_p	≤ 1600 V_p
Operational frequency range	45 to 65 Hz	45 to 65 Hz	45 to 65 Hz
Power factor	≥ 0.5 @ 400 VACrms	≥ 0.5 @ 480 VACrms	≥ 0.5 @ 480 VACrms

Output Specifications

	RR2A40D150	RR2A48D220	RR2A40D400	RR2A48D550
IEC rated operational current Ie (AC-53a) @ Ta = 40°C	5 A	5 A	11 A	11 A
IEC rated operational current Ie (AC-51) @ Ta = 40°C	25 A**	25 A**	40 A**	40 A**
Assigned motor rating @ 40°C/ UL rating @ 40°C	1.5kW / 2HP	2.2kW / 3HP	4.0kW / 5HP	5.5kW / 7.5HP
Overload cycle according to EN/IEC 60947-4-2 @ 40°C	5A: AC53a: 6-6: 100-60	5A: AC53a: 6-6: 100-60	11A: AC53a: 8-3: 100-40**	11A: AC53a: 8-3: 100-40**
Number of starts/hr @ 40°C	60	60	40	40
Unlimited starts/hr @40°C	4A: AC53a: 6-6: 100 - unlimited**	4A: AC53a: 6-6: 100 - unlimited**	5A: AC53a: 6-3: 100 - unlimited**	5A: AC53a: 6-3: - unlimited**
	3.5A: AC53a: 5-6: 100 - unlimited*	3.5A: AC53a: 5-6: 100 - unlimited*	4A: AC53a: 5-3: 100 - unlimited*	4A: AC53a: 5-3: 100 - unlimited*
	1.5A: AC53a: 4-6: 100 - unlimited	1.5A: AC53a: 4-6: 100 - unlimited	2A: AC53a: 5-3: 100 - unlimited	2A: AC53a: 5-3: 100 - unlimited
Minimum operational current	150 mArms	150 mArms	250 mArms	250 mArms
Off-state leakage current	≤ 1 mArms	≤ 1 mArms	≤ 1 mArms	≤ 1 mArms
I^2t for fusing t= 10ms	525 A^2s	525 A^2s	1800 A^2s	1800 A^2s
On-state voltage drop	≤ 1.6 Vrms	≤ 1.6 Vrms	≤ 1.6 Vrms	≤ 1.6 Vrms
Critical dv/dt off-state	≥ 500 V/us	≥ 500 V/us	≥ 1000 V/us	≥ 1000 V/us

* This overload cycle is applicable when device is mounted on heatsink type RHS300

** Applicable only when device is mounted on heatsink type RHS301

Environmental Specifications

Operating temperature	-20°C to +80°C (-4°F to +176°F)
Storage temperature	-40°C to +100°C (-40°F to +212°F)
Relative humidity	<95% non-condensing @40°C
Pollution Degree	3

Degree of Protection	IP10 (EN/IEC 60529)
Installation category	III
Installation Altitude	1000m
Vibration	
Sinusodial (IEC 60068-2-6)	13 to 25Hz: 2.0mm peak 25 to 150Hz: 20m/s^2

Short Circuit Protection (according to EN/IEC 60947-4-2 and UL 508)

	RR2A40D150 RR2A48D220	RR2A40D400 RR2A48D550
Type of coordination: 1		
UL rated short circuit current	5kA when protected by RK5 fuses	10kA when protected by RK5 fuses
RK5 fuse	TRS10R 10A	TRS20R 20A
Type of coordination: 2		
Rated short circuit current	10kA when protected by semiconductor fuses	10kA when protected by semiconductor fuses
Semiconductor fuse	Ferraz Shawmut 25A, Class URC Art. No. 6.9 CP gRC 14.51 25	Ferraz Shawmut 50A, Class URC Art. No. 6.9 CP gRC 14.51 50

Housing Specifications

Weight	Approx. 430 g
Housing material	Noryl, glass-reinforced
Colour	Black
Base plate	Aluminium, nickel-plated
Potting compound	Polyurethane, black
Relay	
Mounting screws	M5
Mounting torque	≤ 1.5 Nm

Control terminal		
Mounting screws		M4
Mounting torque		≤ 0.5 Nm
Wire size	Max.	2 x 2.5 mm² (AWG 14)
	Min.	2 x 1.0 mm²
Power terminal		
Mounting screws		M5
Mounting torque		≤ 2.5 Nm
Wire size	Max.	2 x 6 mm² (AWG 8)
	Min.	2 x 1 mm²

Isolation

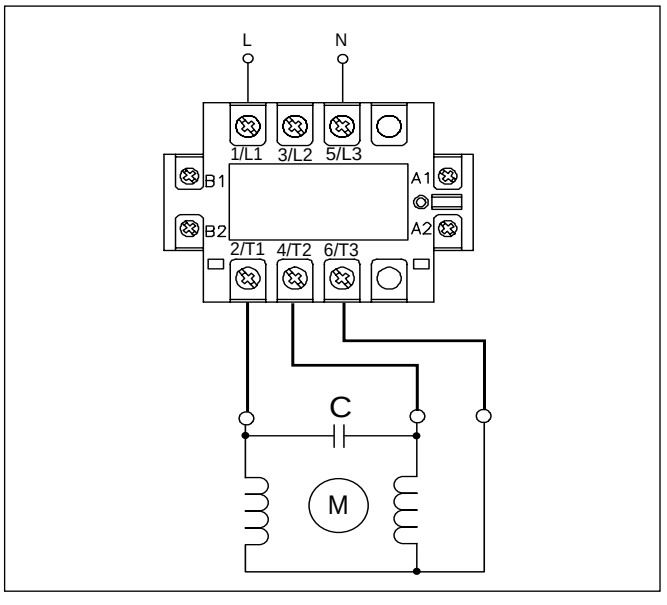
Dielectric withstand voltage	
Input to output	≥ 4000 VACrms
Input to case	≥ 4000 VACrms
Dielectric withstand voltage	
Output to case	≥ 4000 VACrms

Input Specifications

Control voltage range	10 - 40 VDC
Pick-up voltage	8.5 VDC
Input current range	10 - 20 mADC
Drop-out voltage	3.5 VDC
Time delay	
F → R, R → F	≤ 80 ms

Applications

Reversing an Asynchronous single phase motor working with a phase-shifting capacitor



Standards

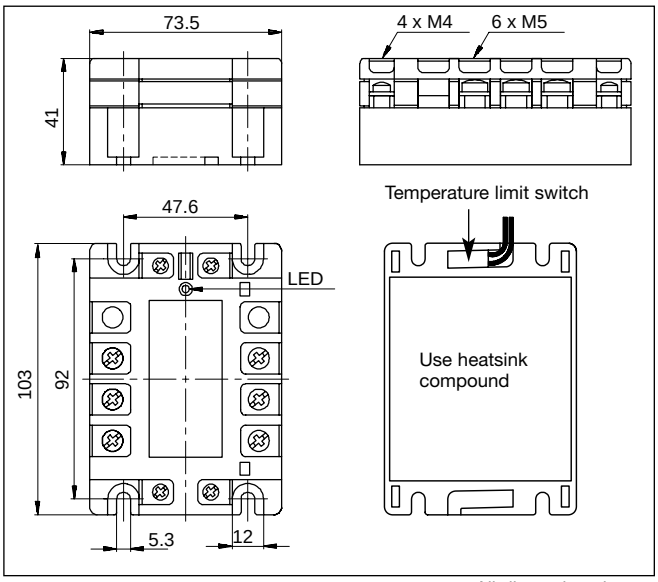
Approvals		UL, cUL (E172877)
Markings		CE, EN 60947-4-2
EMC (Electromagentic compatability)		accord. to EN 61000-6-2
Wire conducted emission		Class A
Radiated emission		Class B
ESD Immunity (EN 61000-4-2)		4kV contact, PC1 8kV air discharge, PC2
10V/m, PC1 (80-1000MHz)		Radiated RF immunity (EN 61000-4-3)
Fast transient immunity (EN 61000-4-4)	Output	2kV, PC1
	Input	2kV, PC1
Surge immunity (EN 61000-4-5)		
Output:	line to line	1kV, PC1
	line to ground	2kV, PC1
Input:	line to line	500V, PC1**
	line to ground	500V, PC1**
Conducted RF immunity (EN 61000-4-6)		140dBuV, PC1* (0.15-80MHz)
Voltage Dips & Interruptions		EN 61000-4-11

* It is suggested that the input lines be installed together (such as a 3 core cable) to enhance susceptibility.

** Surge immunity level with an external transient voltage suppressor (47V) meets PC2 @ 1 kV between line to line and 2kV between line to ground.

Note: EMC tests were performed with representative motor loads of 1.1kW and 4.0kW. The above is just an indication of the EMC performance. The performance of the controller would have to be evaluated with the device connected and fitted as part of the complete system in the end application.

Dimensions



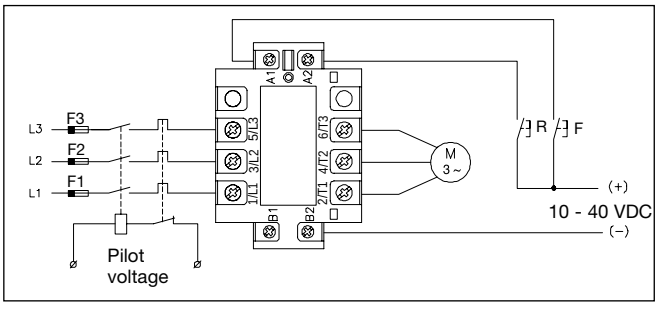
All dimensions in mm

Accessories

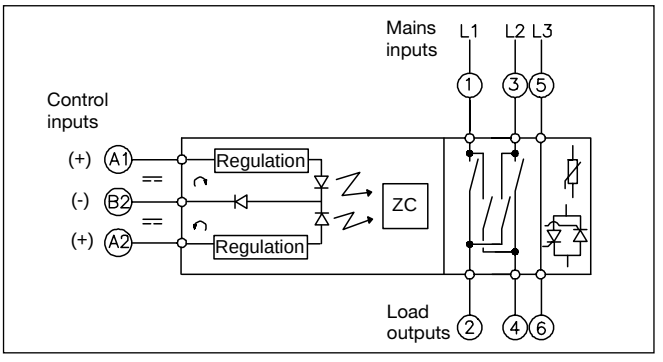
Heatsinks
Fuses
Temperature limit switch

For further information refer to “General Accessories”.

Wiring Diagram



Functional Diagram



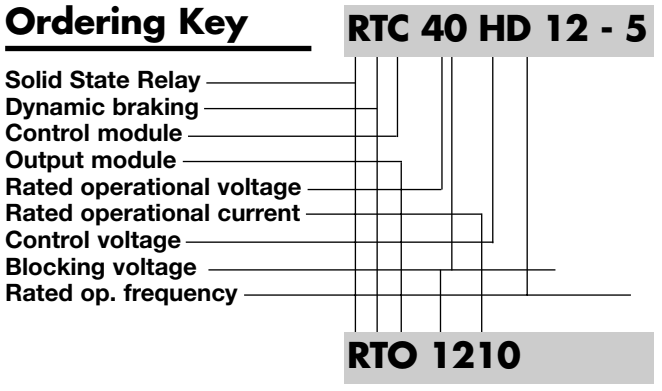
Motor Controllers
Dynamic Braking
Types RTC 40 HD12-./RTO 12..

- **Control and output modules for dynamic braking of 3-phase induction motors**
- **Rated operational current: 18.5, 30 and 60 A DC**
- **Rated operational voltage: Up to 400 VACrms**
- **Control voltage: 10 to 32 VDC**
- **LED indication for line ON and brake ON**

Product Description

Dynamic braking is achieved by introducing a DC current, rectified from the mains, through the motor windings. The control module RTC 40 HD-12-. is used in combination with the output module RTO 12.. to achieve dynamic braking of 3-phase induction motors with braking current up to 60 A. The desired braking time and the required brake current can be adjusted with the TIME and BRAKE CURRENT potentiometers. The control module, which is separately supplied from an external DC voltage source, has LED indications for LINE ON and BRAKE ON. The output signal from the control module is off 350 ms before the brake current is introduced. This signal can be used to take away the AC supply of the motor.

Ordering Key



Type Selection

Type	Blocking voltage	Control voltage	Blocking voltage	Rated operational frequency
C: Control module	40: 120/208 VACrms 230/400 VACrms	HD: 10 to 32 VDC	12: 1200 V_p	5: 50 Hz ± 3 Hz 6: 60 Hz ± 3 Hz

Type	Blocking voltage	Rated operational current
O: Output module	12: 1200 V_p	10: 2 x 18.5 A DC 25: 2 x 30 A DC 50: 2 x 60 A DC

Selection Guide

Control module	Rated operational frequency 50 Hz	 60 Hz
230/400 VACrms	**RTC 40 HD-12-5**	**RTC 40 HD-12-6**

Blocking voltage	Rated operational current 18.5 A	 30 A	 60 A
1200 V_p	**RTO 1210**	**RTO 1225**	**RTO 1250**

General Specifications Control Module

	RTC 40 HD12-5	RTC 40 HD12-6
Operational voltage range Line to line	190 to 440 VACrms	190 to 440 VACrms
Blocking voltage	≥ 1200 V_p	≥ 1200 V_p
Operational frequency range	47 to 52 Hz	57 to 63 Hz
Supply current @ RUN, no output @ BRAKE, no output	 ≤ 30 mA @ 32 VDC ≤ 110 mA @ 32 VDC	 ≤ 30 mA @ 32 VDC ≤ 110 mA @ 32 VDC
Approval	CSA	CSA
CE-marking	Yes	Yes

Control Input Specifications

Control voltage range	10 to 32 VDC
Motor running	≥ 8 VDC
Motor stopped	≤ 2 VDC
Adjust. braking current	Dependent on motor size
Adjust. braking time	1 to 40 s
Min. delay, stop to run	≥ 1 cycle
Remanence delay	≥ 350 ms

Thermal Specifications Control Mod.

Operating temperature	-20° to +80°C (-4° to +176°F)
Storage temperature	-40° to +100°C (-40° to +212°F)

Control Output Specifications

Minimum output voltage	Power supply less 3.5 VDC
Output current short-circuit protected	150 mA DC

Isolation Control Module

Rated isolation voltage Input to trigger outputs	≥ 4000 VACrms

Mode of Operation

The control module RTC 40 HD12-5 (50 Hz)/RTC 40 HD12-6 (60 Hz) is used with output module RTO 12.. to achieve dynamic braking of 3-phase induction motors.

Dynamic braking is achieved by passing direct current, rectified from the mains, through the motor windings. The DC-current will then produce a static field through the short-circuited rotor, and the induced rotor current will create a torque opposite to the direction of rotation.

Note:
This means that no braking takes place when the motor revolution is zero. The desired braking time can be set by means of the BRAKE TIME potentiometer. The braking current can be adjusted by means of the BRAKE CURRENT potentiometer to achieve motor stop within the desired time.

Note:
Avoid excessive braking current after the motor has been stopped, as this will create unnecessary heating of the motor.

Since the RTC/RTO configuration is only capable of braking the motor, a starting device is needed. Either a Solid State Relay, e.g. Carlo Gavazzi RZ, or a motor controller RSC 40 HD12-./RSO 12.. can be connected to the application.

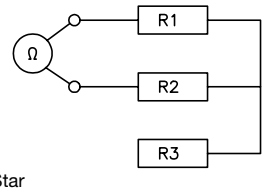
To ensure safe operation the starting device must be controlled by the RTC output. When the control voltage (terminal C2) is removed, braking will take place.

The control module has LED indication for line ON and brake ON. The control module also features remanence delay. To avoid torque shock, a delay of min. 350 ms passes from the moment the motor contactor has been released until DC voltage is reapplied to the motor windings.

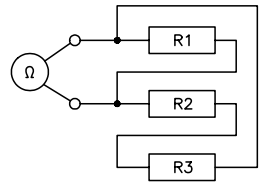
To measure the braking current, always use a true rms ammeter with DC range.

In order to define the size of the output module, it is necessary to find the resistance between the two terminals from the motor where the brake module will be connected. This resistance is a combination of the resistances of the motor windings and is dependent on how the motor is connected. In star connection it is a series connection of two windings (see top of next page). In delta connection it consists of two windings connected in parallel to the third winding (see top of next page).

Mode of Operation (cont.)



Star



Delta

If the brake current is adjusted to max., full half waves are introduced to the motor, and the DC voltage is calculated as follows:

$$U_{DC} = \frac{U_{max}}{\pi} = \frac{U_n \times \sqrt{2}}{3.14}$$

$$= U_n \times 0.45$$

The max. current can be calculated as follows:

$$I_{max} = \frac{U_n \times 0.45}{\sum R}$$

where $\sum R$ is a combination of the windings mentioned above.

Example: The resistance of the motor winding is 5 Ω. The rated operational voltage is 400 VAC.

What is the max. current in star connection and in delta connection?

$\sum R$ star is R1 + R2 = 5 + 5 Ω = 10 Ω

$\sum R$ delta is R1 parallel to R2 + R3 = 3.3 Ω.

The current is:

$$\frac{400 \times 0.45}{10} = 18 \text{ A}$$

for the star connection, and

$$\frac{400 \times 0.45}{3.33} = 54 \text{ A}$$

for the delta connection.

The output module has to be selected accordingly (next higher power rating).

