RSB, RSBS, RSBD, RSBT

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RSBS, RSBD & RSBT

Scroll compressor soft starter series

Where does the need for scroll compressor soft starters come from?

Scroll compressors have earned a strong reputation in HVAC applications by proving to be a more reliable and efficient solution than other categories of compressors.

Scroll compressors are generally 10 to 15% more efficient than piston compressors. Worldwide initiatives promoting energy efficiency in the building sector are generating a growing interest for more cost saving and efficient HVAC solutions, making the use of scroll compressors more and more a necessity.

A complete range of scroll compressor soft starters

Scroll compressor high starting currents

Starting scroll compressors via direct on line (DOL) methods results in a high inrush current typically 6 to 8 times the rated compressor current.

Such levels of current inevitably cause a number of undesirable effects including:

- Light flickering
- Triggering of protection equipment
- Increased compressor noise and vibration
- Excessive stresses on compressor
- Voltage fluctuations and disturbances on neighboring equipment

Benefits of soft starting solutions

Carlo Gavazzi's line of dedicated scroll compressor soft starters RSBS, RSBD and RSBT is the result of an extensive study of scroll compressor systems together with a continuous communication with our customers.

RSBS, RSBD and RSBT soft starters are equipped with specific algorithms to reduce the high starting currents thereby resulting in:

- Elimination of light flickering
- Reduction in voltage disturbances
- Increased compressor lifetime

Additionally, by limiting starting current to more than 50%* with respect to DOL start, additional benefits can be achieved such as:

- Lower-rating protection devices and cabling
- Less expensive contracts with utility companies

* Typical for RSBS, RSBT

Applications

It is estimated that around 40% of electrical energy is consumed in buildings mainly for heating, ventilation and air conditioning systems. Initiatives aimed at reducing CO_2 emissions by using more efficient and renewable energy systems are contributing to innovative designs for more energy-saving products and technologies both in the residential and the industrial sectors.
Carlo Gavazzi offers a comprehensive range of softstarting solutions specifically designed for scroll compressor applications so as to reduce such negative effects whilst prolonging the system lifetime.

Heat pumps

Benefits:
- Patented algorithm optimised for scroll compressors
- No external settings required
- Unmatched inrush current reduction
- Compact design
- Compliance to residential (Class B) EMC requirements for RSBS and RSBT series (up to 15 kW)

Chillers

Benefits:
- Typical inrush current reduction vs direct on line >50%
- Reduction in system vibrations
- Longer compressor lifetime
- Tamper proof design with no external settings
- Optimised control through serial communication

Roof tops

Benefits:
- Auto-adaptive algorithm ensures that starting parameters are automatically adjusted to optimize inrush current reduction
- Integrated diagnostic functions for increased system protection and reduced downtime
- Operating temperature range: -20°C to +60°C (-4°F to +140°F)
- Optimised algorithm for multi-compressor systems

RSBS, RSBD & RSBT

Scroll compressor soft starter series

RSBS compact single phase compressor soft starter

RSBS is single phase soft starter that reduces the scroll compressor starting current to 45A AC limiting the peak energy demand and reducing voltage disturbances as well as light flickering. RSBS provides a one-package solution for compressor softstarting and starting capacitor control. Driven by local utility regulations, single phase heat pumps need to respect specific current limits during start so as not to disturb the electrical network and/or neighboring equipment.

RSBS has a dedicated algorithm and inbuilt current limit settings specifically for scroll compressor starting. To limit the peak energy demand resulting in expensive utility contracts by the end-users.

RSBS complies with Class B (residential) limits for conducted and radiated emissions which ensures that neighbouring equipment is not negatively affected by any interference generated by the softstarter switching.

RSBS HP provides a dynamic current limit that ensures compressor starting even at higher starting pressures with a maximum current limit of 80 AACrms.

