

Motor Controller Three-Phase Compressor Softstarter Type RSBT....EV..

CARLO GAVAZZI



- Soft starting of 3-phase AC compressors
- Auto adaptive algorithm (patent pending) for optimum inrush current reduction
- 3-phase controlled with integrated bypass of semiconductors
- Short ramp up time: < 600ms
- Rated operational voltage: 220VACrms, 400VACrms, 50/60 Hz
- Rated operational current: 16, 25, 32A AC-53b
- Built-in transient overvoltage and undervoltage protection
- Phase sequence and under-voltage monitoring
- Overtemperature protection
- Overcurrent protection in bypass mode
- Locked rotor protection
- UL, cUL Listed (for RSBT....V5./ V6. versions only)

Product Description

Easy-to-use AC semiconductor compressor soft-starter. 3-phase compressors with nominal current up to 32A can be soft-started with this controller. The unit is supplied inside housing, with screw connection, while DIN

Clip adapter is optional on models RSBT....EV11.

RSBT...EV21 and RSBT...EV61 options include an auxiliary relay module (RFPM) already mounted.

Ordering Code **RSB T 40 16 E V10**

Compressor Softstarter _____
 3-Phase Compressor _____
 Rated operational voltage _____
 Rated operational current _____
 Control voltage _____
 Version _____

Type Selection

Type	Rated operational voltage U_e	Rated operational Current I_e	Control voltage U_c
RSBT: 3-Phase soft starter for compressor	22: 220 VACrms, 50/60 Hz 40: 400 VACrms, 50/60 Hz	16: 16A AC-53b 25: 25A AC-53b 32: 32A AC-53b	E: 110 - 400 VAC \pm 15%, 50/60Hz \pm 10%

Versions

V10: Standard housing

V11: Standard housing with DIN clip

V21: Standard housing with DIN clip & RFPMV00 module ready mounted

V50: Standard housing (UL approved version)

V51: Standard housing with DIN clip (UL approved version)

V61: Standard housing with DIN clip & RFPMV00 module ready mounted (UL approved version)

Selection Guide

Rated operational voltage U_e	Rated operational current I_e		
	16A AC-53b	25A AC-53b	32A AC-53b
220VACrms	RSBT2216EV..	RSBT2225EV..	RSBT2232EV..
400VACrms	RSBT4016EV..	RSBT4025EV..	RSBT4032EV..

General Specifications

Ramp up time	< 600ms
Ramp down time	0 s
Initial torque	≤ 30%
Integrated current limit	Feedback loop
Undervoltage/ Overvoltage protection	
RSBT22...	190/ 250VAC
RSBT40...	330/ 470VAC
Status indication LEDs	
Power supply ON	LED, Green (continuous)
Recovery mode (1 min. delay)	LED, Green (flashing)
Alarm	LED, Red (flashing sequence)
Protection coordination	Class 10

Input Specifications (Control Input)

Control voltage U_c	
A1-A2:	110 - 400 VAC ±15%
Rated AC frequency	50/60Hz ±10%
Rated insulation voltage	500 VACrms Overvoltage cat. II (IEC 60664)
Dielectric strength	
Dielectric voltage	2 kVrms
Rated impulse withstand volt.	4 kVrms
Control input current	3 ... 6mA
Input to Output response time	100ms