General Specifications Output Module

	RTO 1210	RTO 1225	RTO 1250
Operational voltage range Line to line	220 to 420 VACrms	220 to 420 VACrms	220 to 420 VACrms
Rated operational current	18.5 ADC	30 ADC	60 ADC
Approval	CSA	CSA	CSA
CE-marking	Yes	Yes	Yes

Output Specifications Output Module

	RTO 1210	RTO 1225	RTO 1250
Blocking voltage	≥ 1200 V_p	≥ 1200 V_p	≥ 1200 V_p
Off-state leakage current	≤ 10 mA	≤ 10 mA	≤ 10 mA
On-state voltage drop	≤ 1.6 Vrms	≤ 1.6 Vrms	≤ 1.6 Vrms
I^2t for fusing t=10 ms	≤ 130 A^2s	≤ 525 A^2s	≤ 1800 A^2s
Non-rep. surge current t=10 ms	160 A_p	325 A_p	600 A_p

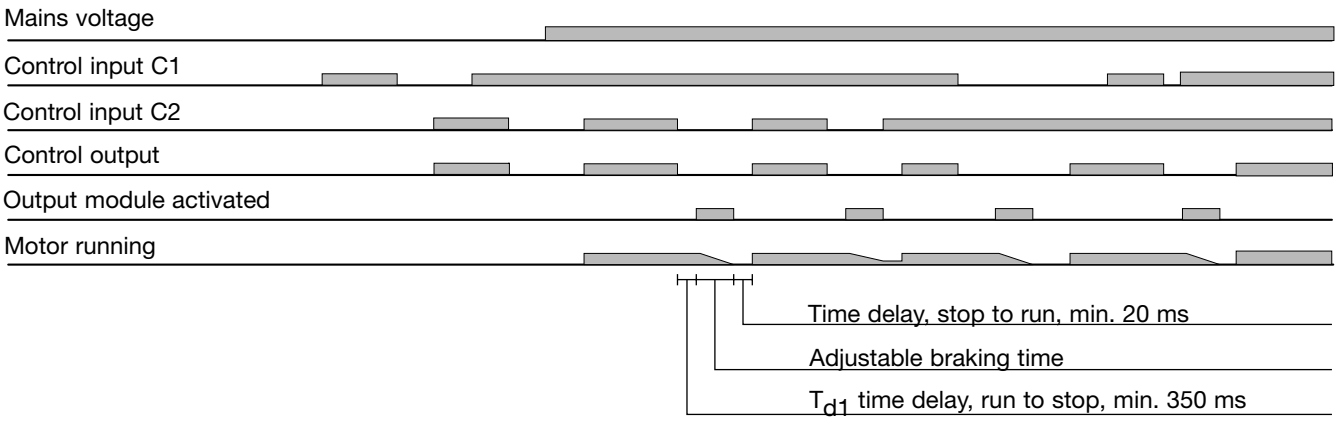
Thermal Specifications Output Module

	RTO 1210	RTO 1225	RTO 1250
Operating temperature	-20° to +70°C (-4° to +158°F)	-20° to +70°C (-4° to +158°F)	-20° to +70°C (-4° to +158°F)
Storage temperature	-40° to +100°C (-40° to +212°F)	-40° to +100°C (-40° to +212°F)	-40° to +100°C (-40° to +212°F)
R_{th} junction to case	≤ 1.4 K/W	≤ 1.0 K/W	≤ 0.5 K/W

Isolation Output Module

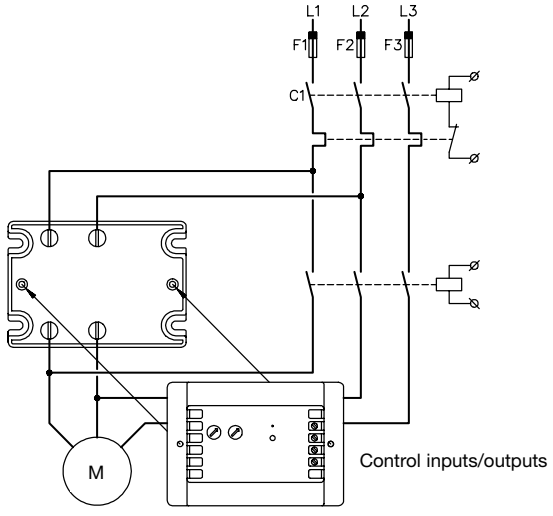
Rated isolation voltage Output to case	≥ 4000 VACrms

Operation Diagram

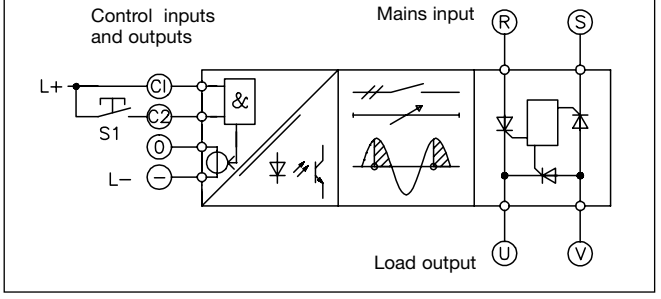


Wiring Diagram

Mounting and connection of control module and output module



Functional Diagram



Accessories

Heatsinks
Varistors
Fuses
Temperature limit switch
Power supply

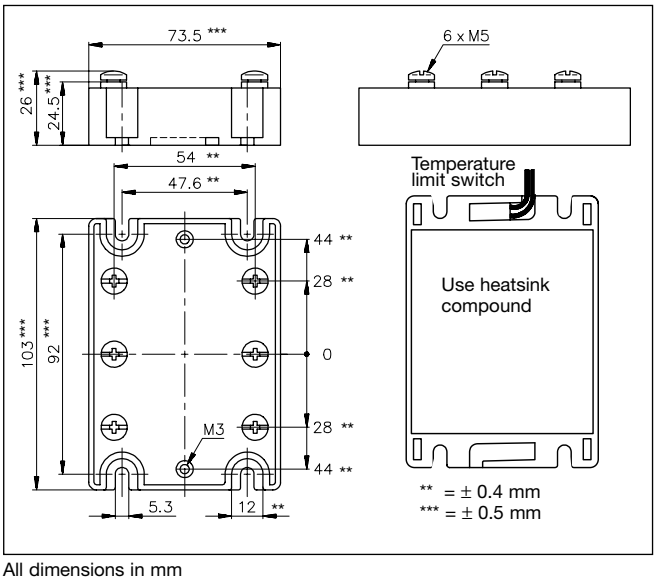
For further information refer to “General Accessories”.

Housing Specifications

Weight	Approx. 275 g
Housing material Colour	Noryl, glass-reinforced Black
Base plate	Aluminium, nickel-plated
Potting compound	Polyurethane, black
Relay Mounting scews Mounting torque	 M5 ≤ 1.5 Nm
Control terminal Mounting screws Mounting torque	 M3 ≤ 0.5 Nm
Power terminal Mounting screws Mounting torque	 M5 ≤ 1.5 Nm

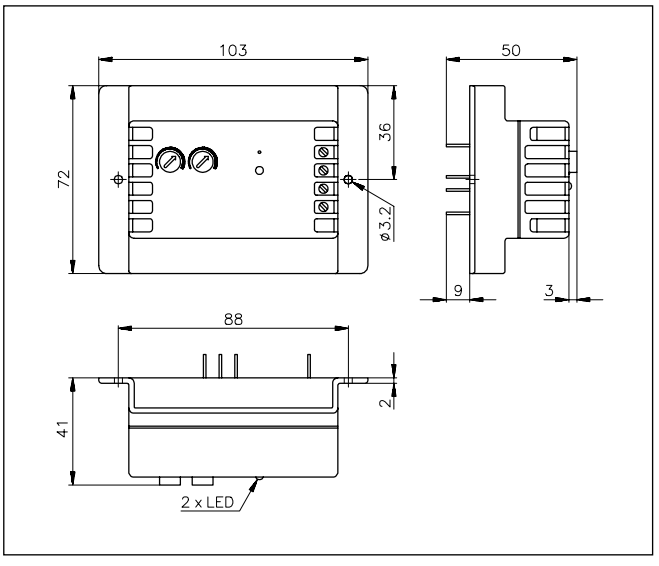
Dimensions

RTO 12..



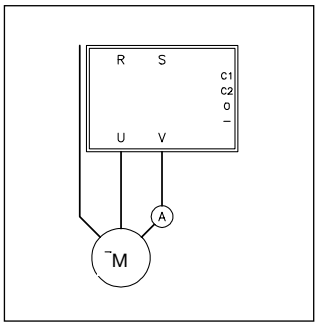
All dimensions in mm

RTC 40 HD12-.

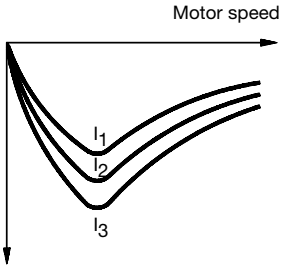


Applications

Measuring point for DC load current
Note: When using a clampmeter, be sure that it is capable of measuring DC-current.



Brake current
Typical behaviour of braking torque as a function of motor speed: As will be seen from the curve, the braking torque will be relatively low at nominal motor speed. As the revolution speed decreases, the braking torque increases until the speed approaches zero. Then, the braking torque decreases. With zero speed the braking torque is at zero.



Different settings of brake current $I_1 > I_2 > I_3$

Protection of the motor
A possible way of protecting the motor against overheating where dynamic braking is used is to mount a temperature sensor, PTC or Klixon, between the motor windings.

Thermal relays will normally be sensitive to the current asymmetry occuring while braking. The thermal relay may trip undesirably.

Connection to the mains
As this type of brake relay has a semiconductor between two phases, it is always recommended to protect it against high surge currents as well as possible voltage transients.

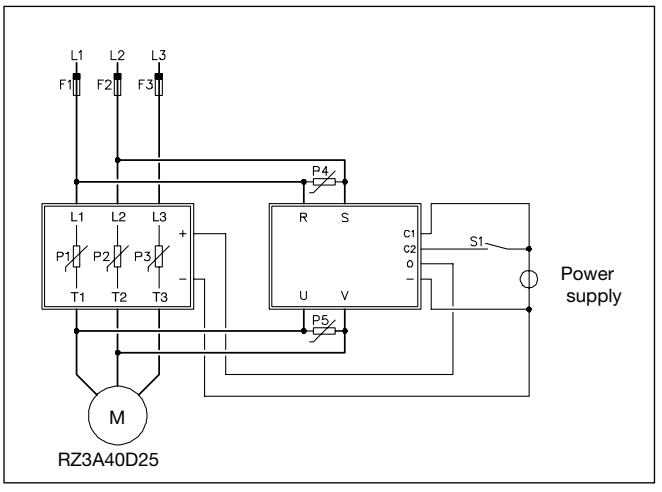
The protection consists of two elements:

1. A semiconductor fuse rated below the max. load integral (I^2t) for the output module.

2. A voltage-dependent resistor (MOV) to prevent voltages higher than the blocking voltage of the output modules. Without MOV, voltage transients might trigger the output module and subsequently cause undesirable fuse blowing.

Connection to 3-phase SSR
F1 - F3: Ultrafast fuses with I^2t rated lower than the I^2t value of the output module.
P1 - P5: Varistors for 420 V mains with a diameter of 20 mm.

Applications (cont.)



S1 closed: The motor is running.
S1 opens: The adjusted current brakes the motor within the adjusted time.

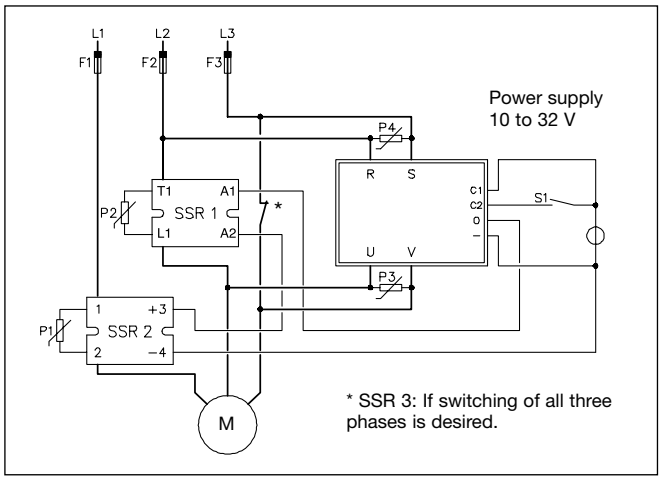
If S1 is closed before the end of a braking cycle, the relays will return to RUN mode within 0.1 s.

Connection to two 1-phase SSRs

Note: Motor protecting relay is not shown.

F1 - F3: Ultrafast fuses with I^2t rated lower than the I^2t value of the output.

P1 - P4: Varistors for 420 V mains with a diameter of 20 mm.



SSR 1, SSR 2: Carlo Gavazzi type RA 48 xx-D 12 (1200 V blocking voltage).
S1 closed: The motor is running.
S1 opens: The adjusted current brakes the motor within the adjusted time.

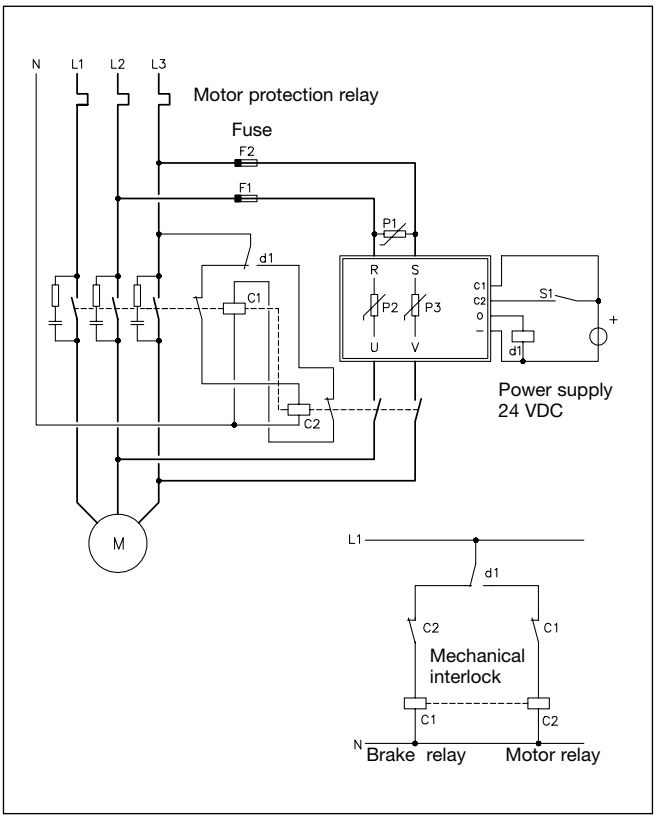
If S1 is closed before the end of a braking cycle, the relays will return to RUN mode within 0.1 s.

Connection to a 3-phase mechanical relay

Special precautions should be taken where the driving element is a mechanical contactor. The electrical voltage peaks from the contactor must be dampened by the use of RC snubbers.

Varistor: S20 K 420 Siemens
RC: PMR 209 Rifa 47Ω/0.1 µF
d1: Feme MZP
Fuse: See "General Accessories".

The output of the braking module is disconnected from the motor terminals when the motor is running and is connected only when the motor is in brake or stop mode. This feature together with a mechanical and electrical interlock (dotted line) between motor and brake relay will help to reduce the risk of malfunction.



F1 - F3: Ultrafast fuses with I^2t rated lower than the I^2t value of the output module. F3 is optional since there is no semiconductor in L3.
P1 - P3: Varistors for 420 V mains with a diameter of 20 mm.

When S1 is closed, the motor is running.
When S1 is opened, the motor brakes and stops.
Note: The max. allowable delay time for switching off is 350 ms. Do not use more than one auxiliary relay.

The d1 relay could also be a Solid State Relay, e.g. Carlo Gavazzi relay type RP1A23D3.

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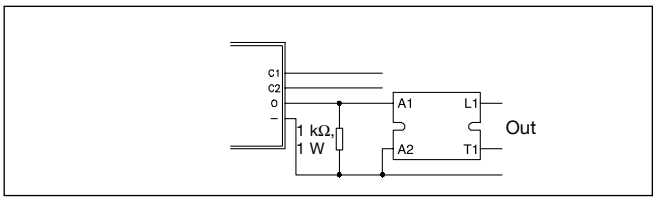
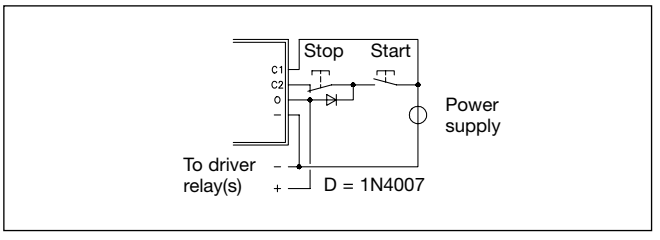
Applications (cont.)

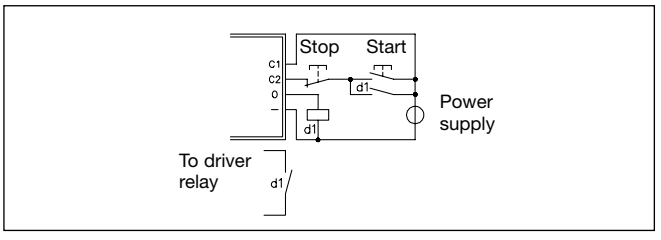
When using Solid State Relays, a resistor of 1 kΩ should be connected between output (0) and negative (-) on the RTC control unit to ensure that the output voltage from the RTC control unit is lower than the drop-out voltage for the Solid State Relay.



Start - stop function
(only control circuit is shown)

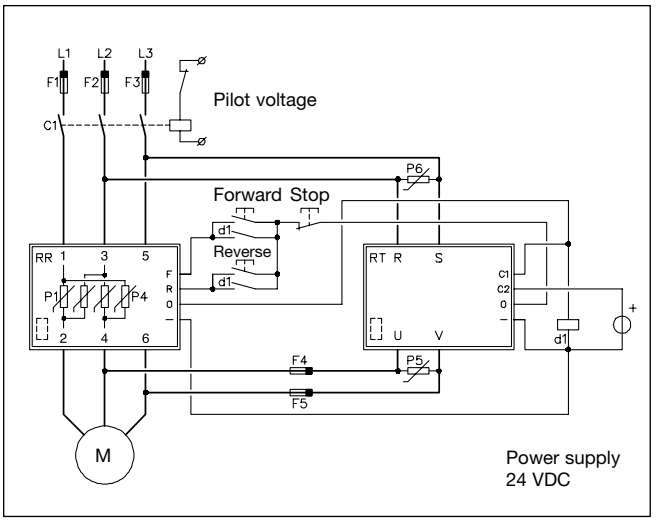


With auxiliary diode



With auxiliary relay

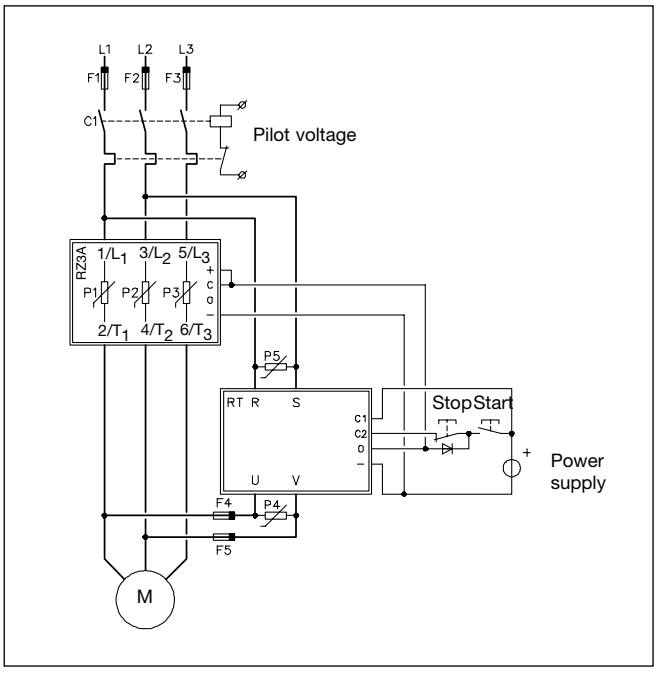
Interconnection of braking and reversing SSRs



F1 - F5: Ultrafast fuses with I^2t rated lower than the I^2t value of the relevant output modules.

P1 - P6: Varistors for 420 V mains with a diameter of 20 mm.

Interconnection of soft starting and braking SSRs



F1 - F5: Ultrafast fuses with I^2t rated lower than the I^2t value of the relevant output modules.

P1 - P5: Varistors for 420 V mains with a diameter of 20 mm.

Thermal considerations

Motor
Dynamic braking of 3-phase induction motors creates power dissipation in the motor. The DC current dissipates power in the stator windings, and the stored energy in the rotating machine is dissipated in the rotor during braking. Consequently, the best way of protecting the motor will be to install temperature sensors in the motor windings.

Solid State Relay
Due to the relatively high power dissipation in the motor the RUN and BRAKE mode ratio is normally less than 0.1.

$$\frac{\text{Brake time}}{\text{Run + Brake time}} < 0.1$$

This gives negligible power dissipation in the braking Solid State Relay. Under normal conditions it will be sufficient to mount the relay on to the chassis. If no metal backplate is available, a heatsink must be used:

RTO 1210 R_{th} = 2.5 K/W
RTO 1225 R_{th} = 2.5 K/W
RTO 1250 R_{th} = 1 K/W

The heatsinks are sufficient for ambient temperatures up to 60°C (140°F).