RSBS Single phase soft starters up to 32A AC

Features
- Current limiting strategy
- No user setting required
- Integrated diagnostic functions
- High pressure (HP) algorithm
- Conforms to Class B limits for EMC
- Alarm relay output

Benefits
- Reduces light flickering and voltage disturbance
- Tamper-proof design
- Quicker diagnosis of problems in the heat pump
- Algorithm self-adjust the maximum starting current in case of high pressure starts
- No need for additional EMC filters
- Easier fault diagnostics

Dedicated soft starting solutions for 3-phase scroll compressors

The RSBD and RSBT range of three phase soft starters is specifically designed and optimized for three phase scroll compressors incorporating a patented, auto-adaptive algorithm that continuously measures system parameters to optimize the starting performance of the scroll compressor.

RSBD and RSBT compact series is fitted in a "contactor-like" housing of just 45 mm width to facilitate installation and replacement of existing components.

Panel space saving is also enhanced through the incorporation of a number of diagnostic functions designed to protect your system in abnormal conditions.

RSBD 2-phase controlled soft starters up to 95A AC

Features
- No user settings required
- Self-learning algorithm for start current reduction
- Current balancing strategy
- 45A in 45mm wide housing
- 95A in 75mm wide housing
- Internally bypassed solution
- Integrated diagnostic functions
- HP algorithm for multi-compressor systems
- Two (RSBD 45mm) or 3 (RSBD 75mm) auxiliary relay outputs

Benefits
- The most easy to use soft starter
- Reduces compressor start current by an average of 40% vs Direct on line
- Ensures compressor starts with lowest current within less than 1 second
- Easy replacement of existing mechanical contactors
- Less heat dissipation inside the electrical panel
- Increased protection for scroll compressor
- HP algorithm ensures that compressor starts even at high pressure difference
- Increases installation flexibility

RSBT 3-phase controlled soft starters up to 95A AC

Features
- Patented self-learning algorithm for compressor start current reduction
- No user settings required
- Compliance with EMC class B (residential) limits
- Internally bypassed solution
- Up to 32Arms in 45mm wide housing
- User-friendly alarm indication
- Serial communication (RS485)
- HP algorithm for multi-compressor systems
- Additional plug-in modules available

Benefits
- >50% Start current reduction vs Direct on Line
- Reduces heavily any light flickering
- Less vibrations in the pipes and joints
- Meets the most demanding limits for emissions – hence no need for additional filters
- Easier fault-finding in case of abnormal conditions
- Communication with machine controller for energy consumption, soft start status, ON/OFF control and alarms
- Installation flexibility with different configurations

Modularity

The RSBT compact installation flexibility can be enhanced through the additional accessories such as the RFPM and RSPM auxiliary relay modules.

For those systems where EMC emissions need to be reduced further we also provide an optional plug-in filter (RFILT) than be mounted directly on top of RSBT to further reduce the EMC noise.

Furthermore, through the interconnecting clip (RTPM) further time-saving for the connection to manual motor starters is achieved.

RFILT *
Plug-in EMC filter
- Noise attenuation: 5 dB
- Operational current: up to 32Arms
- Ordering code: **RFILT4032V00**

RFPM **
Plug-in alarm relay output
- Changeover (NO, NC) contact
- Ordering code: **RFPMV00**

RSPM **
Side-mount alarm relay output
- Version V110: Transistor output
- Version V120: Transistor and relay output
- Ordering code: **RSMPV120**, **RSPMV110**

RTPM *
Interconnectring clip for manual motor starters
- No additional tools required
- Facilitates connection to manual motor starters
- Ordering code: **RTPMGMS32SL**, **RTPMGMS32HL**

RFCG ***
Finger guards
- Provide increased protection for maintenance personnel
- Ordering Code: **RFCGX6**