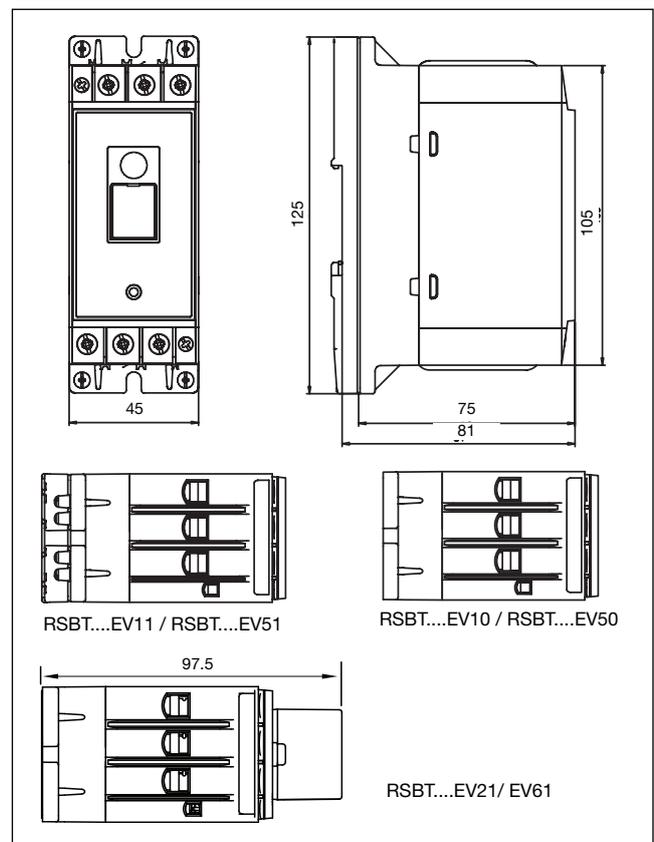
Output Specifications

IEC rated operational current I_e (AC-53b)		
RSBT..16EV..		16A
RSBT..25EV..		25A
RSBT..32EV..		32A
Overload cycle according to EN/IEC 60947-4-2		
@ 40°C surrounding temp.	RSBT..16EV..	16: AC-53b : 2.5-1 : 60
	RSBT..25EV..	25: AC-53b : 3.6-1 : 60
	RSBT..32EV..	32: AC-53b : 3.4-1 : 60
Number of starts per hour @40°C	RSBT....EV..	12
Minimum full load current	RSBT....EV..	2 AAC rms

Housing Specifications

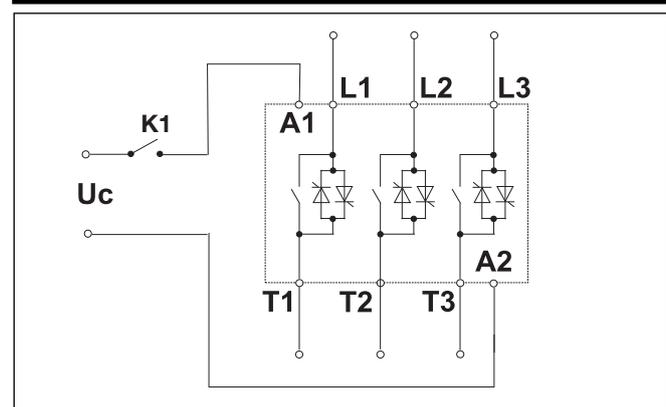
Dimensions (D x W x H)	
RSBT....EV10/ EV50	125mm x 45mm x 75mm
RSBT....EV11/ EV51	125mm x 45mm x 81mm
RSBT....EV21/ EV61	125mm x 45mm x 103.5mm
Weight	
RSBT....EV10/ EV50	400g
RSBT....EV11/ EV51	425g
RSBT....EV21/ EV61	460g
Material	PA66
Material colour	RAL 7035/ RAL 7040
Protection category	IP20
Mounting	
RSBT....EV10/ EV50	Panel
RSBT....EV11/ EV51	DIN
RSBT....EV21/ EV61	DIN + Relay module (RFPMV...)

Dimensions



All dimensions in mm

Connection Diagram



Environmental Specifications

Operating temperature	
RSBT..16EV..	-20°C to +60°C (-4°F to +140°F)
RSBT..25EV..	-20°C to +55°C (-4°F to +131°F)
RSBT..32EV..	-20°C to +50°C (-4°F to +122°F)
Storage temperature	-40°C to +85°C (-40°F to +185°F)
Relative humidity	<95% non-condensing @40°C
Pollution Degree	2
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

Supply Specifications

Rated operational voltage	
L1 - L3	RSBT22..EV.. 127/220VAC ±15%
	RSBT40..EV.. 230/400VAC ±15%
Supply current at standby	25 mA
Blocking voltage	RSBT22..EV.. 800 V _p
	RSBT40..EV.. 1200 V _p
Rated AC frequency	50/60Hz ±10%
Rated insulation voltage	630VAC, accord. to EN 60947-1
Dielectric strength	
Dielectric withstand voltage	
Supply to input	2.5 kVrms
Supply to heatsink	2.5 kVrms
Integrated varistor	Across L1 - L3

EMC Standards

Immunity	IEC/ EN 61000-6-2
Emission	IEC/ EN 61000-6-3
Electrostatic Discharge ESD Immunity	IEC/ EN 61000-4-2 8kV, PC2 Air discharge 4kV, PC2 Contact
Electrical fast transient/ Burst Immunity	IEC/ EN 61000-4-4 Output 2kV, 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	1kV
Input, line to earth	2kV