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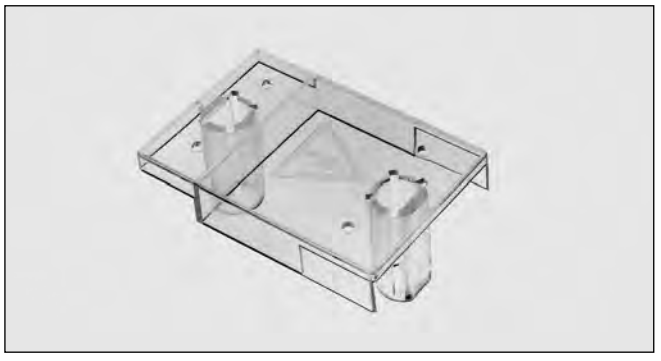
Solid State Relays
Motor Controllers

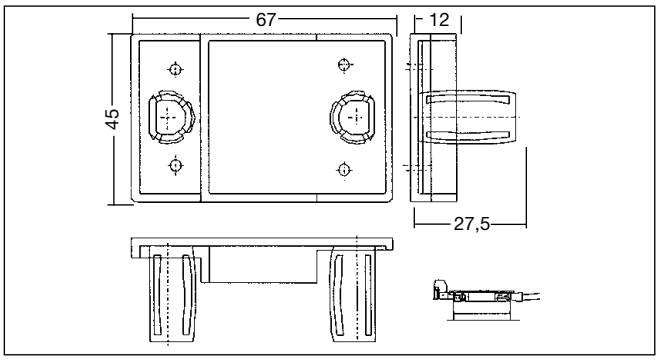
Solid State Relays
Accessories
Types BBR, RHS00, KK071, RXHT

Protection Covers

BBR
Cover for 1-phase SSRs. In order to achieve a higher protection degree for 1-phase relays, the cover must be mounted correctly on top of the relay.

Material	Plastic
Colour	Transparent



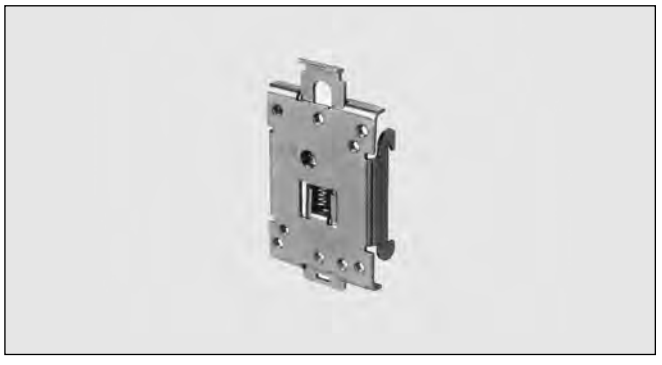


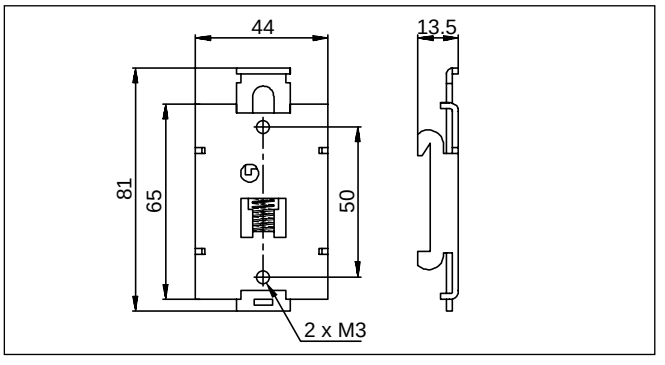
Dimensions in mm

DIN Rail Adapter

RHS00
DIN rail adapter RHS00 is intended for mounting a heatsink assembly or a 1-phase relay directly on a DIN-rail.

Material	Electroplated steel



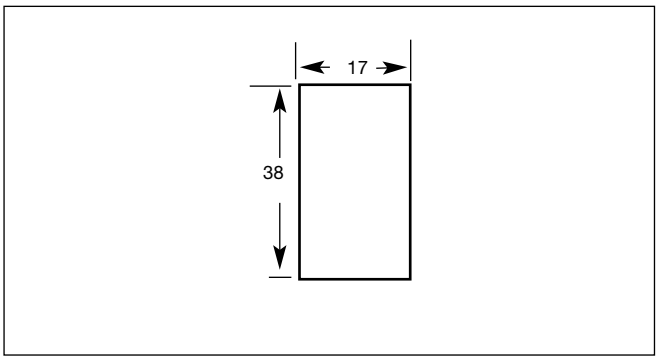


Dimensions in mm

Thermal Pads

RXHT
Pack of 50 pieces thermal pad for RX series size 17 x 38mm intended to be affixed to SSR for thermal transfer between SSR and heatsink

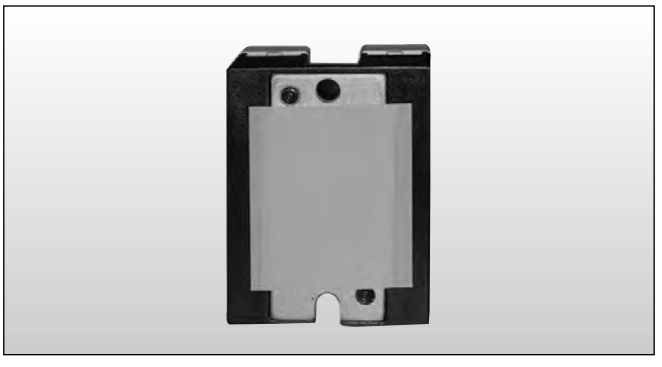
Material	Graphite thermal interface
Rth_{cs}	0.25 K/W

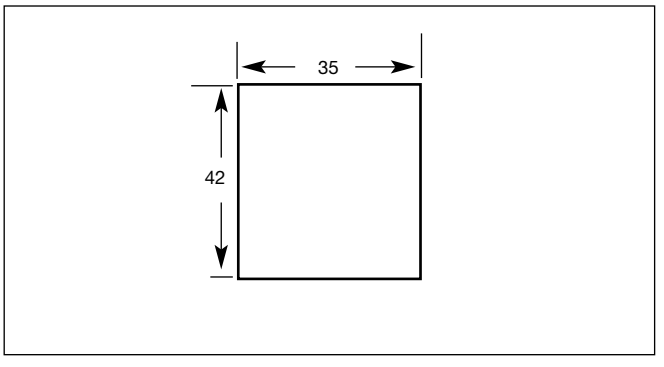


Dimensions in mm

KK071CUT
Pack of 50 pieces thermal pad size 35 x 42mm intended to be affixed to SSR for thermal transfer between SSR and heatsink.

Material	Thermally conductive polyimide film
Rth_{cs}	0.4 K/W





Dimensions in mm

DIN-Rail Adapter for PCB SSRs

DIN Rail adapter module intended for mounting of PCB relays series RP on DIN rail. RPM1 is intended for 230 VAC modules. For higher nominal operational voltages (up to 600 VAC) RPM2 is available.

RP SSR is not included. Add 'M1' or 'M2' suffix to RP type for mounting of RP SSR to DIN rail adaptor.

Note that when the RP..10 is mounted on a DIN Rail (and hence vertically mounted), a derating factor has to be applied to the SSR.

Ordering Key

RPM1 V

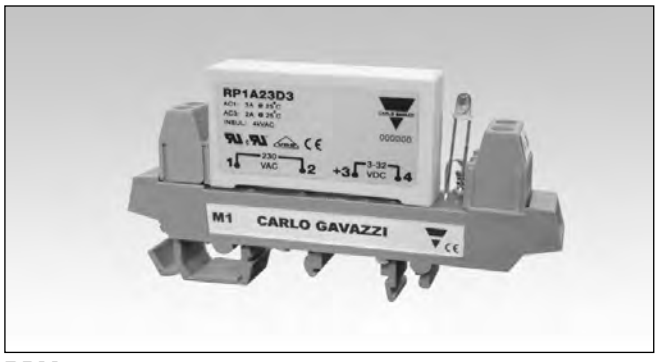
RP DIN rail adaptor module
Options

V: Integrated varistor across RPM1 output terminals

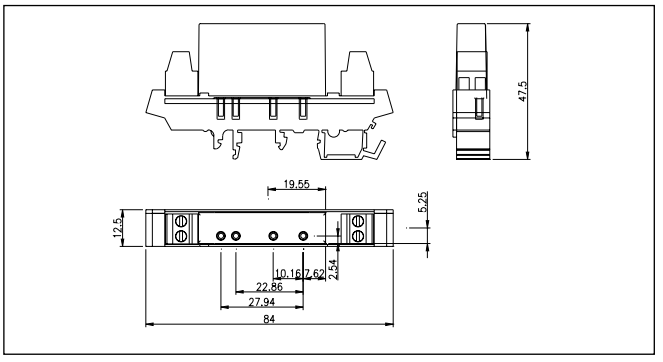
P: RPM1 with pins for easy removal of RP unit*

PD: RPM1 with pins for easy removal of RP unit including an LED for control status indication *

* Not available with RPM2

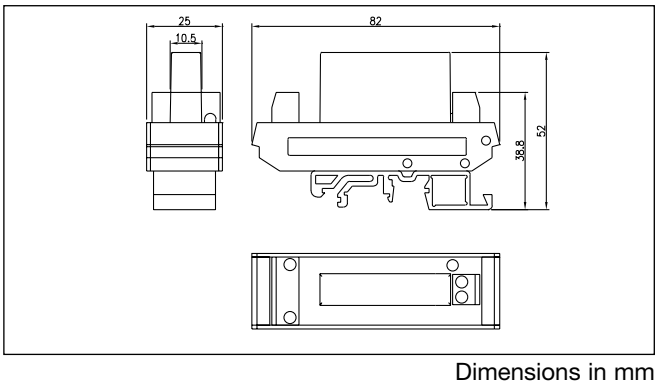


RPM1



Dimensions in mm

RPM2



Dimensions in mm

Housing Specifications

Housing material	PA, green, UL94 V0
Weight	RPM1 approx. 15g RPM2 approx. 20g
Terminal screws	M3
Terminal cable size max. (stranded)	1.5mm^2
Mounting torque max.	0.5 Nm
Operating temperature	-20° to + 70°C [-4 to +158°F]
Storage temperature	-40° to + 100°C [-40° to +212°F]
DIN rail guide	DIN EN 50022, 50035

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Fork Terminals

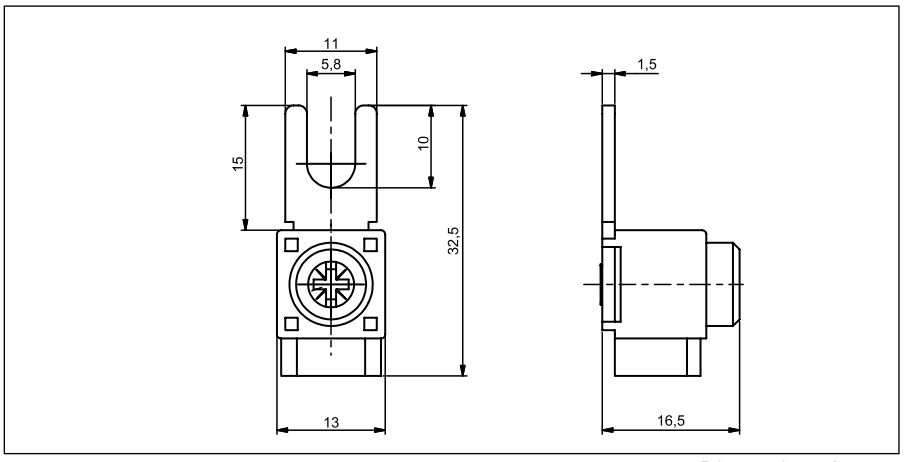
These fork terminals are suitable for use on the RM, RS and RAM models. The RM635FK can handle conductors with a maximum cross sectional area of 35mm² whilst the RM625FK can handle conductors with a maximum cross sectional area of 16mm². The RM635FK is also available with touch protection cover, i.e. RM635FKP

Ordering Key

RM635FK | **P**

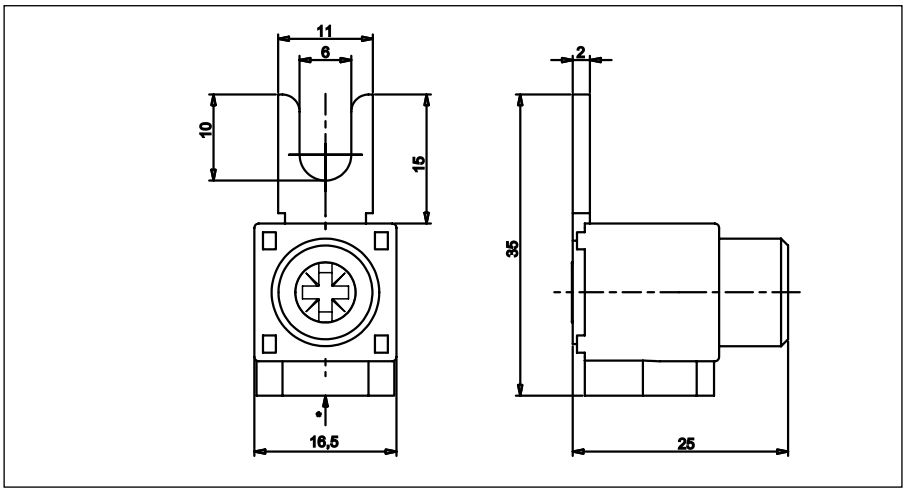
RM terminal adaptor
Touch protected (optional)

RM625FK

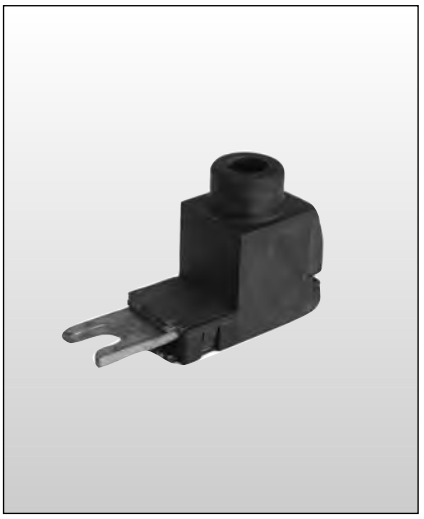


Dimensions in mm

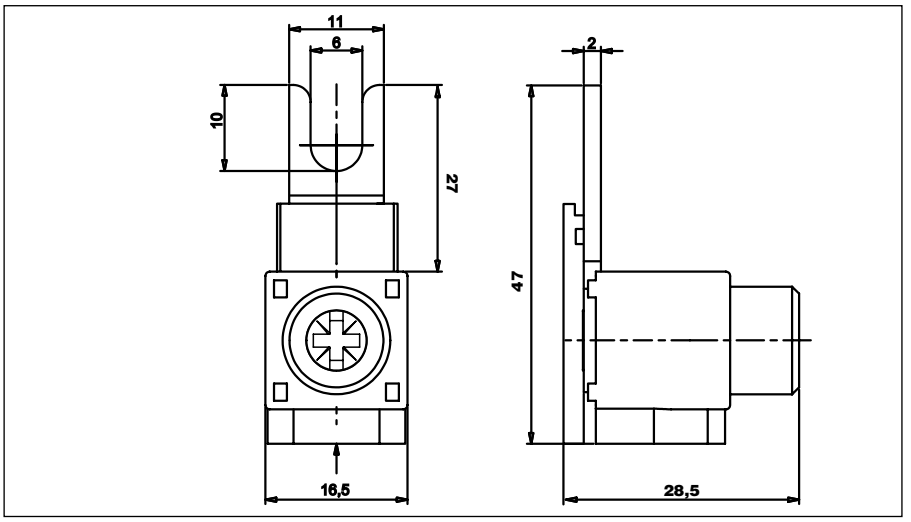
RM635FK



Dimensions in mm



RM635FKP



Dimensions in mm

Fork Terminals (cont.)

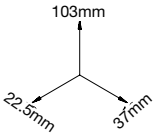
General Specifications

Housing	RM6x5FK	Cycoloy UL 94 V0
	RM635FKP	Latamid UL 94 V0
Connection lug		CuZn37 with surface Zn4ymcA
Max. fastening torque		2Nm
Max. CSA	RM635FK	50mm² solid Cu conductor 35mm² flexible Cu conductor
	RM625FK	25mm² solid Cu conductor 16mm² flexible Cu conductor

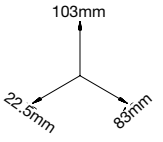
Min. cross-sectional area	
RM635FK	6mm²
RM625FK	6mm²
Max. connection diameter	
RM635FK	10mm
RM625FK	6.5mm
Max. operating voltage	600 VAC
Max. handling current	
RM635FK	100A
RM625FK	63A
Pack size	10pcs.

Dimensions not including the SSR

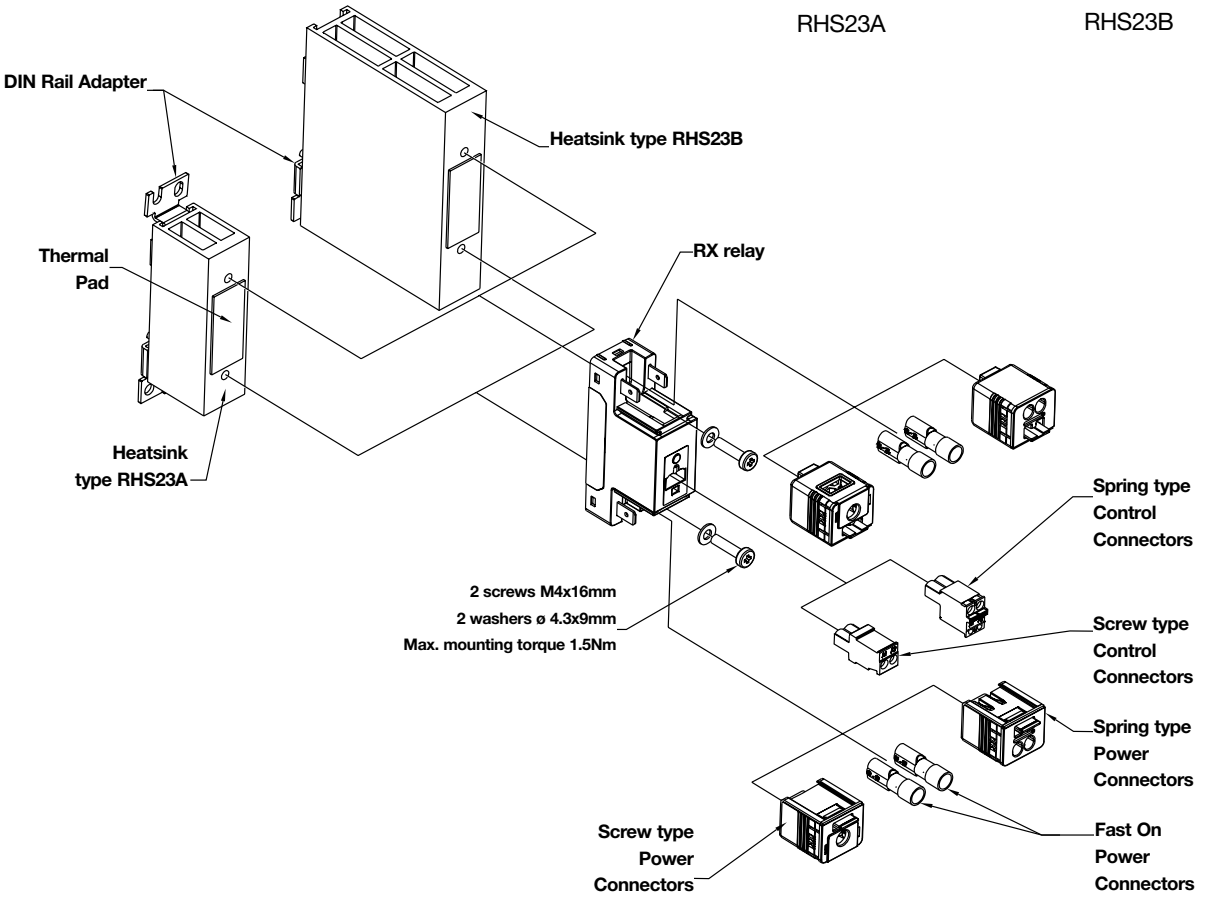
RHS23A and RHS23B
Heatsink assembly with DIN-rail adapter for RX type SSR.
Type RHS23A and RHS23B are a complete kit not including the SSR.

