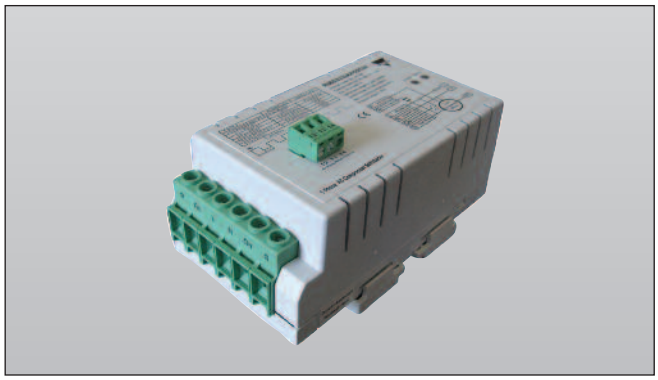
Motor Controller
AC Semiconductor Motor Controller
Type RSBS23..A2V.2C24



- Soft starting of 1-Phase Scroll Compressors
- Enclosed solution
- Integrated current limit
- Rated operational voltage: 230 VACrms, 50/60 Hz
- Rated operational current: up to 32A: AC-53b
- Integral bypassing of semiconductors
- Built-in transient overvoltage protection
- Undervoltage protection after ramp up
- DIN rail or panel mount
- EMC Compliant
- Optional auxiliary alarm relay output
- Relay Protection
- UL, cUL listed

Product Description

This motor controller, intended to be used with single-phase scroll compressors can limit inrush currents to 40AACrms for RSBS2325A2V.2C24 and 45AACrms for RSBS2332A2V.2C24 Upon applying the control signal, soft starting 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. Alarm indication is provided through a red LED which signals the type of alarm via a user friendly flashing sequence.

Short circuit and Overload protection are not provided with this controller and must be procured separately. Starting and running capacitors are required for controller to operate as intended.

The RSBS can also be supplied with an optional auxiliary alarm relay (Option - V22).

Ordering Code

RSB S 23 32 A2 V12 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 Ie	Control Voltage Uc	Options	Starting Capacitor
RSBS: 1-Phase Soft Starter for Scroll Compressors	23: 230VACrms	25: 25AAC 32: 32AAC	A2: 230VACrms	V12: Enclosed V22: Enclosed & aux. alarm relay	C24: 200 - 240 µF

Selection Guide

Rated operational voltage Ue	Rated operational current Ie		Option
	25A AC-53b	32A AC-53b	
230V ACrms 50/60Hz	RSBS2325A2V12C24	RSBS2332A2V12C24	Enclosed
	RSBS2325A2V22C24	RSBS2332A2V22C24	Enclosed and Aux. alarm relay

General Specifications

Ramp up (preset)	< 0.6 sec
Operating temperature	-20° to +65°C (-4° to +149°F)
Storage temperature	-30° to +70°C (-22° to +158°F)
Degree of protection	IP20
Pollution Degree	2
Overvoltage category	II
Relative humidity	< 95% non condensing @ 40°C
Altitude*	1000m

* Above 1000m derate linearly by 1% of unit FLC per 100m to a maximum altitude of 2000m

Housing Specifications

Dimensions (L x B x H)*	137 x 81.4 x 60.4 mm
Weight	approx 450g
Material	Polyamide
Terminal tightening screws Screw Type (Max. tightening torque) R, Rc, L, N, ON, S 14, 12, 11	 M4 (1.19Nm, 10.5lb-in) M3 (0.5Nm, 4.5lb-in)
Max. cross sectional area of cable (solid) R, Rc, L, N, ON, S 14, 12, 11	 0.5 - 16mm^2, AWG 20-6 0.2 - 1.5mm^2, AWG 28-12
Max. cross sectional area of cable (stranded) R, Rc, L, N, ON, S 14, 12, 11	 0.5 - 16mm^2, AWG 20-6 0.2 - 1.5mm^2, AWG 30-12
Stripping length R, Rc, L, N, ON, S 14, 12, 11	 8mm 7 - 8mm