* for RSBT..16EV...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/cUL rated data	
Rigid (stranded)	AWG 6 ... 14
Rigid (solid)	AWG 10 ... 14
Rigid (solid or stranded)	AWG 2 x 10 2 x 14
Terminal screws	6xM4 (cage clamp)
Max. Tightening torque	2.5Nm (22lb.in) with Posidrive bit 2
Stripping length	8.0mm
Secondary conductors:	
A1, A2	
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/cUL rated data	
Rigid (Solid or Stranded)	AWG 1018
Terminal screws	9xM3 (cage clamp)
Max. Tightening torque	0.6Nm (5.3lb.in) with Posidrive bit 0
Stripping length	6.0mm

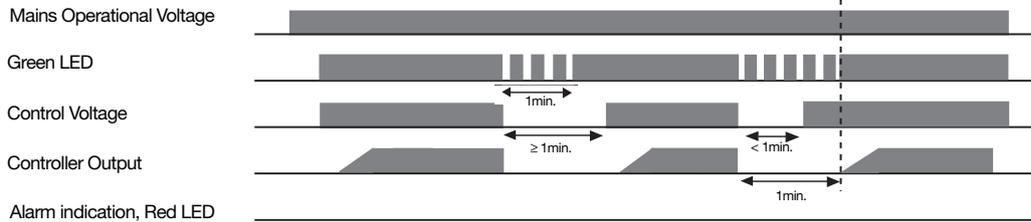
Approvals

UL, cUL Listed	E172877*
Restrictions of hazardous substances	RoHs Compliant
CE Marking	
LVD	IEC/ EN 60947-4-2

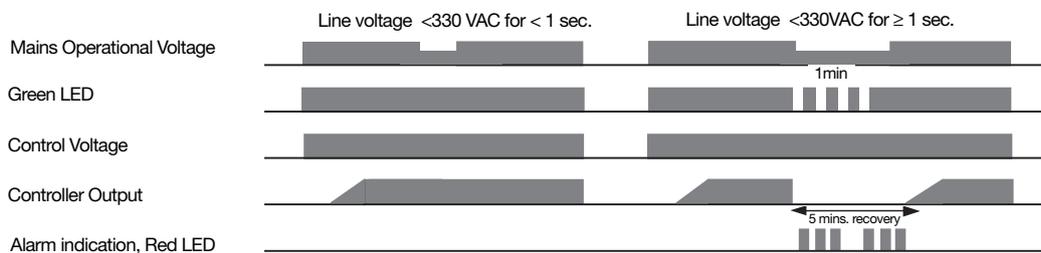
* for versions RSBT....EV5./ EV6.

Mode of Operation

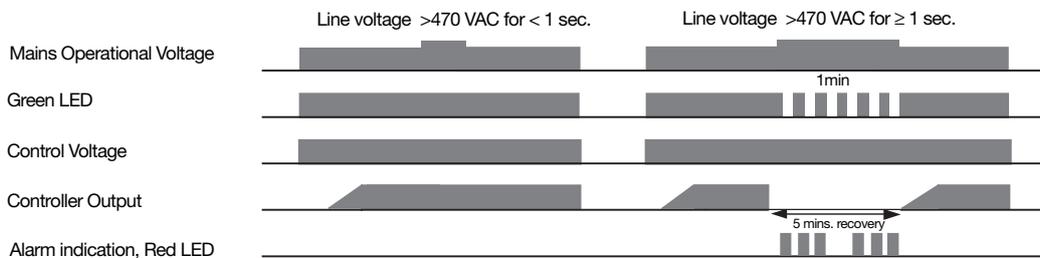
Normal Condition (note 2)



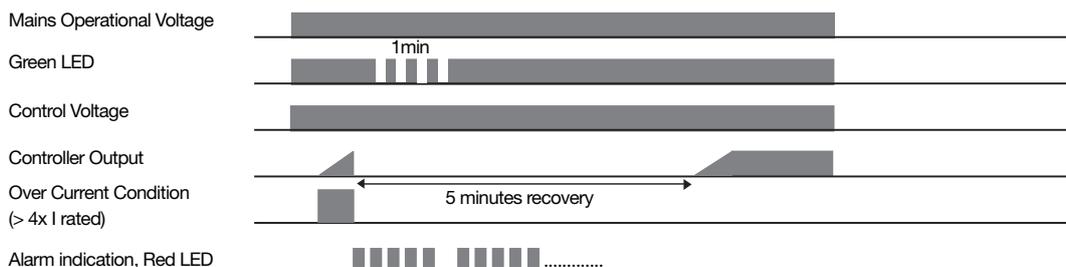
Undervoltage Condition* (note 3)