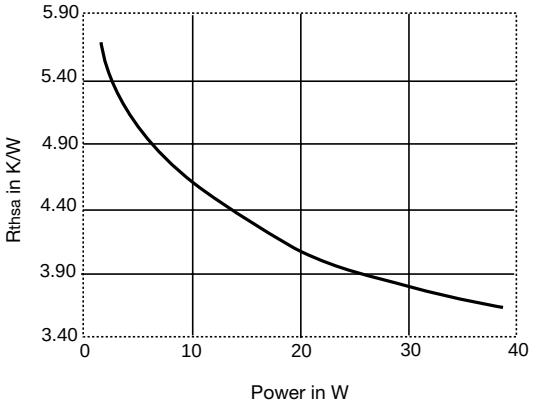


RHS23A

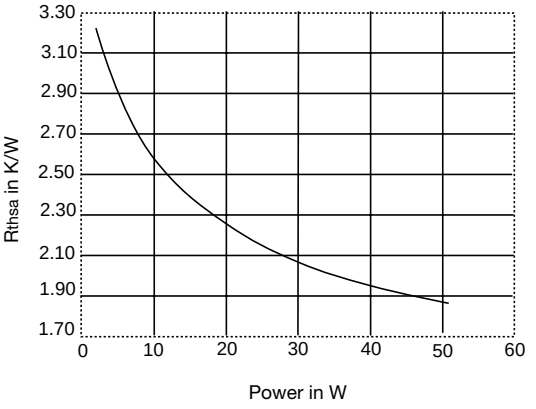


RHS23B





RHS23A



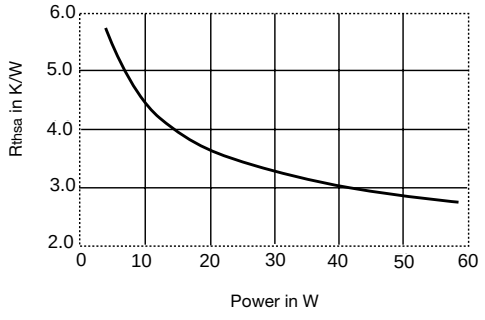
RHS23B

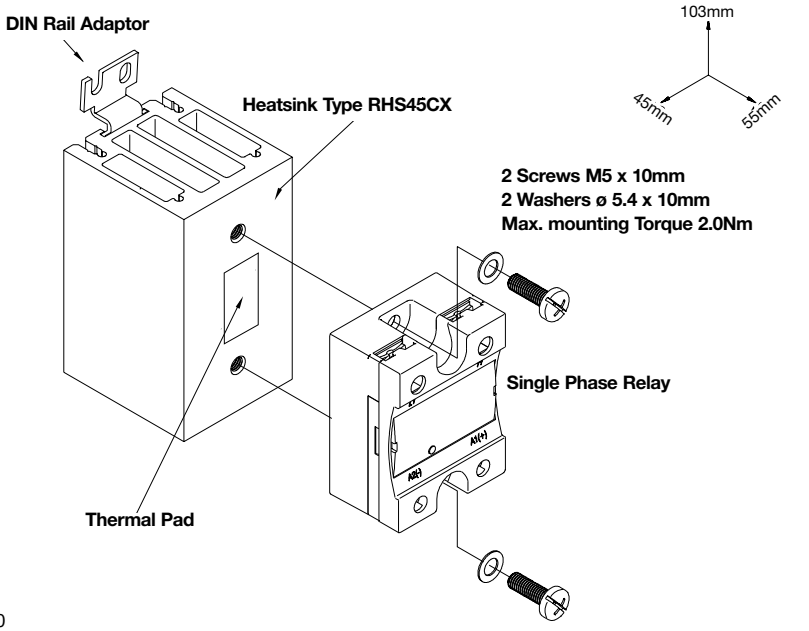
Heatsink Assemblies (cont.)

Dimensions not including the SSR

RHS45C
Heatsink assembly with DIN-rail adapter for 1-phase SSRs. Type RHS45C is a complete heatsink kit not including the SSR. A 40x40 mm fan may be mounted onto the heatsink.

RHS45CD
RHS45C assembly without BBR cover and without heatsink compound.

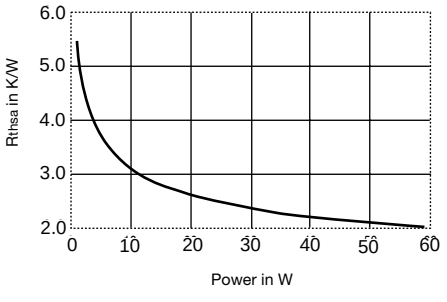


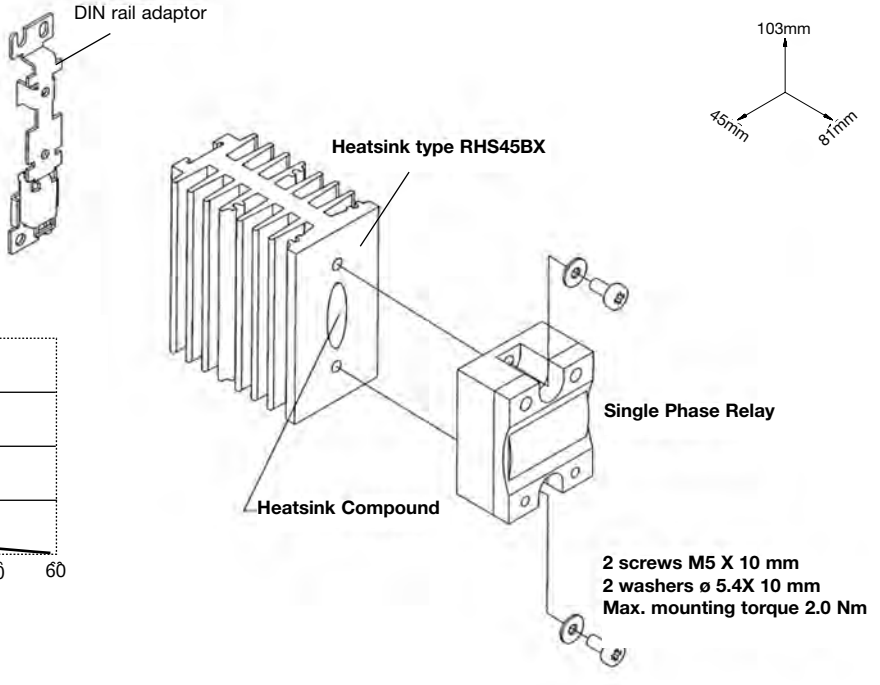


Dimensions not including the SSR

RHS45B
Heatsink assembly with DIN-rail adapter for 1-phase SSRs. Type RHS45B is a complete heatsink kit not including the SSR. A 40x40 mm fan may be mounted on to the heatsink.

RHS45BD
RHS45B assembly without BBR cover and without heatsink compound.





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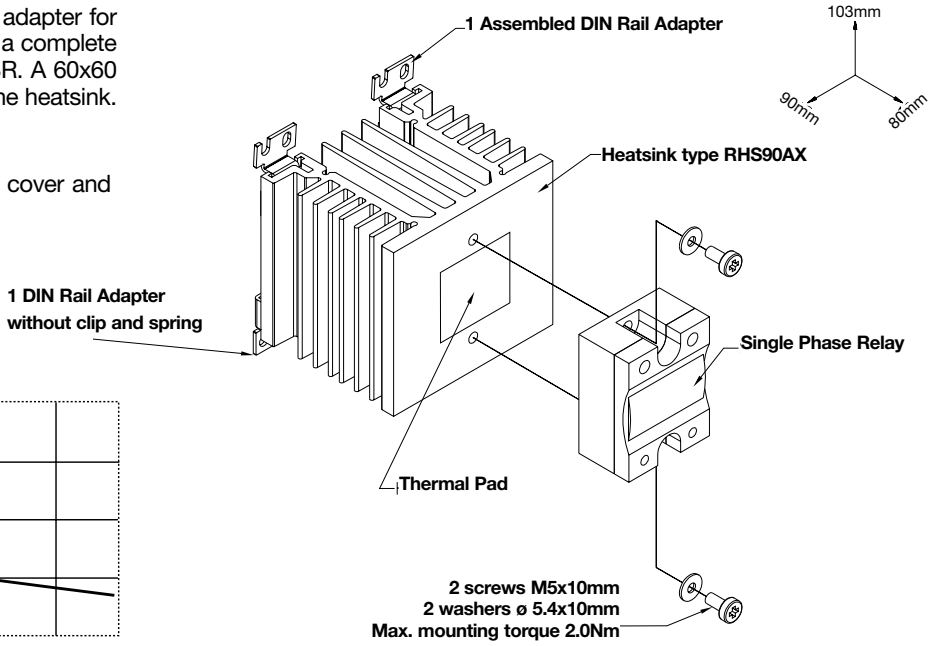
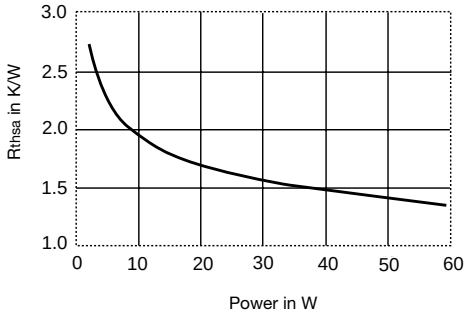
Heatsink Assemblies (cont.)

RHS90A
Heatsink assembly with DIN-rail adapter for 1-phase SSRs. Type RHS90A is a complete heatsink kit not including the SSR. A 60x60 mm fan may be mounted onto the heatsink.

RHS90AD
RHS90A assembly without BBR cover and without heatsink compound.

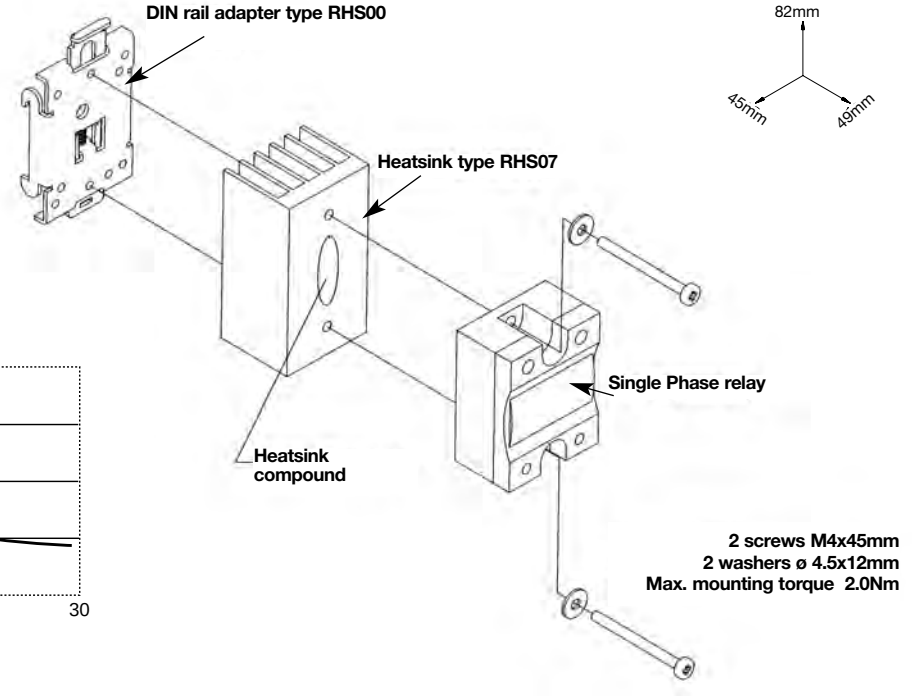
Dimensions not including the SSR

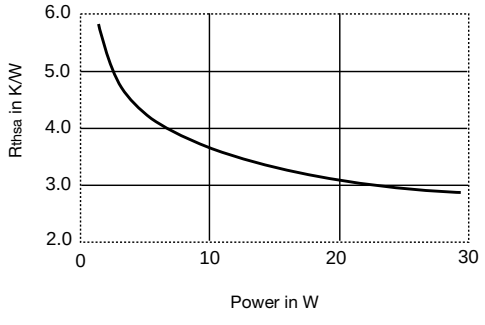




RHS100
Heatsink assembly with DIN-rail adapter for 1-phase SSRs. Type RHS100 is a complete heatsink kit not including the SSR.

Dimensions not including the SSR



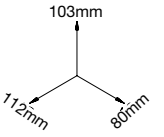


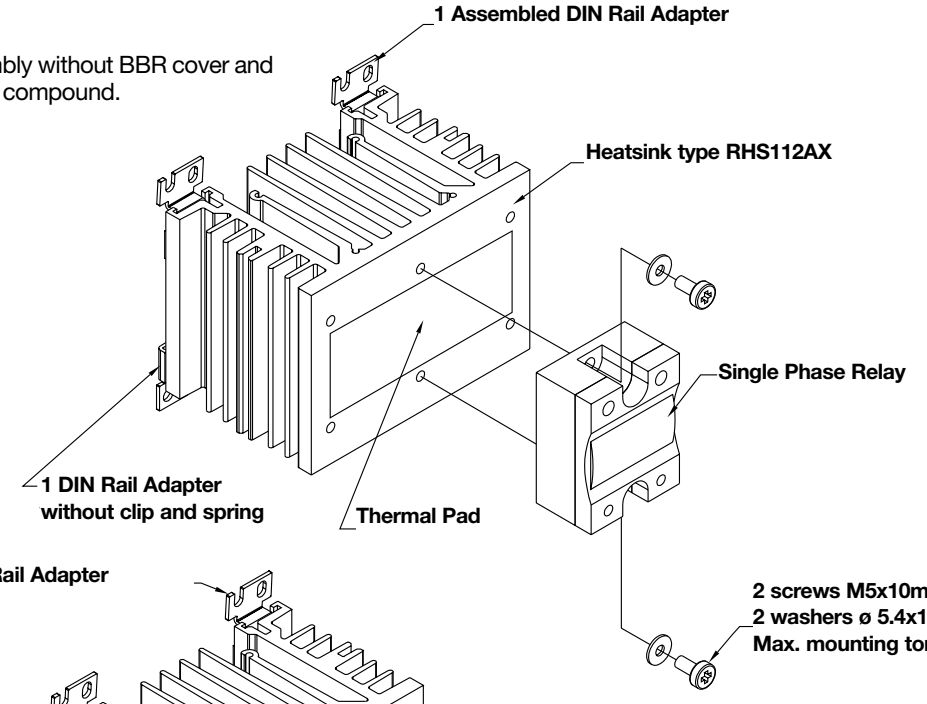
Heatsink Assemblies (cont.)

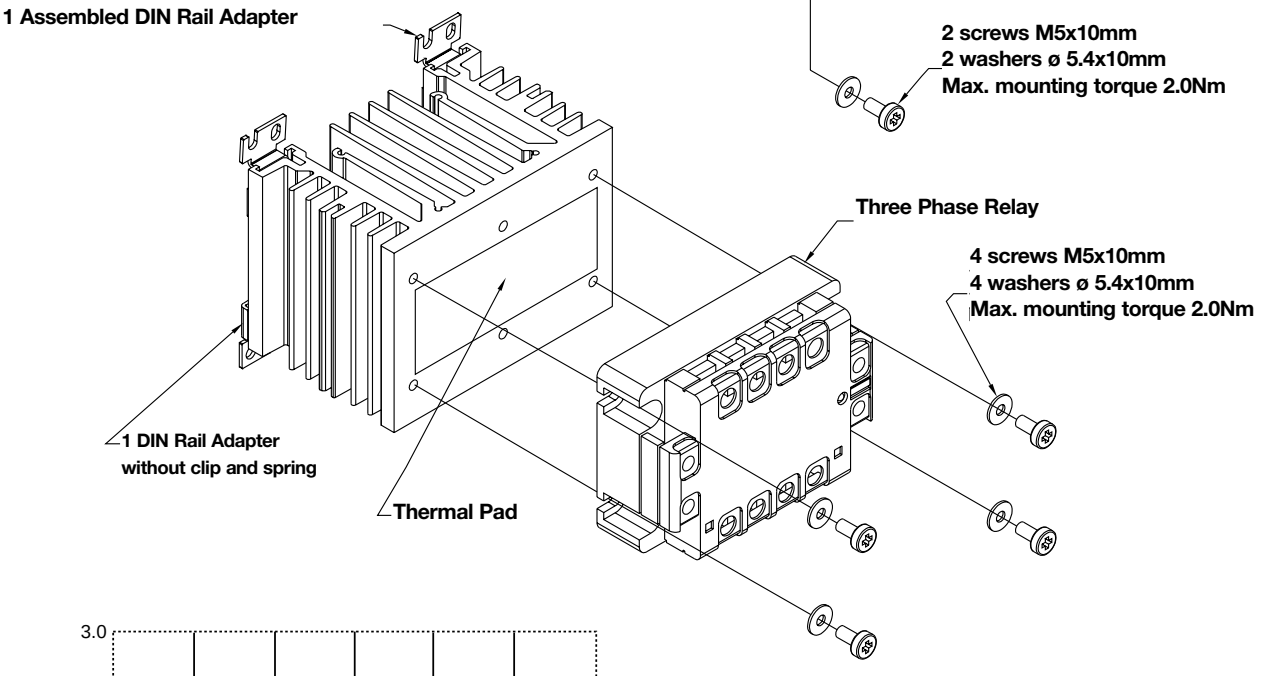
RHS112A
Heatsink assembly with DIN-rail adapter for 1-phase and 3-phase SSRs. Type RHS112A is a complete heatsink kit not including the SSR. A 60x60 mm fan may be mounted onto the heatsink.

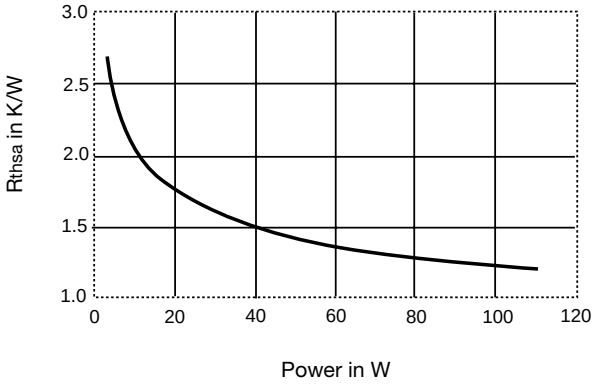
RHS112AD
RHS112A assembly without BBR cover and without heatsink compound.