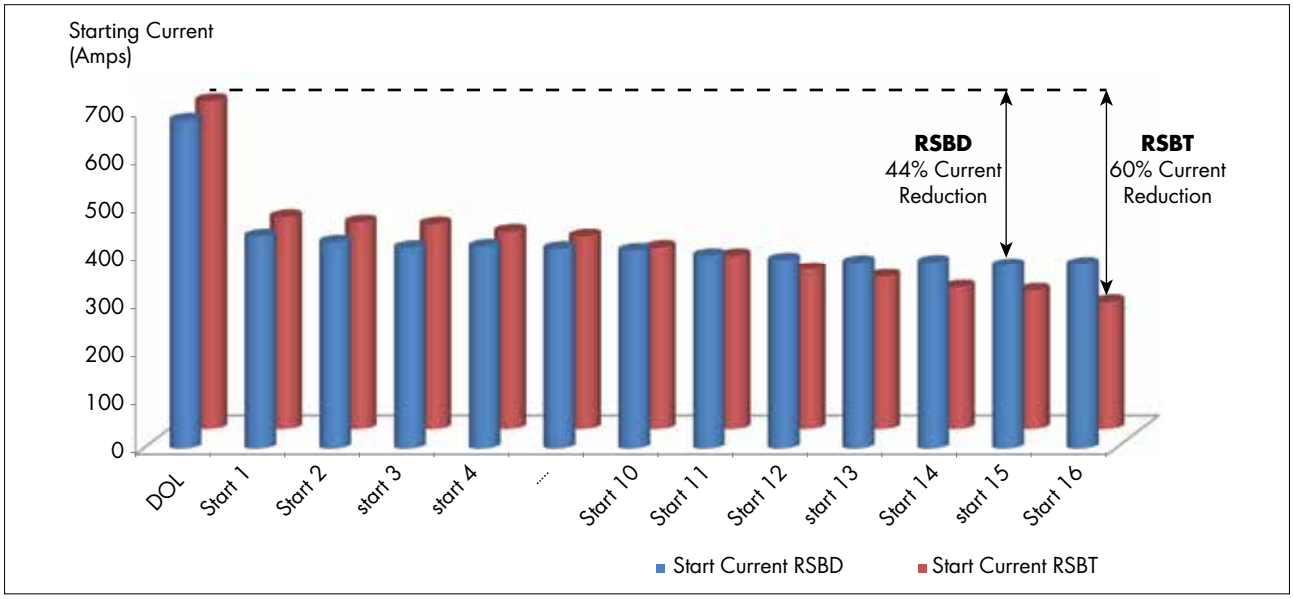
* Applies to RSBD and RSBT compact models
** Applies to RSBT compact models only
*** Applies to RSBD 75mm and RSBT 120mm models only

RSBS, RSBD & RSBT
Scroll compressor soft starter series

Patented auto-adaptive function to reduce starting current

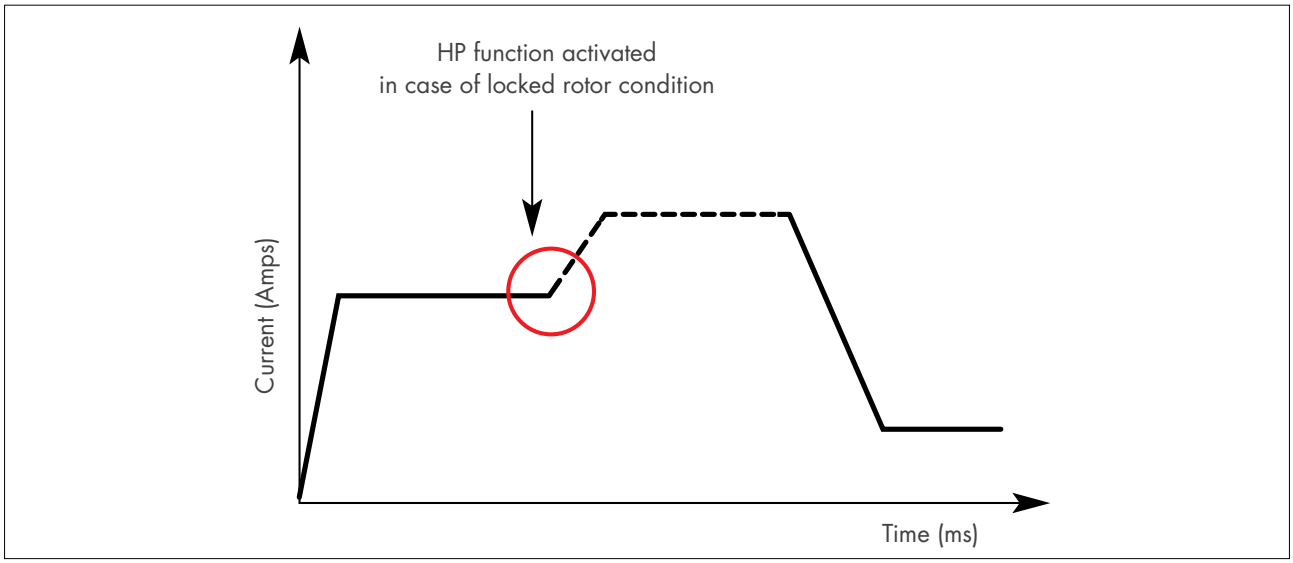
Through the auto-adaptive function, the RSBD and RSBT achieve a considerable inrush current reduction without the need to adjust any settings. During every start the algorithm measures relevant data and modifies the starting parameters to ensure a consistent inrush current reduction.