* For RSBS23....V22...., the auxiliary terminal is 10.5mm protruding

Output Specifications

	RSBS..25A.V.2C24	RSBS..32A.V.2C24
Rated operational current	25A AC-53b	32A AC-53b
Compressor rating/ UL rating	4.4kW/ 5HP	4.4kW/ 5HP
Max. starting current	40A ACrms	45A ACrms
Overload profile	25A: AC-53b: 1.6 - 1:60	32A: AC-53b: 1.4 - 1:60
No. of starts/hr	12 (evenly distributed)	12 (evenly distributed)
I2t for fusing t=10ms	1200 A^{2}s	1200 A^{2}s

Supply Specifications

	RSBS23..A2V.2C24
Rated operational voltage (Ue) L - N	 230 VAC ± 15%
Rated AC frequency	50/60Hz ± 5Hz
Rated insulation voltage	250 VACrms
Supply indication	Green LED
Undervoltage alarm*	< 190 VACrms for ≥1 sec
Overcurrent alarm	> 80 Arms for ≥1 sec
Alarm indication	Red LED/Aux Relay Output**
Current at no load	≤ 15 mA
Pickup voltage (internal power supply)	90VAC
Drop Out voltage (internal power supply)	25VAC

* Not available during ramping

** Only for RSBS23..A2V22C..

Input Specifications (Control Input)

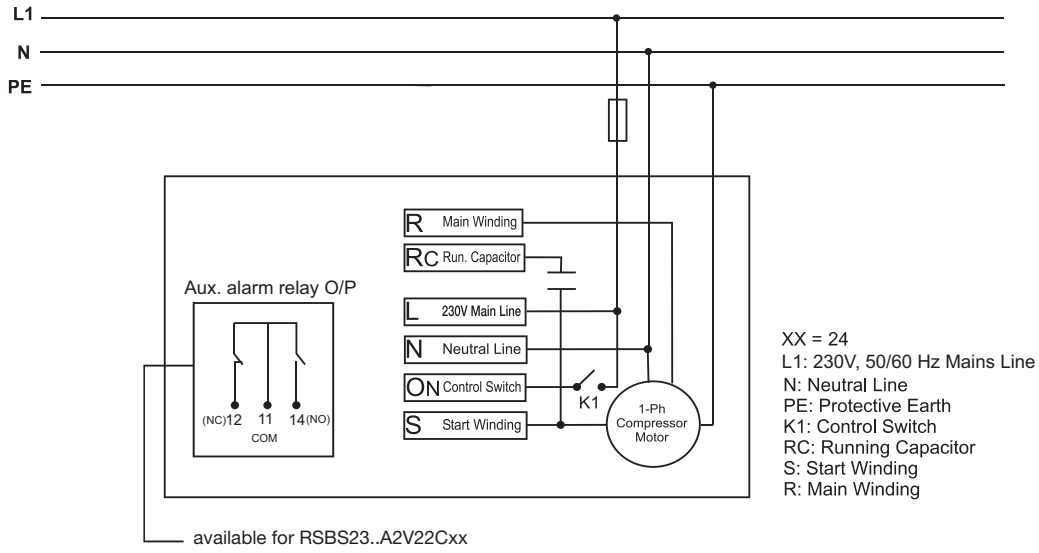
	RSBS23..A2V.2C24
Control voltage (Uc), ON	230VACrms ±15%
Input Current	3 ... 6mA
Pick up voltage	90 VAC
Drop out voltage	25 VAC
Rated AC frequency	50/60 Hz ± 5Hz
Rated insulation voltage	250 VAC rms
Response time Input to output	 <200ms

Auxiliary Alarm Relay*

Alarm	Common, Normally Open, Normally Closed, Changeover
Contact Capacitry	2A, 250VAC 2A,30VDC

* Only available for RSBS...A2V22C..

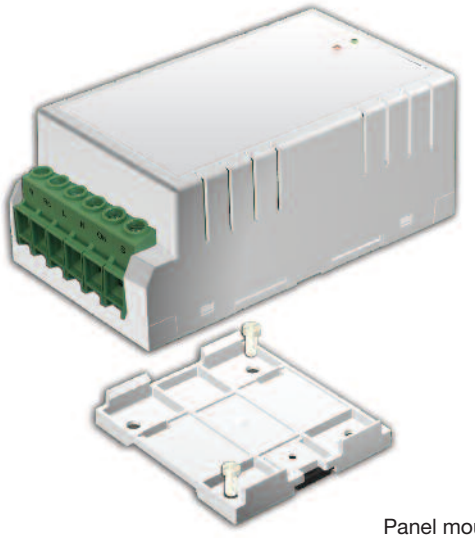
Connection Diagram



XX = 24
L1: 230V, 50/60 Hz Mains Line
N: Neutral Line
PE: Protective Earth
K1: Control Switch
RC: Running Capacitor
S: Start Winding
R: Main Winding