Dimensions not including the SSR





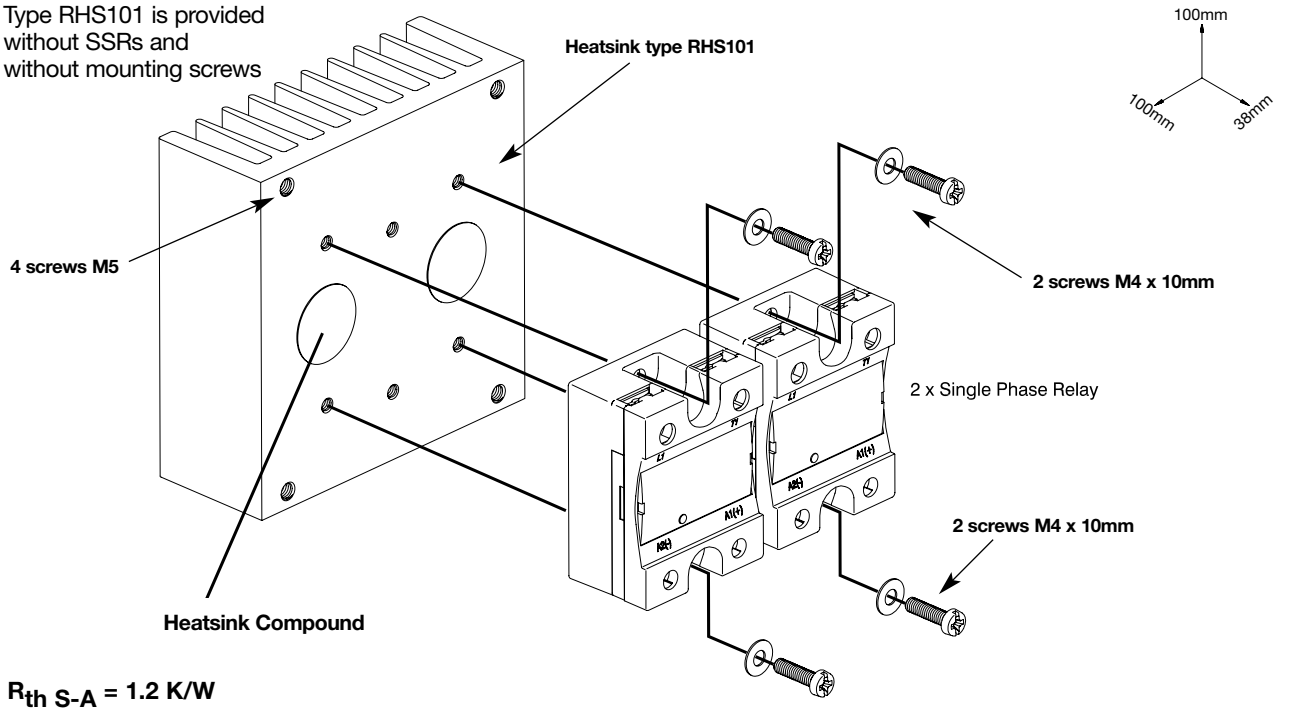




Heatsink Assemblies (cont.)

Dimensions not including the SSR

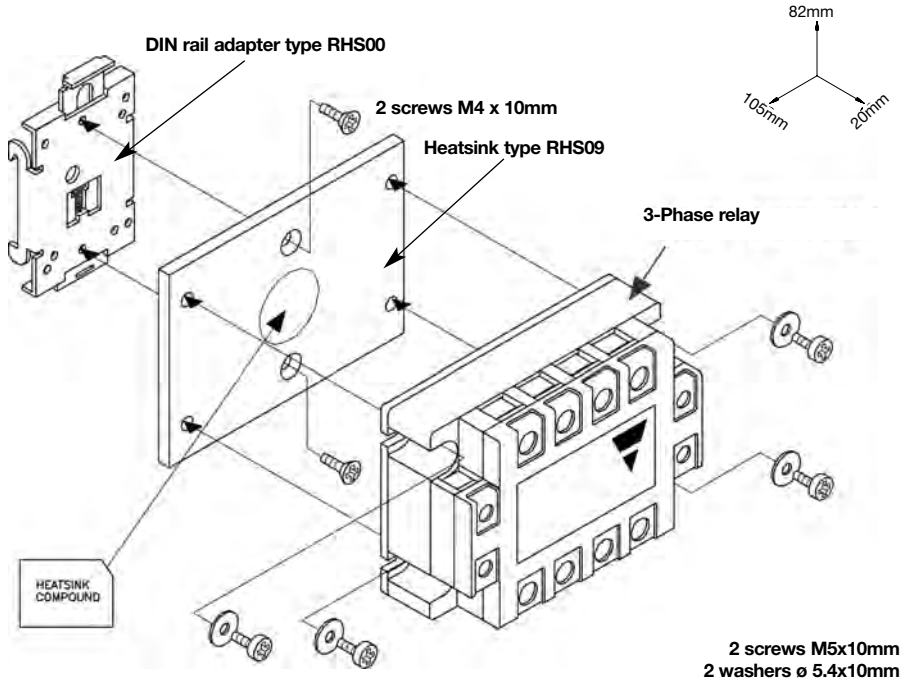
RHS101
Type RHS101 is provided without SSRs and without mounting screws



$R_{th\ S\text{-}A}$ = 1.2 K/W

Dimensions not including the SSR

RHS300
Heatsink assembly with DIN-rail adapter for 3-phase SSRs. Type RHS300 is a complete heatsink kit not including the SSR.

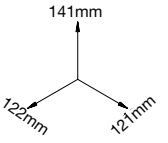


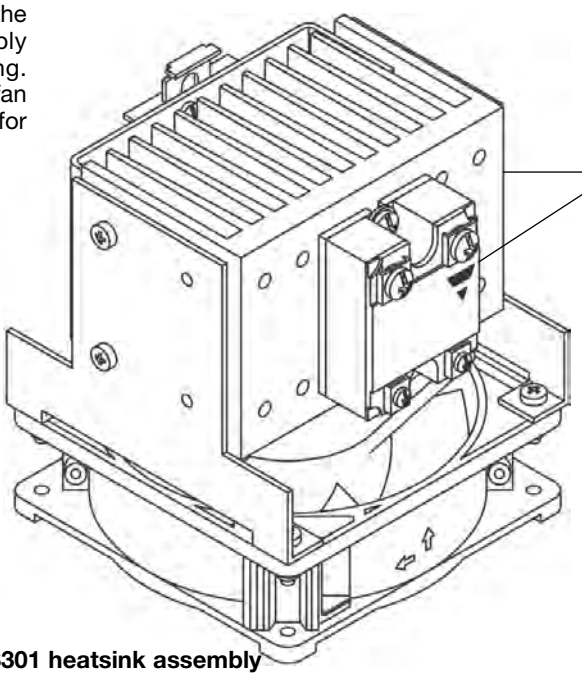
$R_{th\ S\text{-}A}$ = 5 K/W.

Heatsink Assemblies (cont.)

Fan Kit RHS301F115, RHS301F230
Not including the SSR and the RHS301 heatsink assembly shown on the drawing. RHS301F115 for 115 VAC fan supply and RHS301F230 for 230 VAC fan supply.

Dimensions not including the SSR



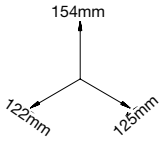


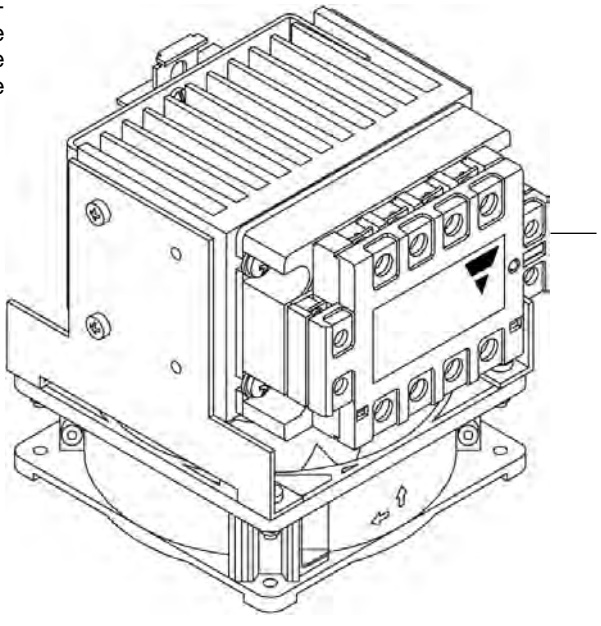
Note:
High-quality fan with full metal bearings.

$R_{th\ S\text{-}A}$ = 0.25 K/W, when attached to the RHS301 heatsink assembly

RHS301F115/230C (115/230 VAC fan supply)
Heatsink assembly with DIN-rail adapter for 1-phase or 3-phase SSRs. Type RHS301F...C is a complete heatsink kit not including the SSR.

Dimensions not including the SSR





Note:
High-quality fan with full metal bearings.

$R_{th\ S\text{-}A}$ = 0.25 K/W.

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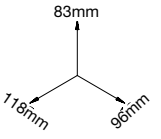
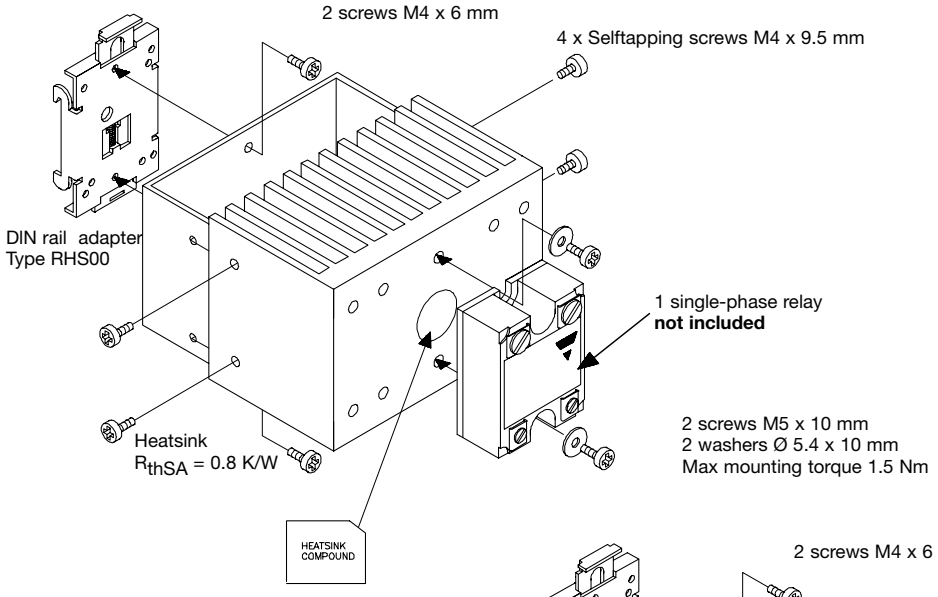
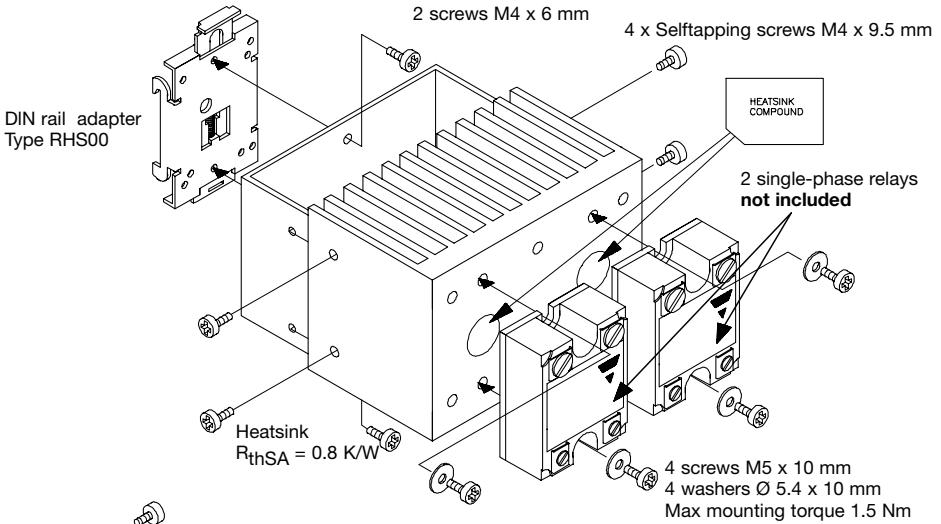
Heatsink Assemblies (cont.)

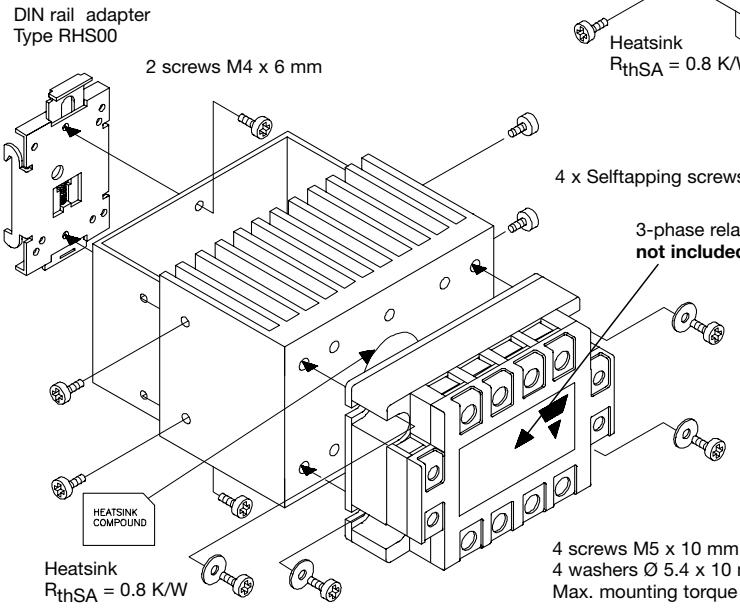
Type RHS301
Heatsink assembly for 1-phase and 3-phase SSRs. Type **RHS301D** is an RHS301 assembly without the heatsink compound.

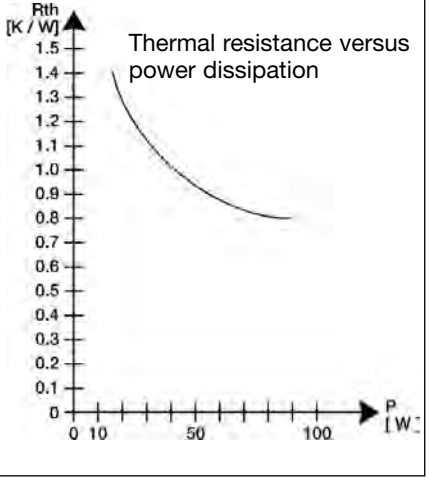
Dimensions not including the SSR









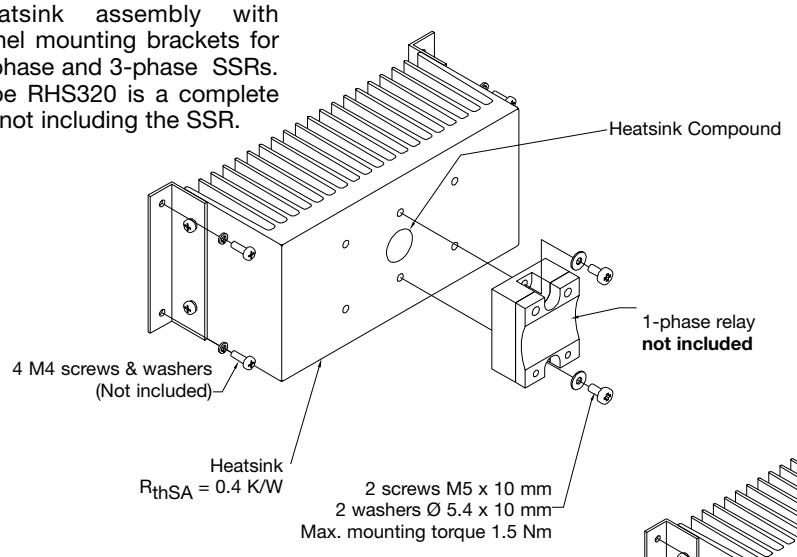


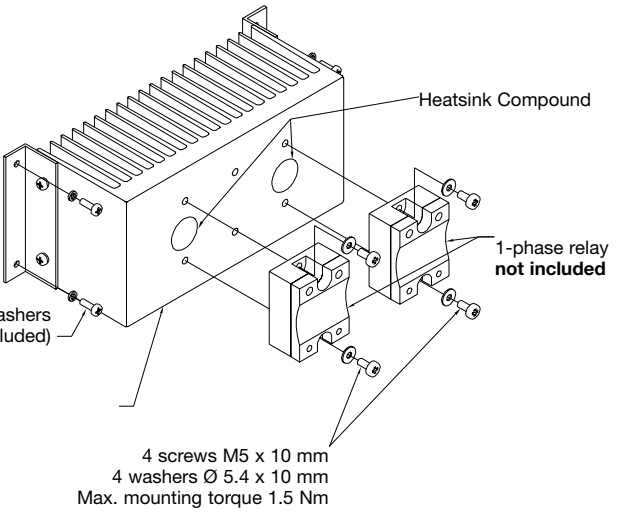
Thermal resistance versus power dissipation

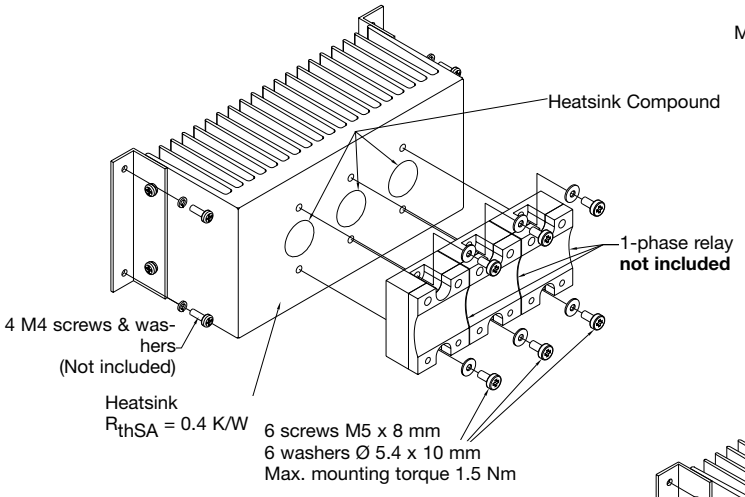
Heatsink Assemblies (cont.)

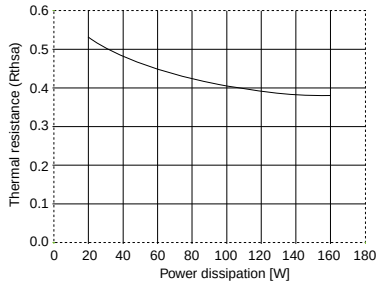
Dimensions not including the SSR

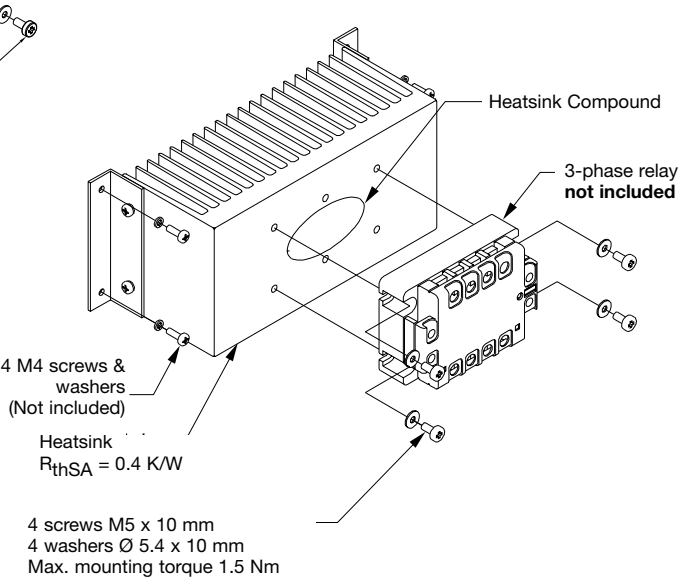
RHS320
Heatsink assembly with panel mounting brackets for 1-phase and 3-phase SSRs. Type RHS320 is a complete kit not including the SSR.