Overvoltage Condition* (note 3)



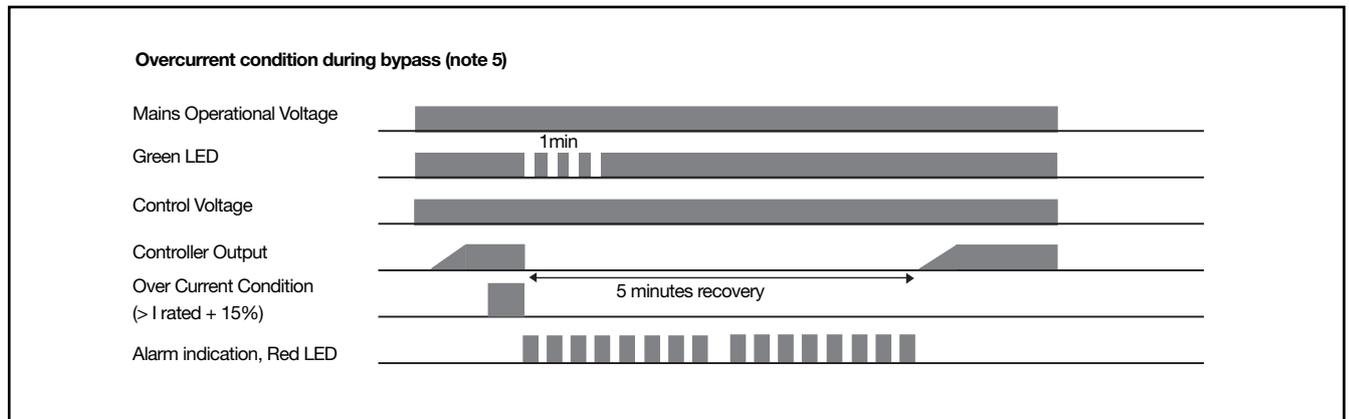
Locked Rotor Condition during softstart (note 4)



Notes:

* The undervoltage and the overvoltage values quoted above refer to RSBT40..... versions. For RSBT22..... versions, undervoltage limit is 190VAC whereas overvoltage limit is 250VAC.

Mode of Operation (cont...)



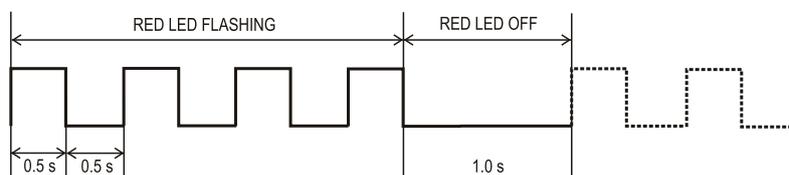
Notes:

- The RSBT has 2 indication LEDs on board. The green LED indicates the presence of mains voltage and is also used during recovery mode (refer to Note 2). The red LED indicates an alarm condition through a flashing sequence.
- Once the mains voltage is present, the green LED will be fully ON. Upon closing K1, the RSBT will start ramping, duration of which is < 600ms. When K1 is opened, the RSBT will stop the compressor without any ramp down. The green LED will start flashing to indicate a 1 minute delay at the end of which another start will be possible.
- In case of an undervoltage/overvoltage condition > 1sec, the RSBT will shut down and the red LED will flash accordingly as long as the undervoltage/overvoltage condition is present. Once the mains voltage is restored, the RSBT will start ramping in case K1 is closed, following a 5 minute recovery.
- If during ramping an overcurrent (> 4 \times le for \geq 1sec) is sensed, the RSBT will shut down and the red LED will start flashing accordingly. After a 5 minutes recovery, if K1 is closed, the RSBT will attempt another start. If after 2 consecutive attempts the RSBT senses an overcurrent, user intervention is required to reset the controller. Reset of the RSBT can be performed by removing power on L1,L2,L3 connection. As soon as mains voltage is reapplied, the RSBT will start ramping as soon as K1 is closed.
- In bypass mode, if there is an overcurrent (> le +15% for \geq 1sec), the RSBT will shut down and the red LED will start flashing accordingly. After a 5 minutes recovery, if K1 is closed, the RSBT will attempt another start.
- If after 1sec, ramp up is not achieved, the RSBT will shut down and the red LED will start flashing accordingly. After a 5 minutes recovery, if K1 is closed, the RSBT will attempt another start. If at the second attempt, ramp up is not performed within the specified time, the RSBT will shut down and user intervention will be required to reset the controller.
- The RSBT has a built-in internal temperature sensing function to protect the controller against overheating. When an internal overtemperature condition is sensed, the RSBT will shut down and the red LED will start flashing accordingly. The RSBT will then start another ramping function as soon as the internal temperature settles within the specified range, assuming K1 is closed.
- In case that the mains frequency is out of range ($f < 45\text{Hz}$ or $f > 65\text{Hz}$) the RSBT will shut down with a flashing red LED as long as the frequency is out of range. Once the mains frequency is within range, the RSBT will start ramping function after a 5 minute recovery, in the case K1 is closed.
- In case that there is $\geq 10\%$ unbalance between (L1, L2, L3), RSBT will shut down with a flashing red LED as long as the supply voltage is unbalanced. After a 5 minute recovery, if K1 is closed and all phases (L1, L2, L3) are connected, RSBT will attempt another start