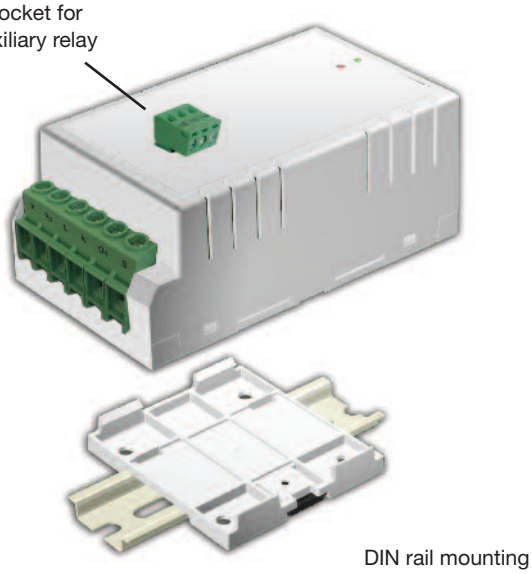
Mounting

RSBS23..A2V.2C24



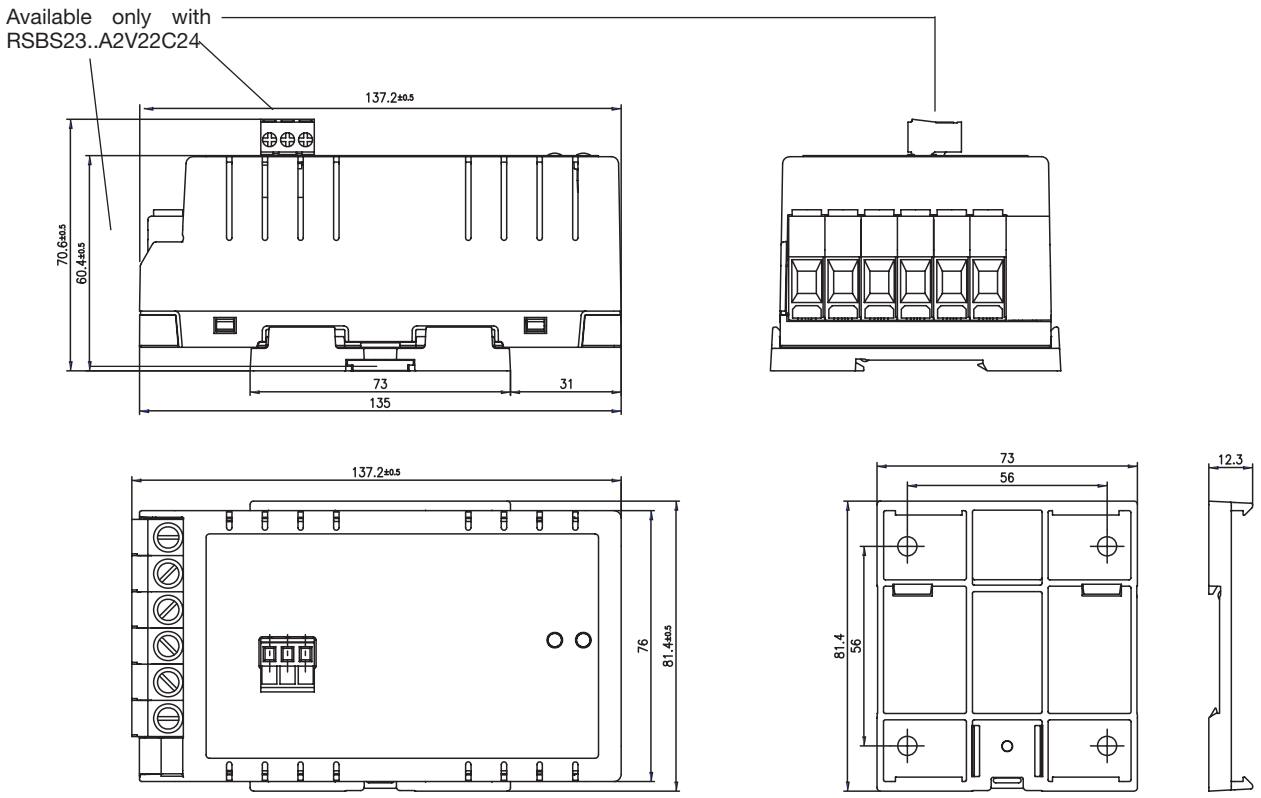
Panel mounting

Pluggable socket for optional auxiliary relay



DIN rail mounting

Dimensions



All dimensions in mm

Short Circuit Protection (according to EN/IEC 60947-4-2) & UL508

	25 A version	32 A version
Type of co-ordination	1	1
UL Rated short circuit current	"Suitable For Use On A Circuit Capable Of Delivering Not More Than 5,000 A rms Symmetrical Amperes, 240 Volts Max. when Protected by RK5 Fuses." • "Use Fuses Only". • Maximum allowed ampere rating of the fuse is 45 A.	"Suitable For Use On A Circuit Capable Of Delivering Not More Than 5,000 A rms Symmetrical Amperes, 240 Volts Max. when Protected by RK5 Fuses." • "Use Fuses Only". • Maximum allowed ampere rating of the fuse is 45 A.
Type of co-ordination:	2	2
Rated short circuit current	5 kA when protected by semiconductor fuses	5 kA when protected by semiconductor fuses
Semiconductor fuse	Ferraz Shawmut 40A, class gRC Art. No. 6.9 xxCp gRC 14.51 40 (xx = 00 or 21)	Ferraz Shawmut 40A, class gRC Art. No. 6.9 xxCp gRC 14.51 40 (xx = 00 or 21)

Use 60/75°C copper (CU) conductors.