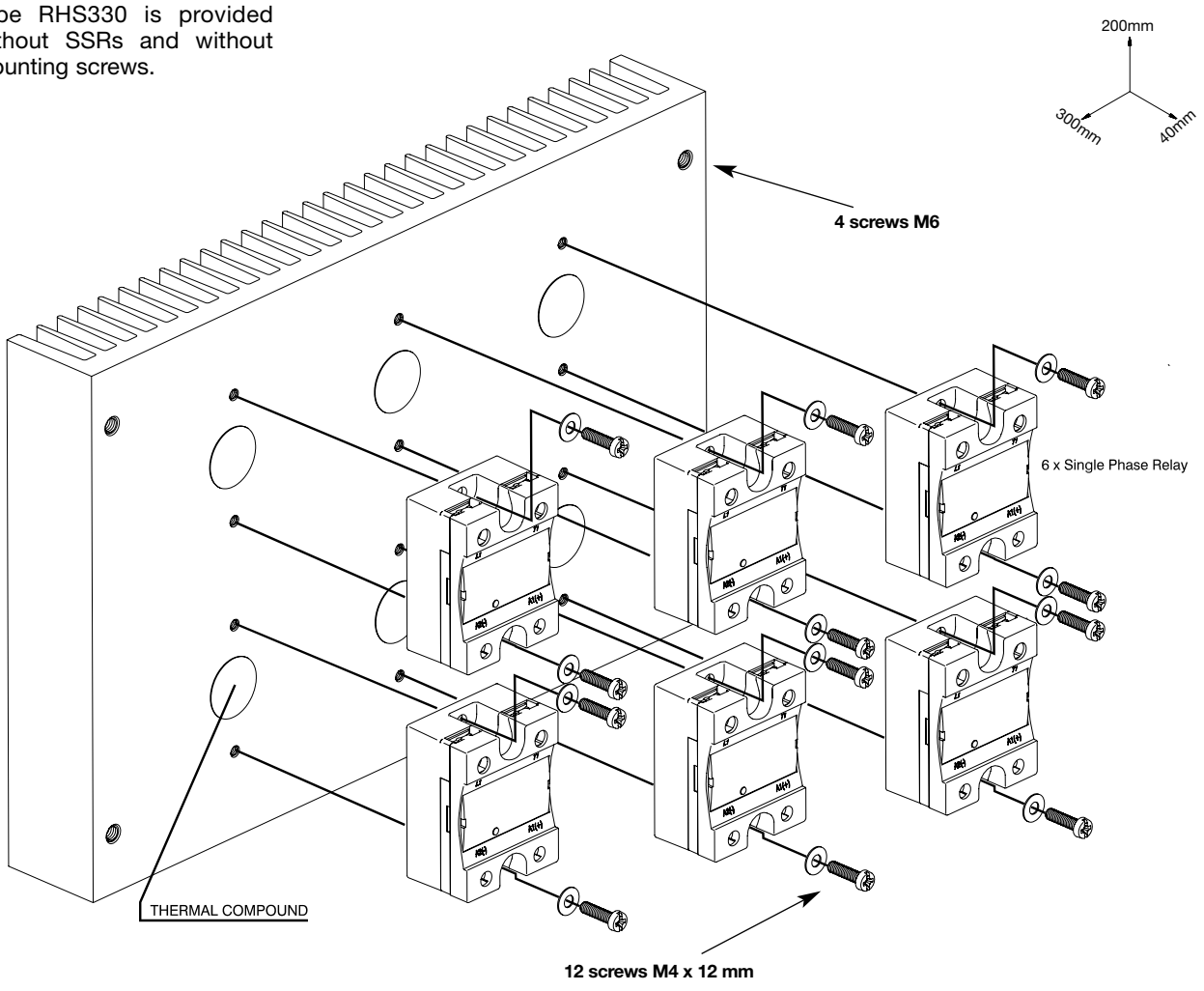




Heatsink Assemblies (cont.)

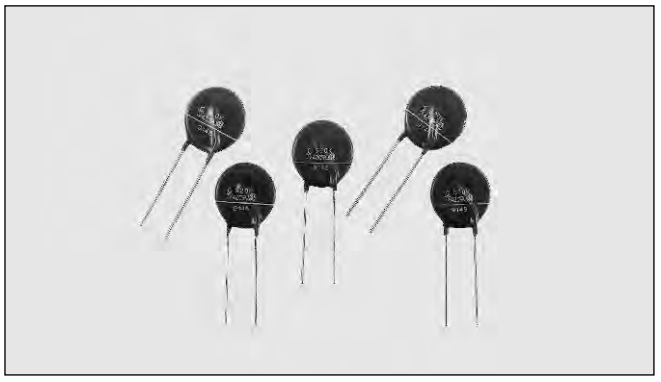
RHS330
Type RHS330 is provided without SSRs and without mounting screws.

Dimensions not including the SSR



Rth $_{S-A}$ = 0.3 K/W

Solid State Relays
Accessories
Type RV



- **Transient protection devices for Solid State Relays**

Product Description

A metal oxide varistor (MOV) is a voltage dependent resistor with a symmetrical V/I characteristics curve whose resistance decreases with increasing voltage.
Varistors are ideally suited for protecting sensitive electronic circuits and components (power semiconductors) against voltage transients caused either by the mains or by other application parts. Connected in parallel with the electronic device that is to be guarded, they form a low resistance shunt when voltage increases and thus prevent any further V/I in the over voltage

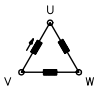
Ordering Key

RV 08

Solid State Relay
Varistor
Varistor voltage

Type Selection

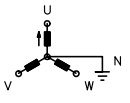
3-phase mains without neutral



Mains	Uc *	Carlo Gavazzi**	Epcos	AVX	Nippon Chemi-Con	ACPA/ Song Long
230 V	710	**RV 02**	SIOV-S20K275	VF20M10431K	TND 20V-431	431KD20
400 V	1120	**RV 04**	SIOV-S20K420	VF20M10681K	TND 20V-681	681KD20
480 V	1355	**RV 05**	SIOV-S20K510	VF20M10821K	TND 20V-821	821KD20
600 V	1650	**RV 06**	SIOV-S20K625	VF20M10102K	TND20V-102	102KD20
660 V	1815	**RV 07**	SIOV-S20K680	-	TND20V-112	112KD20
690 V	-	**RV 08**	-	-	TND20V-122	152KD20

* Uc @ 100 A_p (SIOV-S20K...)
** Pack of 10 pieces

1-phase and 3-phase mains with neutral

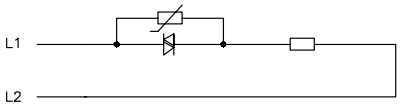
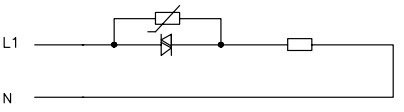
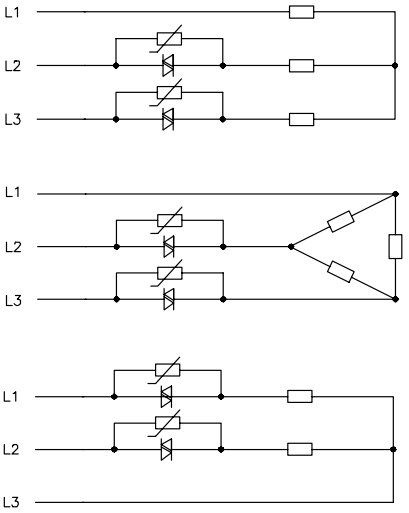
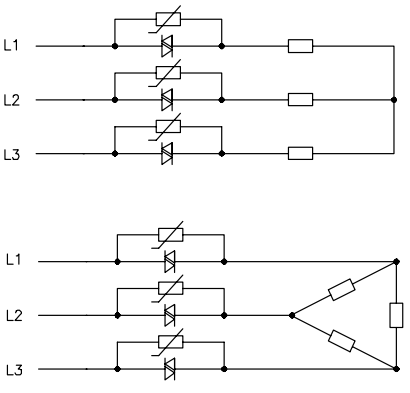
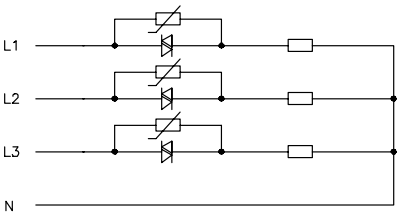


Mains	Uc *	Carlo Gavazzi**	Epcos	AVX	Nippon Chemi-Con	ACPA/ Song Long
120/240	710	**RV 02**	SIOV-S20K275	VF20M10431K	TND20V-431	431KD20
230/400	710	**RV 02**	SIOV-S20K275	VF20M10431K	TND20V-431	431KD20
277/480	775	**RV 03**	SIOV-S20K300	VF20M10471K	TND20V-471	471KD20
400/690	1120	**RV 04**	SIOV-S20K420	VF20M10681K	TND20V-681	681KD20

* Uc @ 100 A_p (SIOV-S20K...)
** Pack of 10 pieces

CARLO GAVAZZI

Wiring Diagrams

	Mains without neutral	Mains with neutral
1-phase		
2-phase	Economy switch 	
3-phase		

Solid State Relays
Accessories
Type MS1...

- **Rated operational voltage: 115, 230 or 400 VACrms**
- **Supply output: 14 VDC @ $I_{max.}$ = 110 mA**
- **Short-circuit protected**
- **5 A SPST relay output**
- **LED indication for power supply on and relay on**
- **Insulation: 2000 Vrms/4 mm**
- **H2 housing**

Product Description

Power supply unit with built-in control relay for motor controllers type RSC/RSO and RTC/RTO.

Ordering Key

MS 1 400

Motor controller
Supply unit
Index no.
Rated operational voltage

Type Selection

Type	Index no.	Rated operational voltage
MS: Supply unit for motor controller	1	115: 115 VACrms 230: 230 VACrms 400: 400 VACrms

Selection Guide

Rated operational voltage 115 VACrms	230 VACrms	400 VACrms
MS 1 115	**MS 1 230**	**MS 1 400**

General Specifications

	MS 1 115	MS 1 230	MS 1 400
Rated operational voltage (terminals 21 & 22)	115 VACrms	230 VACrms	400 VACrms
Operational frequency range	45 to 65 Hz	45 to 65 Hz	45 to 65 Hz
Environment Degree of protection Pollution degree (IEC 60664)	 IP 20 B 3	 IP 20 B 3	 IP 20 B 3
Overvoltage category	III	III	III
Indication for Power supply ON Relay ON	 LED, green LED, yellow	 LED, green LED, yellow	 LED, green LED, yellow
Approval	CSA	CSA	CSA
CE-marking	Yes	Yes	Yes

Supply Specifications

	MS 1 115	MS 1 230	MS 1 400
Operational voltage range	103 to 126 VACrms	207 to 253 VACrms	360 to 440 VACrms
Voltage interruption	≤ 40 ms	≤ 40 ms	≤ 40 ms

Input Specifications

Relay pick-up voltage	≤ 8.0 VDC
Relay drop-out voltage	≥ 0.6 VDC
Max. input voltage	≤ 21.2 VDC
Input impedance	640 Ω

Output Specifications

Supply output range		10 to 30 VDC
Rated DC output voltage @ 110 mA (terminals 1 & 4)		14 VDC
Relay output SPST (terminals 23 & 24)	AC 1	5 A, 250 VAC
	AC 15	2 A, 250 VAC
	DC 1	5 A, 24 VDC
	DC 13	3 A, 24 VDC

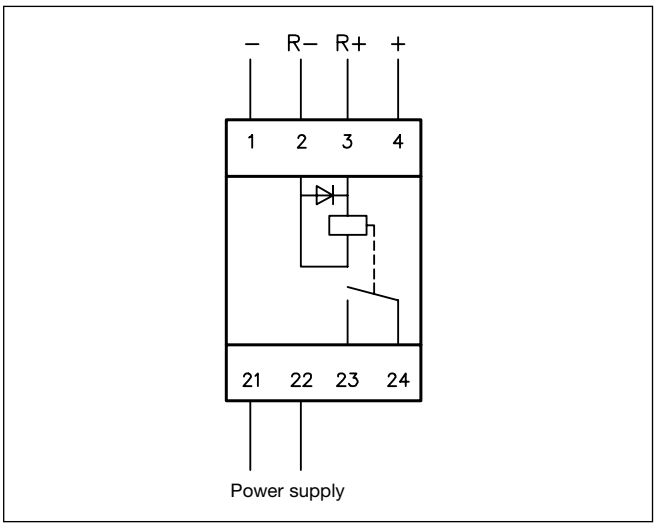
Thermal Specifications

Operating temperature	-20° to +50°C (-4° to +122°F)
Storage temperature	-50° to +85°C (-58° to +185°F)

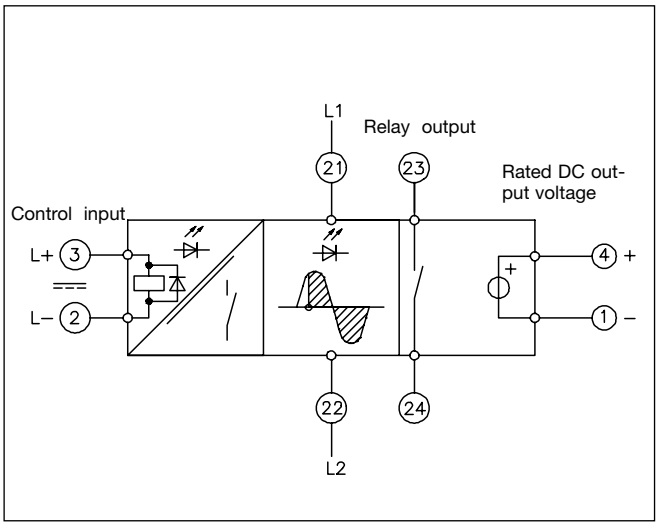
Isolation

Rated isolation voltage Supply to electronic circuit	≥ 2000 VACrms
Rated impulse withstand voltage	4000 Vp (1.2/50 µs)

Wiring Diagram

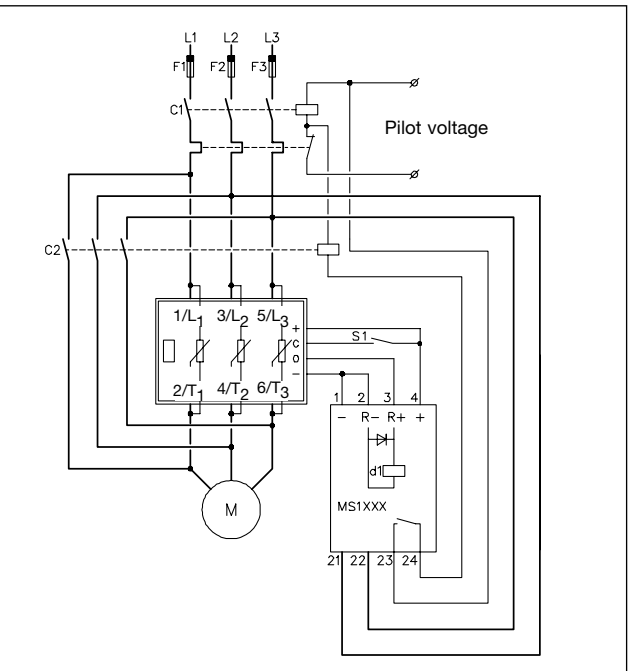


Functional Diagram



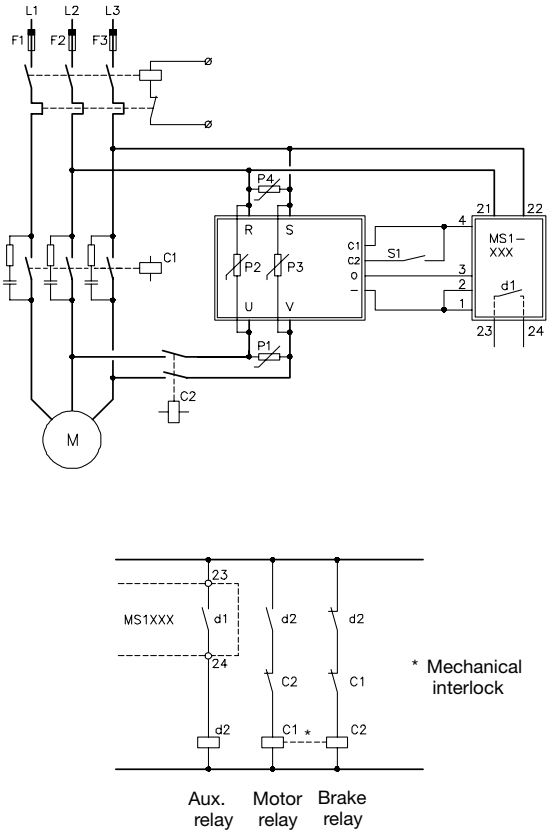
Applications

The MS1.. power supply connected to a motor controller (RSC) for soft starting/soft stopping of an induction motor.



Start/stop of RSC:
Start: Activate S1 until the motor is fully on
Stop: Activate S2

The MS1.. power supply connected to a motor controller (RTC) for dynamic braking of an induction motor.



For a 400 V application the following components are recommended:

S1 closed:
Motor is running

S1 opened:
Motor brakes and stops

Varistors:
S20K420 Siemens

RC:
PMR 209 Rifa 47 Ω/1.1 µF

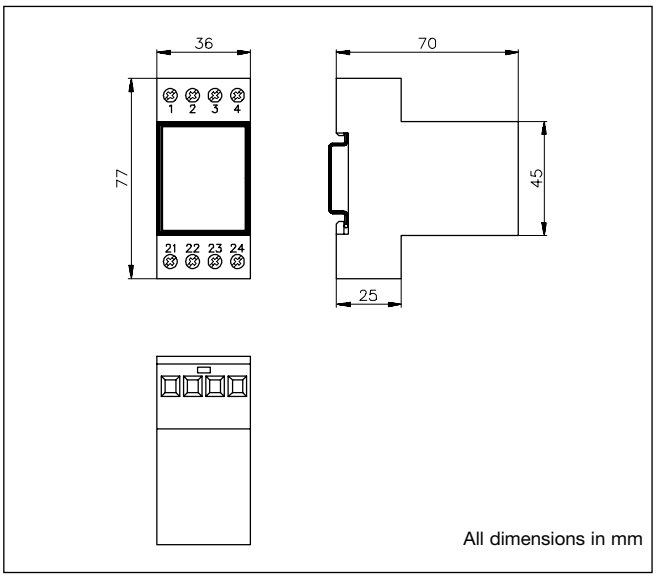
Fuses:
F2 - F3 FERRAZ

RTO 1210:
6.9 gRB 10-16

RTO 1225:
6.9 gRB 10-25

RTO 1250:
6.921CP gRC 22 x 58/50

Dimensions

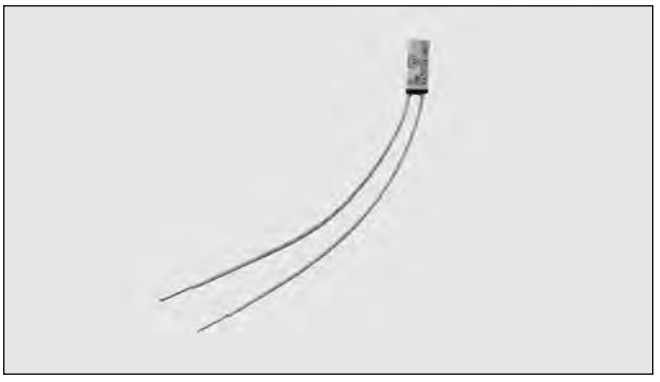


All dimensions in mm

Housing Specifications

Weight	Approx. 250 g
Housing material	Noryl, black
Mounting	DIN rail
Terminals	
Mounting screws	M 3.5
Mounting torque	≤ 0.8 Nm

Solid State Relays
Accessories
Type UP 62 - ..