Alarms

No. of Flashes Red LED	Condition	Action
2	Wrong Phase sequence	Physical Change
3	Line Voltage Out of Range	Auto Reset with 5 minutes recovery
4	Frequency Out of Range	Auto Reset with 5 minutes recovery
5	Locked Rotor Condition (during Ramping)	Auto Reset with 5 minutes recovery
6	Ramp Up Time > 1 sec	Auto Reset with 5 minutes recovery
7	Over Temperature	Auto Reset
8	Over Current (during Bypass)	Auto Reset with 5 minutes recovery
9	Supply Voltage Unbalance	Auto Reset with 5 minutes recovery assuming all phases (L1, L2, L3) are conneted

Flashing Sequence



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

Type of coordination: 1	RSBT..16EV5. RSBT..16EV6.	RSBT..25EV5. RSBT..25EV6.	RSBT..32EV5. RSBT..32EV6.
Rated short circuit current	RK5 fuses up to 40A	RK5 fuses up to 40A	RK5 fuses up to 40A
Type of coordination: 2	RSBT..16EV..	RSBT..25EV..	RSBT..32EV..
Rated short circuit current	5kA when protected by semiconductor fuses Semiconductor fuse 50A, Class gRC Art. No. 6.9xx CP gRC 14.51 50 (xx = 00 or 21)	5kA when protected by semiconductor fuses Semiconductor fuse 50A, Class gRC Art. No. 6.9xx CP gRC 14.51 50 (xx = 00 or 21)	5kA when protected by semiconductor fuses Semiconductor fuse 50A, Class gRC Art. No. 6.9xx CP gRC 14.51 50 (xx = 00 or 21)

Current/power rating

I_e (AC-53b)	Assigned compressor rating @ 220V	Assigned compressor rating @ 400V	Max. Current limit level I_{rms}
16A	4.0kW (5Hp)	7.5kW (7.5Hp)	40A*
25A	5.5kW (7.5Hp)	11.0kW (10Hp)	90A*
32A	9.0kW (10Hp)	15.0kW (15Hp)	110A*

* Auto Adaptive Algorithm (Patent Pending)

RSBT series of softstarters includes an innovative auto-adaptive algorithm (Patent Pending) such that an optimum starting current performance is achieved at every

compressor start. This feature is active at every compressor start. Appropriate parameters are automatically set by the softstarter in order to achieve an optimum inrush

current reduction whilst maintaining a ramp-up time < 600ms. In case of Locked Rotor/Ramp Up Time alarm, default parameter settings are

restored automatically. During the subsequent compressor starts, the auto adaptive function will start optimising such parameters automatically once again.

Accessories

DIN Rail Mounting



- Only available with RSBT...EV.1 models

EMC/ RFI Filter



- Insertion loss 5dB
- Lightweight and compact design
- Operational current: Max. 32A @ 60°C
- Rated operational voltage: 220/ 440 VAC \pm 15%
- Ordering code: RFILT4032V00
- UL, cUL Listed (Accessory of Listed RSBT)

Auxiliary Relay Alarm Output



- Normally open (NO) or Normally Closed (NC) configuration
- Contact rating: 3A, 250 VAC / 3A, 30VDC
- 1-Relay Output for alarms generated by softstarter
- Ordering code: RFPMV00
- UL, cUL Listed (Accessory of Listed RSBT)