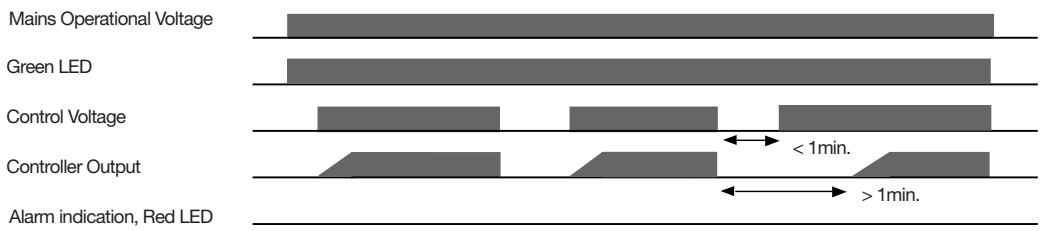
Standards

Approvals	UL (E172877), cUL
CE Marking LVD	IEC/ EN 60947-4-2/ EN60335-1/ EN 60335-2-40 [1, 2]
EMC : Immunity	IEC/ EN 61000-6-1, EN 55014-2
Emission	IEC/ EN 55014-1 IEC/ EN 61000-3-11, IEC/ EN 61000-3-12
Electrostatic Discharge ESD Immunity	IEC/ EN 61000-4-2 8kV, PC2 air discharge
Electrical fast transient/ Burst Immunity	4kV, PC2 contact IEC/ EN 61000-4-4
Output	2kV, PC2
Input	1kV, PC2
Electrical Surge Immunity	IEC/ EN 61000-4-5, PC2
Output, line to line	1kV
Output, line to earth	2kV
Input, line to line	500V
Input, line to earth	1kV
Radiated Radio Frequency	EN 61000-4-3, PC1 3V/m, 80-2700MHz
Conducted radio-frequency immunity	IEC/ EN 61000-4-6, PC1 3V/m, 0.15-80MHz
Voltage dips & interruptions	IEC/ EN 61000-4-11 100% Ue dip, 20ms, PC2 60% Ue dip, 200ms, PC2 30% Ue dip, 500ms, PC3 100% Ue interruption, 5000ms, PC3
Continuous disturbance	IEC/ EN 55014-1
Radio interference voltage emissions (conducted)	CISPR 11 IEC/ EN 55011, Class B
Disturbance power	CISPR 14 IEC/ EN 55014-1
Harmonics	IEC/ EN 61000-3-2 IEC/ EN 61000-3-12
Flicker (Load Conditions apply)	IEC/ EN 61000-3-11