- **Temperature limit switch for overheat protection of small assemblies.**

Product Description

The temperature limit switch is a readily available accessory. It is a thermostat especially designed for overheat protection for small assemblies.

The thermal response is excellent due to its miniaturized housing. It becomes an effective thermal cutout due to the fact that this limit switch can be fitted close to the heatsink of the relay.

When connected serial with the control voltage, the TLS will switch off the relay as soon as the operating temperature of the switch is reached. The relay will be activated again when the temperature drops (approx. 30°C) below its cut-out value.

In the RZ3 relay, the TLS can be connected to two free (internally non-connected) terminals (B1/B2).

Thermal compound must be added when inserting the TLS (to guarantee a fast thermal response).

The heatsink selection charts (load current versus ambient temperature) for RSO types provide information about which thermal switch to use.

Ordering Key

UP 62 - 90

Thermostat type
Switch temperature

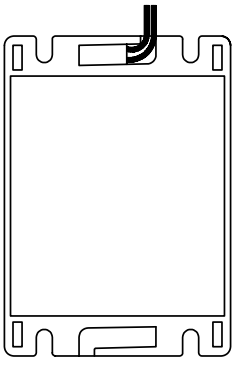
Type Selection

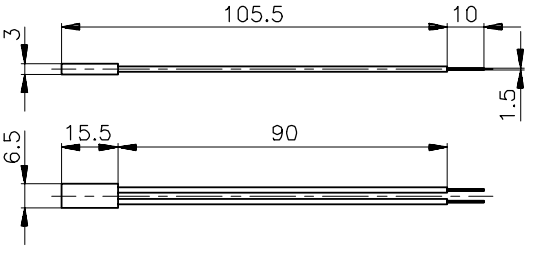
Switch temperature

UP 62-70	70°C (158°F)
UP 62-80	80°C (176°F)
UP 62-90	90°C (194°F)

Installation

The UP 62 - .. is mounted in one of the two slots of the 3-phase SSR housing.





All dimensions in mm

Solid State Relays
Protection
Fuses

- **Semiconductor fuses**
- **High breaking capacity for the protection of power semiconductors**
- **European reference numbers (American reference numbers available in Ferraz-catalogue)**

Product Description

To ensure troublefree operation and to achieve a higher level of serviceability in applications with SSRs, it is recommended to use fuses with very high breaking capacity. In some countries Carlo Gavazzi diCMSributes fuses from Ferraz. The mocms common types can be delivered. (Information about your nearecms Ferraz supplier on requecms.)

Type Selection (selection of Ferraz types)

Relay type	Rated oper. voltage	Max. fuse	Size (mm)	Fuse type	Fuseholder type
RAP, RP					
3A					
I^2t = 18-20 A^2s	230 VAC	3 A	10.3 x 38	**6.9 gRB 10-03**	**CMS10 1P**
	400 VAC	3 A	10.3 x 38	**6.9 gRB 10-03**	**CMS10 1P**
	480 VAC	3 A	10.3 x 38	**6.9 gRB 10-03**	**CMS10 1P**
5A					
I^2t = 40-50A^2s	230 VAC	5 A	10.3 x 38	**6.9 gRB 10-05**	**CMS10 1P**
	400 VAC	5 A	10.3 x 38	**6.9 gRB 10-05**	**CMS10 1P**
	480 VAC	5 A	10.3 x 38	**6.9 gRB 10-05**	**CMS10 1P**
6A					
I^2t = 340A^2s	230 VAC	5 A	10.3 x 38	**6.9 gRB 10-05**	**CMS10 1P**
	400 VAC	5 A	10.3 x 38	**6.9 gRB 10-05**	**CMS10 1P**
	480 VAC	5 A	10.3 x 38	**6.9 gRB 10-05**	**CMS10 1P**
10A					
I^2t = 340A^2s	230 VAC	10 A	10.3 x 38	**6.9 gRB 10-10**	**CMS10 1P**
	400 VAC	10 A	10.3 x 38	**6.9 gRB 10-10**	**CMS10 1P**
	480 VAC	10 A	10.3 x 38	**6.9 gRB 10-10**	**CMS10 1P**
RP1D, RD					
1 A DC	350 VDC	1 A	10.3 x 38	**A050 URD 001 T13 1**	**CMS10 1P**
	200 VDC	1 A	6.3 x 32	**250 V FA 1A 6.32**	**SI 6.32 LL PRE**
4 A DC	60 VDC	5 A	6.3 x 32	**250 V FA 5A 6.32**	**SI 6.32 LL PRE**
5 A DC	60 VDC	6.3 A	6.3 x 32	**250 V FA 6.3A 6.32**	**SI 6.32 LL PRE**
8 A DC	60 VDC	10 A	6.3 x 32	**250 V FA 10A 6.32**	**SI 6.32 LL PRE**
RX					
25A					
I^2t = 525A^2s	230 VAC	25 A	10.3 x 38	**6.9 gRB 10-25**	**CMS10 1P**
	480 VAC	25 A	10.3 x 38	**6.9 gRB 10-25**	**CMS10 1P**
50A					
I^2t = 1800A^2s	230 VAC	50 A	14 x 51	**6.9xx CP gRC 14 x 51/50**	**CMS14 1P**
	480 VAC	50 A	22 x 58	**6.9xx CP gRC 22 x 58/50**	**CMS22 1P**
I^2t = 6600A^2s	230 VAC	50 A	14 x 51	**6.9xx CP gRC 14 x 51/50**	**CMS14 1P**
	480 VAC	50 A	14 x 51	**6.9xx CP gRC 14 x 51/50**	**CMS14 1P**

Type Selection (cont.)

Relay type	Rated oper. voltage	Max. fuse	Size (mm)	Fuse type	Fuseholder type
RS					
10A					
I^2t = 50 A^2s	230 VAC	10 A	10.3 x 38	**6.9 gRB 10-10**	**CMS10 1P**
	400 VAC	10 A	10.3 x 38	**6.9 gRB 10-10**	**CMS10 1P**
	480 VAC	10 A	10.3 x 38	**6.9 gRB 10-10**	**CMS10 1P**
25A					
I^2t = 450 A^2s	230 VAC	25 A	10.3 x 38	**6.9 gRB 10-25**	**CMS10 1P**
	400 VAC	25 A	10.3 x 38	**6.9 gRB 10-25**	**CMS10 1P**
	480 VAC	25 A	10.3 x 38	**6.9 gRB 10-25**	**CMS10 1P**
40A					
I^2t = 760 A^2s	230 VAC	40 A	14 x 51	**6.9xx CP gRC 14 x 51/40**	**CMS14 1P**
	400 VAC	40 A	14 x 51	**6.9xx CP gRC 14 x 51/40**	**CMS14 1P**
	480 VAC	40 A	22 x 58	**6.9xx CP gRC 22 x 58/40**	**CMS22 1P**
RM					
25A					
I^2t = 525A^2s	230 VAC	25 A	10.3 x 38	**6.9 gRB 10-25**	**CMS10 1P**
	400 VAC	25 A	10.3 x 38	**6.9 gRB 10-25**	**CMS10 1P**
	480 VAC	25 A	10.3 x 38	**6.9 gRB 10-25**	**CMS10 1P**
	600 VAC	20 A	10.3 x 38	**6.9 gRB 10-20**	**CMS10 1P**
50A					
I^2t = 1800A^2s	230 VAC	50 A	14 x 51	**6.9xx CP gRC14 x 51/50**	**CMS14 1P**
	400 VAC	50 A	14 x 51	**6.9xx CP gRC 14 x 51/50**	**CMS14 1P**
	480 VAC	50 A	22 x 58	**6.9xx CP gRC 22 x 58/50**	**CMS22 1P**
	600 VAC	50 A	22 x 58	**6.9xx CP gRC 22 x 58/50**	**CMS22 1P**
75A					
I^2t = 6600A^2s	230 VAC	63 A	22 x 58	**6.9xx CP gRC 22 x 58/63**	**CMS22 1P**
	400 VAC	63 A	22 x 58	**6.9xx CP gRC 22 x 58/63**	**CMS22 1P**
	480 VAC	63 A	22 x 58	**6.9xx CP gRC 22 x 58/63**	**CMS22 1P**
	600 VAC	63 A	22 x 58	**6.9xx CP gRC 22 x 58/63**	**CMS22 1P**
100A					
I^2t = 18000A^2s	230 VAC	100 A	22 x 58	**6.9xx CP gRC 22 x 58/100**	**CMS22 1P**
	400 VAC	100 A	22 x 58	**6.9xx CP gRC 22 x 58/100**	**CMS22 1P**
	480 VAC	100 A	22 x 58	**6.9xx CP gRC 22 x 58/100**	**CMS22 1P**
	600 VAC	100 A	22 x 58	**6.9xx CP gRC 22 x 58/100**	**CMS22 1P**
RAM, RM1E					
25A					
I^2t = 525A^2s	230 VAC	25 A	10.3 x 38	**6.9 gRB 10-25**	**CMS10 1P**
	400 VAC	25 A	10.3 x 38	**6.9 gRB 10-25**	**CMS10 1P**
	480 VAC	25 A	10.3 x 38	**6.9 gRB 10-25**	**CMS10 1P**
	600 VAC	20 A	10.3 x 38	**6.9 gRB 10-20**	**CMS10 1P**
50A					
I^2t = 1800A^2s	230 VAC	50 A	14 x 51	**6.9xx CP gRC 14 x 51/50**	**CMS14 1P**
	400 VAC	50 A	14 x 51	**6.9xx CP gRC 14 x 51/50**	**CMS14 1P**
	480 VAC	50 A	22 x 58	**6.9xx CP gRC 22 x 58/50**	**CMS22 1P**
	600 VAC	50 A	22 x 58	**6.9xx CP gRC 22 x 58/50**	**CMS22 1P**
75A					
I^2t = 3200A^2s	230 VAC	63 A	22 x 58	**6.9xx CP gRC 22 x 58/63**	**CMS22 1P**
	400 VAC	63 A	22 x 58	**6.9xx CP gRC 22 x 58/63**	**CMS22 1P**
	480 VAC	63 A	22 x 58	**6.9xx CP gRC 22 x 58/63**	**CMS22 1P**
	600 VAC	63 A	22 x 58	**6.9xx CP gRC 22 x 58/63**	**CMS22 1P**
100A					
I^2t = 6600A^2s	230 VAC	100 A	22 x 58	**6.9xx CP gRC 22 x 58/100**	**CMS22 1P**
	400 VAC	100 A	22 x 58	**6.9xx CP gRC 22 x 58/100**	**CMS22 1P**
	480 VAC	100 A	22 x 58	**6.9xx CP gRC 22 x 58/100**	**CMS22 1P**
	600 VAC	80 A	22 x 58	**6.9xx CP gRC 22 x 58/80**	**CMS22 1P**
125A					
I^2t = 18000A^2s	230 VAC	125 A	27 x 60	**6.921 CP URGD 27 x 60/125**	**US271I**
	400 VAC	125 A	27 x 60	**6.921 CP URGD 27 x 60/125**	**US271I**
	480 VAC	125 A	27 x 60	**6.921 CP URGD 27 x 60/125**	**US271I**
	600 VAC	125 A	27 x 60	**6.921 CP URGD 27 x 60/125**	**US271I**

Type Selection (cont.)

Relay type	Rated oper. voltage	Max. fuse	Size (mm)	Fuse type	Fuseholder type
RA, RA...S					
10A					
I^2t = 130 A^2s	230 VAC	16 A	10.3 x 38	**6.9 gRB 10-16**	**CMS10 1P**
	400 VAC	16 A	10.3 x 38	**6.9 gRB 10-16**	**CMS10 1P**
	480 VAC	16 A	10.3 x 38	**6.9 gRB 10-16**	**CMS10 1P**
25A					
I^2t = 525 A^2s	230 VAC	25 A	10.3 x 38	**6.9 gRB 10-25**	**CMS10 1P**
	400 VAC	25 A	10.3 x 38	**6.9 gRB 10-25**	**CMS10 1P**
	480 VAC	25 A	10.3 x 38	**6.9 gRB 10-25**	**CMS10 1P**
50A					
I^2t = 1800 A^2s	230 VAC	50 A	14 x 51	**6.9xx CP gRC 14 x 51/50**	**CMS14 1P**
	400 VAC	50 A	14 x 51	**6.9xx CP gRC 14 x 51/50**	**CMS14 1P**
	480 VAC	50 A	22 x 58	**6.9xx CP gRC 22 x 58/50**	**CMS22 1P**
90A					
I^2t = 6600 A^2s	230 VAC	80 A	22 x 58	**6.9xx CP gRC 22 x 58/80**	**CMS22 1P**
	400 VAC	80 A	22 x 58	**6.9xx CP gRC 22 x 58/80**	**CMS22 1P**
	480 VAC	80 A	22 x 58	**6.9xx CP gRC 22 x 58/80**	**CMS22 1P**
	600 VAC	80 A	22 x 58	**6.9xx CP gRC 22 x 58/80**	**CMS22 1P**
RA, RA...S (high-current/high voltage series)					
50A					
I^2t = 1800 A^2s	600 VAC	50 A	22 x 58	**6.9xx CP gRC 22 x 58/50**	**CMS22 1P**
90 A					
I^2t = 6600 A^2s	See above.				
110A					
I^2t = 18000 A^2s	230 VAC	100 A	22 x 58	**6.9xx CP gRC 22 x 58/100**	**CMS22 1P**
	400 VAC	100 A	22 x 58	**6.9xx CP gRC 22 x 58/100**	**CMS22 1P**
	480 VAC	100 A	22 x 58	**6.9xx CP gRC 22 x 58/100**	**CMS22 1P**
	600 VAC	100 A	22 x 58	**6.9xx CP gRC 22 x 58/100**	**CMS22 1P**
RA...L, RA .... T					
10A					
I^2t = 40 A^2s	230 VAC	10 A	10.3 x 38	**6.9 gRB 10-10**	**CMS10 1P**
	400 VAC	10 A	10.3 x 38	**6.9 gRB 10-10**	**CMS10 1P**
25A					
I^2t = 200 A^2s	230 VAC	25 A	10.3 x 38	**6.9 gRB 10-25**	**CMS10 1P**
	400VAC	20 A	10.3 x 38	**6.9 gRB 10-20**	**CMS10 1P**
RA2A					
25A					
I^2t = 450 A^2s	230 VAC	25 A	10.3 x 38	**6.9 gRB 10-25**	**CMS10 2P**
	400 VAC	25 A	10.3 x 38	**6.9 gRB 10-25**	**CMS10 2P**
	480 VAC	25 A	10.3 x 38	**6.9 gRB 10-25**	**CMS10 2P**
	600 VAC	20 A	10.3 x 38	**6.9 gRB 10-20**	**CMS10 2P**
40 A					
I^2t = 760 A^2s	230 VAC	40 A	14 x 51	**6.9xx CP gRC 14 x 51/40**	**CMS14 2P**
	400 VAC	40 A	14 x 51	**6.9xx CP gRC 14 x 51/40**	**CMS14 2P**
	480 VAC	40 A	22 x 58	**6.9xx CP gRC 22 x 58/40**	**CMS22 2P**
	600 VAC	40 A	22 x 58	**6.9xx CP gRC 22 x 58/40**	**CMS22 2P**
25A (M)					
I^2t = 450A^2s	230 VAC	25 A	10.3 x 38	**6.9 gRB 10-25**	**CMS10 2P**
	400 VAC	25 A	10.3 x 38	**6.9 gRB 10-25**	**CMS10 2P**
	480 VAC	25 A	10.3 x 38	**6.9 gRB 10-25**	**CMS10 2P**
	600 VAC	20 A	10.3 x 38	**6.9 gRB 10-20**	**CMS10 I2P**
40A (M)					
I^2t = 1800A^2s	230 VAC	40 A	14 x 51	**6.9xx CP gRC 14 x 51/40**	**CMS14 2P**
	400 VAC	40 A	14 x 51	**6.9xx CP gRC 14 x 51/40**	**CMS14 2P**
	480 VAC	40 A	14 x 51	**6.9xx CP gRC 14 x 51/40**	**CMS14 2P**
	600 VAC	40 A	14 x 51	**6.9xx CP gRC 14 x 51/40**	**CMS14 2P**

Type Selection (cont.)

Relay type	Rated oper. voltage	Max. fuse	Size (mm)	Fuse type	Fuseholder type
RZ3A					
25A					
I^2t = 450 A^2s	400 VAC	25 A	10.3 x 38	**6.9 gRB 10-25**	**CMS10 3P**
	600 VAC	20 A	10.3 x 38	**6.9 gRB 10-20**	**CMS10 3P**
55A					
I^2t = 1800 A^2s	400 VAC	50 A	14 x 51	**6.9xx CP gRC 14 x 51/50**	**CMS14 3P**
	600 VAC	50 A	22 x 58	**6.9xx CP gRC 22 x 58/50**	**CMS22 3P**
75A					
I^2t = 6600 A^2s	400 VAC	63 A	22 x 58	**6.9xx CP gRC 22 x 58/63**	**CMS22 3P**
	600 VAC	63 A	22 x 58	**6.9xx CP gRC 22 x 58/63**	**CMS22 3P**
RMD					
25A					
I^2t = 200A^2s	230 VAC	20 A	10.3 x 38	**6.9 gRB 10-20**	**CMS10 1P**
RJ1, RJCS, RJ1P					
20A					
I^2t = 450A^2s	230 VAC	20 A	10.3 x 38	**6.9 gRB 10-20**	**CMS10 1P**
	600 VAC	20 A	10.3 x 38	**6.9 gRB 10-20**	**CMS10 1P**
30A					
I^2t = 1800A^2s	230 VAC	30 A	10.3 x 38	**6.9 gRB 10-30**	**CMS10 1P**
	600 VAC	30 A	10.3 x 38	**6.9 gRB 10-30**	**CMS10 1P**
45A					
I^2t = 6600A^2s	230 VAC	40 A	14 x 51	**6.9xx CP gRC 14 x 51/40**	**CMS14 1P**
	600 VAC	40 A	14 x 51	**6.9xx CP gRC 14 x 51/40**	**CMS14 1P**
50A					
I^2t = 18000A^2s	230 VAC	50 A	14 x 51	**6.9xx CP gRC 14 x 51/50**	**CMS14 1P**
	600 VAC	50 A	14 x 51	**6.9xx CP gRC 14 x 51/50**	**CMS14 1P**
70A, 75A					
I^2t = 18000A^2s	230 VAC	63 A	22 x 58	**6.9xx CP gRC 22 x 58/63**	**CMS22 1P**
	600 VAC	63 A	22 x 58	**6.9xx CP gRC 22 x 58/63**	**CMS22 1P**
90A					
I^2t = 18000A^2s	230 VAC	80 A	22 x 58	**6.9xx CP gRC 22 x 58/80**	**CMS22 1P**
	600 VAC	80 A	22 x 58	**6.9xx CP gRC 22 x 58/80**	**CMS22 1P**
RJD2A					
30A					
I^2t = 18000A^2s	230 VAC	30 A	10.3 x 38	**6.9 gRB 10-30**	**CMS10 2P**
	600 VAC	30 A	10.3 x 38	**6.9 gRB 10-30**	**CMS10 2P**
45A					
I^2t = 18000A^2s	230 VAC	40 A	14 x 51	**6.9xx CP gRC 14 x 51/40**	**CMS14 2P**
	600 VAC	40 A	14 x 51	**6.9xx CP gRC 14 x 51/40**	**CMS14 2P**
RJ2, RJ3, RJT3					
12A					
I^2t = 450A^2s	230 VAC	12.5 A	10.3 x 38	**6.9 gRB 10-12.5**	**CMS10 1P**
	480 VAC	12.5 A	10.3 x 38	**6.9 gRB 10-12.5**	**CMS10 1P**
18A					
I^2t = 1800A^2s	230 VAC	16 A	10.3 x 38	**6.9 gRB 10-16**	**CMS10 1P**
	480 VAC	16 A	10.3 x 38	**6.9 gRB 10-16**	**CMS10 1P**
20A					
I^2t = 1800A^2s	220 VAC/ 230 VAC	20 A	10.3 x 38	**6.9 gRB 10-20**	**CMS10 3P**
	600 VAC	20 A	10.3 x 38	**6.9 gRB 10-20**	**CMS10 3P**
25A					
I^2t = 1800A^2s	220 VAC/ 230 VAC	25 A	10.3 x 38	**6.9 gRB 10-25**	**CMS10 3P**
	600 VAC	25 A	10.3 x 38	**6.9 gRB 10-25**	**CMS10 3P**
32A					
I^2t = 1800A^2s	220 VAC	30 A	10.3 x 38	**6.9 gRB 10-30**	**CMS10 3P**
	600 VAC	30 A	10.3 x 38	**6.9 gRB 10-30**	**CMS10 3P**

Type Selection (cont.)