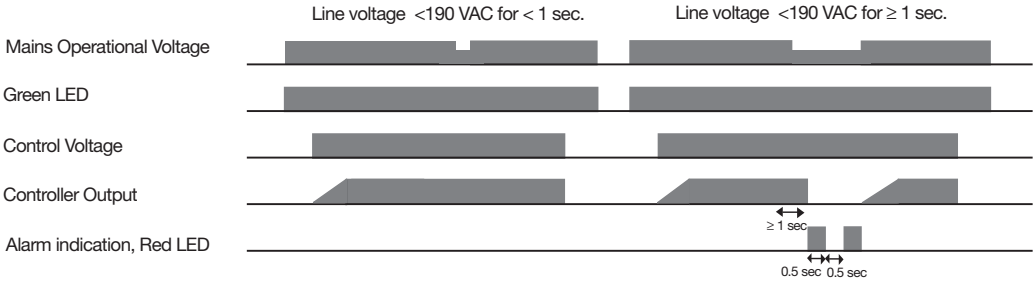
1. Safety of household and similar electrical appliances. Particular requirements for electrical heatpumps, airconditioners and dehumidifiers.
2. Auxiliary relay terminal (available on RSBS23..A2V22C24) is not suitable to be connected to accessible SELV circuits.

Mode of Operation

Normal Condition (Note 3)



Undervoltage Condition (Note 4)



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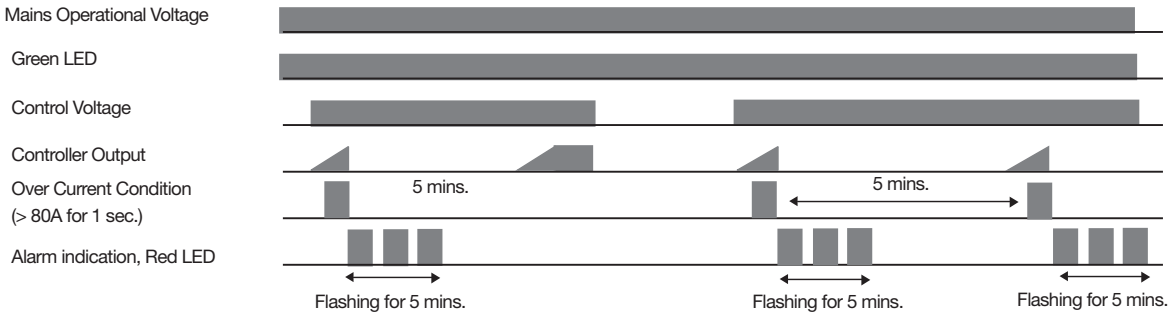
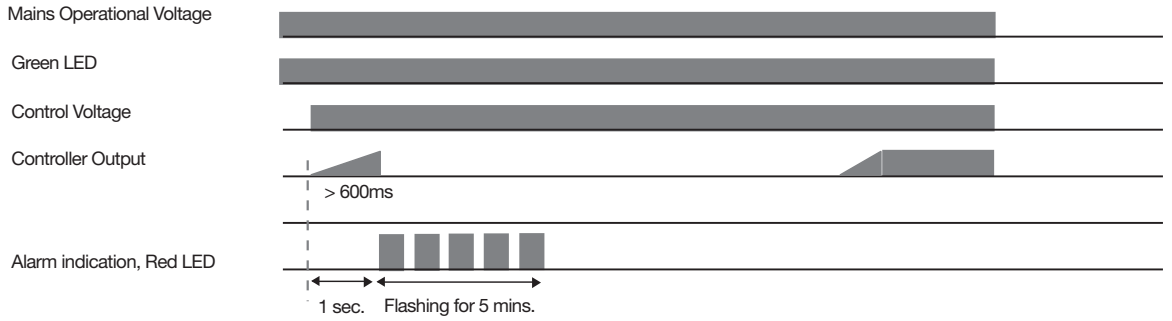
Mode of Operation (cont.)

Overcurrent Condition (Note 5)



Incomplete Ramp Alarm (Note 7)



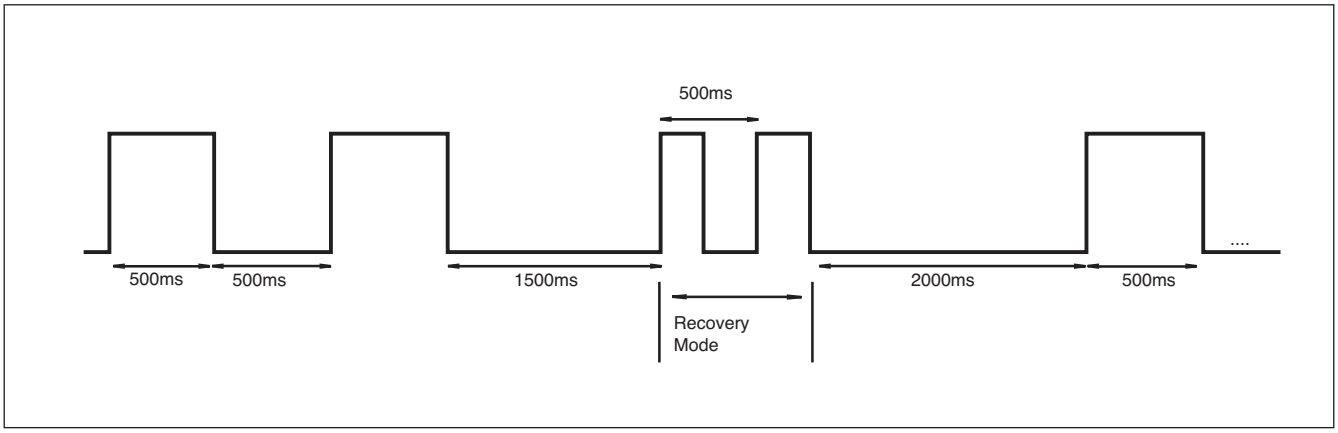
Notes:

1. The RSBS has 2 indication LEDs on board. The green LED indicates the status of the on-board power supply, whilst the red LED indicates an alarm condition.
2. Once the mains voltage is present, the green LED will be fully ON. In case the mains voltage is less than the stated pickup voltage alarm value, the green LED will be flashing. In case mains voltage is less than the stated pick-up voltage and green LED is flashing, then this may indicate that the on-board power supply is faulty. (Power Supply Alarm)
3. Upon closing K1, the RSBS will start ramping, duration of which is < 600ms. When opening K1, the RSBS will stop without any ramp down. The RSBS will not start if a subsequent start is attempted before 1 minute has elapsed from the end of the previous start.
4. In the case of an undervoltage, the RSBS will shut down and the Red LED flashes 2 times as long as the undervoltage is present. Once the mains voltage is restored the red LED will continue flashing for 5 minutes. Following these 5 minutes, the RSBS will start ramping function in the case K1 is closed. The device can be reset at any time by removing power on L1 - N connection. When the power is reapplied, the soft starter will start ramping up as soon as K1 is closed.
5. If an overcurrent (>80A for 1 sec.) is sensed, the RSBS will shut down and the red LED will flash 3 times indicating an overcurrent situation. This continues for 5 minutes before the RSBS tries to ramp up again. In the case that the overcurrent is still present at the second attempt, user intervention is required to reset the controller by cycling power for the device to operate again as this implies that there are problems in the system.
6. A detection circuitry provides protection in terms of controller shutdown in case of a faulty starting capacitor (EMR). In such a situation, the red LED will flash 4 times and user intervention is required to reset the controller by cycling power for the device.
7. In the case of incomplete ramping of the softstarter, the red LED will flash 5 times. This flashing will be indicated by the red LED for 5 minutes after which the RSBS will start ramping function in the case K1 is closed. If after the second attempt there is another incomplete ramp alarm, user intervention is required to reset controller.
8. As indicated in the figure below, during recovery from Undervoltage, Overcurrent, Incomplete ramp alarms, the red LED will flash at twice the normal flashing frequency, using the same number of flashes. The figure shows the flashing in case of a recovery from an undervoltage alarm.

Alarms

No. of flashes Red LED	Condition	Action
2	Undervoltage (Ue < 190VAC)	Auto reset with 5 mins recovery
3	Overcurrent (>80A for ≥ 1 sec)	Auto reset with 5 mins recovery
4	Relay Protection	User intervention
5	Incomplete Ramp	Auto reset with 5 mins recovery

Flashing Sequence



Note: During recovery from an alarm condition, the red LED will flash at twice the normal flashing frequency between successive flashing cycles as shown above to indicate that the softstarter is in recovery mode which recovery lasts for 5 minutes