Relay type	Rated oper. voltage	Max. fuse	Size (mm)	Fuse type	Fuseholder type
RN1A, RN1S, RN1F					
30A					
I^2t = 525 A^2s	120 VAC	30 A	10.3 x 38	**6.9 gRB 10-30**	**CMS10 1P**
	230 VAC	30 A	10.3 x 38	**6.9 gRB 10-30**	**CMS10 1P**
	400 VAC	30 A	10.3 x 38	**6.9 gRB 10-30**	**CMS10 1P**
	480 VAC	30 A	10.3 x 38	**6.9 gRB 10-30**	**CMS10 1P**
50A					
I^2t = 1800 A^2s	120 VAC	50 A	14 x 51	**6.9xx CP gRC 14 x 51/50**	**CMS14 1P**
	230 VAC	50 A	14 x 51	**6.9xx CP gRC 14 x 51/50**	**CMS14 1P**
	400 VAC	50 A	14 x 51	**6.9xx CP gRC 14 x 51/50**	**CMS14 1P**
	480 VAC	50 A	14 x 51	**6.9xx CP gRC 14 x 51/50**	**CMS14 1P**
63A					
I^2t = 6600 A^2s	230 VAC	63 A	22 x 58	**6.9xx CP gRC 22 x 58/63**	**CMS22 1P**
	400 VAC	63 A	22 x 58	**6.9xx CP gRC 22 x 58/63**	**CMS22 1P**
	480 VAC	63 A	22 x 58	**6.9xx CP gRC 22 x 58/63**	**CMS22 1P**
RN2A, RN2F					
30A					
I^2t = 525 A^2s	120 VAC	16 A	10.3 x 38	**6.9 gRB 10-16**	**CMS10 2P**
	230 VAC	16 A	10.3 x 38	**6.9 gRB 10-16**	**CMS10 2P**
	400 VAC	16 A	10.3 x 38	**6.9 gRB 10-16**	**CMS10 2P**
	480 VAC	16 A	10.3 x 38	**6.9 gRB 10-16**	**CMS10 2P**
50A					
I^2t = 1800 A^2s	120 VAC	25 A	10.3 x 38	**6.9 gRB 10-25**	**CMS10 2P**
	230 VAC	25 A	10.3 x 38	**6.9 gRB 10-25**	**CMS10 2P**
	400 VAC	25 A	10.3 x 38	**6.9 gRB 10-25**	**CMS10 2P**
	480 VAC	25 A	10.3 x 38	**6.9 gRB 10-25**	**CMS10 2P**
RN3A					
15A					
I^2t = 525 A^2s	220 VAC	16 A	10.3 x 38	**6.9 gRB 10-16**	**CMS10 3P**
	400 VAC	16 A	10.3 x 38	**6.9 gRB 10-16**	**CMS10 3P**
	480 VAC	16 A	10.3 x 38	**6.9 gRB 10-16**	**CMS10 3P**
50A					
I^2t = 1800 A^2s	220 VAC	30 A	10.3 x 38	**6.9 gRB 10-30**	**CMS10 3P**
	400 VAC	30 A	10.3 x 38	**6.9 gRB 10-30**	**CMS10 3P**
	480 VAC	30 A	10.3 x 38	**6.9 gRB 10-30**	**CMS10 3P**

NOTES

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

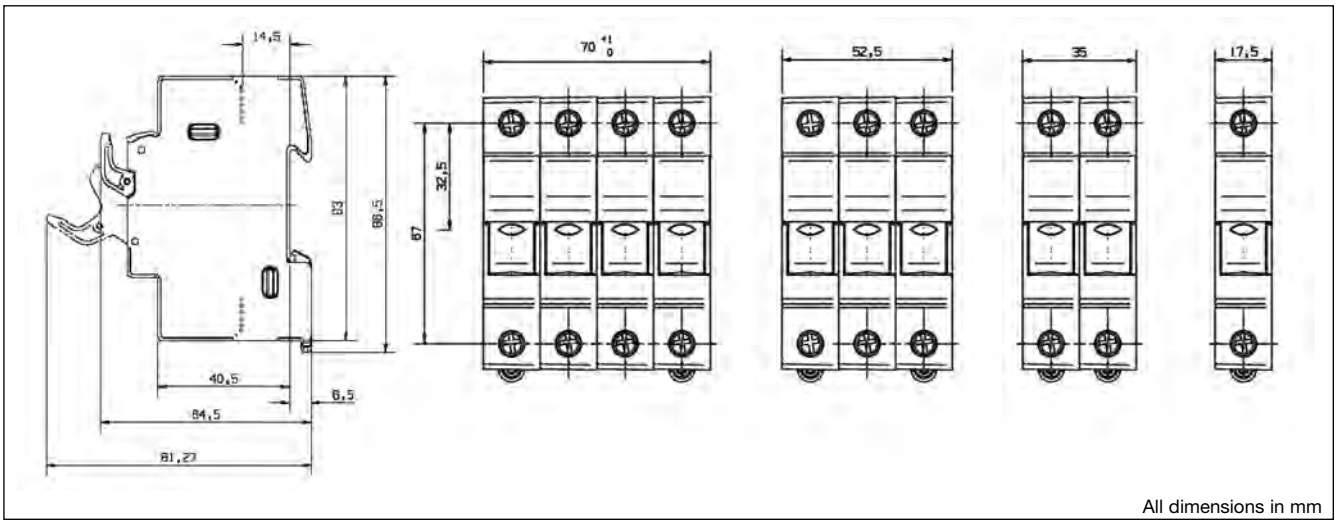
2) Fuse types suggested are valid for full load currents @ Ta= 25°C. at lower currents the fuses suggested will not fully protect the semiconductor.

Fuseholder (for mounting on DIN-rail)

1-phase Fuseholder type	Dimensions W x H x D (mm)	For fuse link	Max. rated operational voltage	Max. rated operational current of fuseholder
S1 6.32	15 x 63 x 52	6.3 x 32	690 VAC	32 A
CMS10	17.5 x 88.5 x 81.5	10.3 x 38	690 VAC	32 A
CMS14	26.5 x 107 x 94	14 x 51	690 VAC	50 A
CMS22	35 x 126.5 x 96.5	22 x 58	690 VAC	125 A
US 27	40 x 146 x 117	27 x 60	800 VAC	150 A

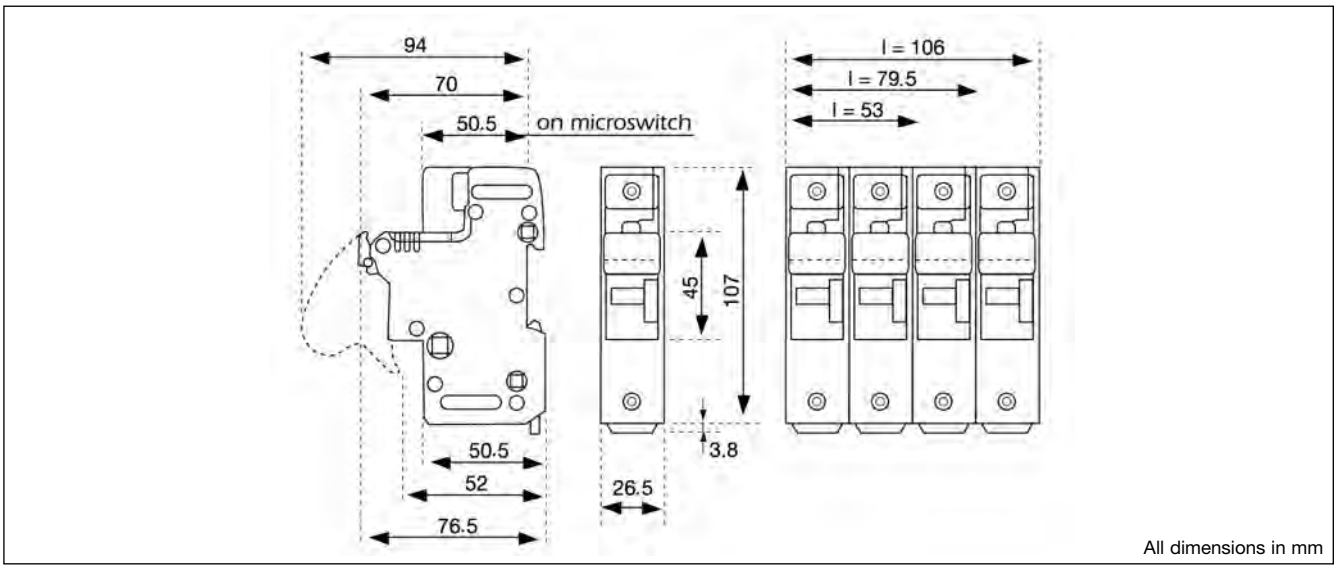
3-phase Fuseholder type	Dimensions W x H x D (mm)	For fuse link	Max. rated operational voltage	Max. rated operational current of fuseholder
CMS10 3P	52.5 x 88.5 x 81.5	10 x 38	690 VAC	32 A
CMS14 3P	79.5 x 107 x 94	14 x 51	690 VAC	50 A
CMS22 3P	105 x 126.5 x 96.5	22 x 58	690 VAC	125 A

Dimensions



All dimensions in mm

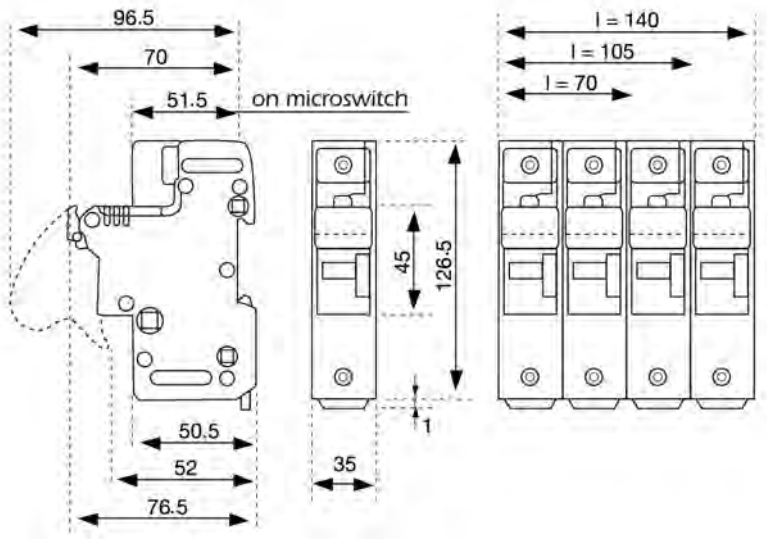
CMS10



All dimensions in mm

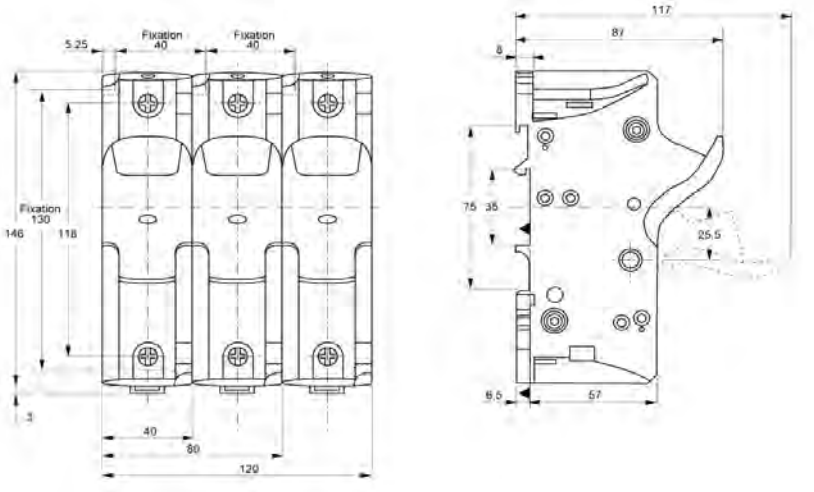
CMS14

Dimensions (cont.)



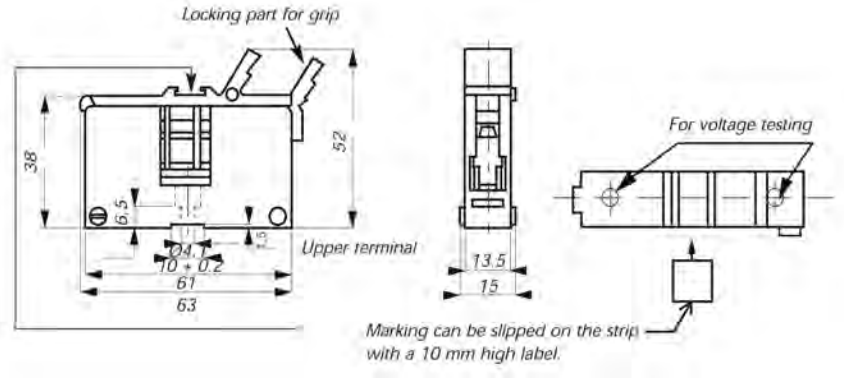
All dimensions in mm

CMS22



All dimensions in mm

US 27

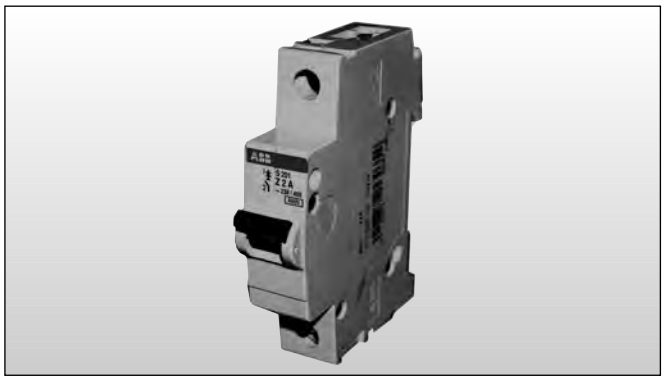


SI 6 x 32 LL Pre (for DIN rail mounting with mounting bracket B 92093)

All dimensions in mm

SI 6.32

Solid State Relays
Protection
M. C. B.s



- **ABB Miniature Circuit Breakers System pro M**
- **High short-circuit switching capacity**
- **Low let-through energy at the point of fault**
- **Rated voltage single pole - 230/400 VAC, multi pole - 400 VAC**
- **All round protection against contact with live parts in accordance with IN VDE 106 part 100**

Product Description

This series of current limiting M.C.B.'s from ABB have undelayed magnetic and delayed thermal trips with fixed setting. They provide protection against overheating of electrical wires, cables and appliances in the case of over-current due to overload, short-circuit or earth fault in compliance with DIN VDE 0100 part 430.

B-characteristic M.C.B.'s are in accordance with EN 60898 and are designed for line protection. Z-characteristic M.C.B.'s are designed in accordance with IEC 60947-2. Z-type M.C.B.'s are ideal for protection of semiconductor devices.

For further specifications on this series refer to ABB datasheets.

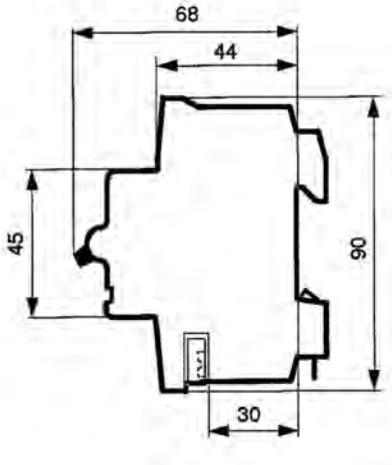
Type Selection

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]
RX 25	S201 - Z2 (2A)	N/A	1.0	15.0
RJ 20			1.5	22.5
RS 25				
RS 40	S201 - Z4 (4A)	S201 - B2 (2A)	1.0	21.0
	S201 - Z6 (6A)	S201 - B2 (2A)	1.0	21.0
	S201 - Z6 UC (6A)	S201 - B2 (2A)	1.0	21.0
	S201 - Z10 UC (10A)	S201 - B2 (2A)	1.0	21.0
			1.5	31.5
RM 25	S201 - Z4 (4A)	S201 - B2 (2A)	1.0	21.0
RAM 25	S201 - Z6 UC (6A)	S201 - B2 (2A)	1.0	21.0
			1.5	31.5
RX 50	S201 - Z10 (10A)	S201-B4 (4A)	1.0	7.6
RJ 30			1.5	11.4
RM 50			2.5	19.0
RAM 50	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
RAM 75	S201 - Z25 (25A)	S201-B13 (13A)	2.5	7.0
			4.0	11.2
			6.0	16.8

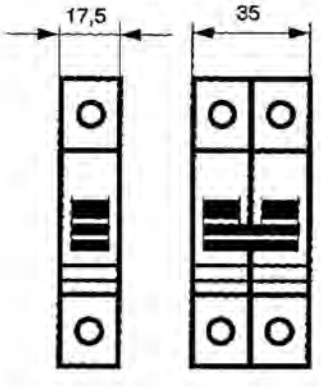
Relay type	"Z" Type characteristic MCB for protection	"B" type characteristic MCB for protection	Wire cross sectional area [mm²]	Minimum length of Cu wire conductor [m]
RJ 45	S201 - Z20 (20A)	S201-B10 (10A)	1.5	4.2
RM 75			2.5	7.0
RAM 100			4.0	11.2
RX 51				
	S202 - Z20 (20A)	S202-B10 (10A)	1.5	1.8
			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 70, RJ 75, RJ 90	S201 - Z50 (50A)	S201-B25 (25A)	4.0	4.8
RM 100			6.0	7.2
RAM 125			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

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.

Dimensions



S 200



S201 S202

All dimensions in mm

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