RSBD & RSBT inrush current reduction



A dedicated algorithm for multi-compressor systems

As a further enhancement to the auto-adaptive algorithm, the RSBD and RSBT family includes a specific algorithm (HP algorithm) which has been designed to detect a locked rotor condition and automatically update the starting parameters to ensure that the compressor is soft-started within 1 second. This feature is particularly suited for multi-compressor systems where starting pressures can vary considerably from start to start thus requiring a different level of starting current. With the HP algorithm, the RSBD and RSBT soft starters automatically adjust the current limit level, upon detection of locked rotor condition, ensuring the system is not stopped unnecessarily.



Main specifications

Types	RSBS	RSBD Compact	RSBT Compact	RSBD 75 mm	RSBT 120 mm
					
Housing (H x W x D)	60.4 x 76 x 137.2 mm	125 x 45 x 105mm	125 x 45 x 81mm	170 x 75 x 150mm	170 x 120 x 150mm
Number of starts per hour @40°C	12 (for RSBS23..A2V.2C24) 10 (for RSBS23..A2V.2C24HP)	12	12	12	12
Operational voltage	230 VAC ± 15%	220- 400 VAC	220- 400 VAC	220- 600 VAC	220- 480 VAC
Operational current	25/32 AAC	12/16/25/32/37/45 AAC	12/25/32 AAC	55/70/95 AAC	55/70/95 AAC
Control voltage	230 VAC ± 15%	24 VAC/DC or 110 - 400 VAC	110 - 400 VAC	24 VAC/DC or 110 - 400 VAC	24 VAC/DC or 110 - 400 VAC
Controlled phases	1	2	3	2	3
Internally bypassed	Yes	Yes	Yes	Yes	Yes
Approvals	CE, UL, cUL, EN 60335-2-40	CE - cULus - CCC	CE - cULus - VDE	CE - cULus	CE - cULus
Protection degree	IP20	IP20	IP20	IP20	IP20

Selection guide

Operational voltage (Ue)	Rated operational current (Ie)	Supply voltage (Us)	RSBS	RSBD	RSBT
230VAC	25A	Internally supplied	RSBS2325A2V12C24		
			RSBS2325A2V22C24		
	32A		RSBS2332A2V12C24		
			RSBS2332A2V12C24HP		
			RSBS2332A2V22C24		
			RSBS2332A2V22C24HP		
220 - 400VAC (220 - 480VAC)*	12A			RSBD4016XVY1HP	-
	16A			RSBD4016XVY1HP	RSBT4016EVY1HPZ
	25A			RSBD4025XVY1HP	RSBT4025EVY1HPZ
	32A			RSBD4032XVY1HP	RSBT4032EVY1HPZ
	37A			RSBD4037XVY1HP	-
	45A			RSBD4050XVY1HP	-
	55A			RSBD4055XV61HP	RSBT4855CVW
	70A			RSBD4070XV61HP	RSBT4870CVW
	95A			RSBD4095XV61HP	RSBT4895CVW
220 - 600VAC	55A	100 - 240VAC		RSBD6055GGV61HP	-
	70A			RSBD6070GGV61HP	-
	95A			RSBD6095GGV61HP	-

W = "C" for versions with Modbus RS485 communication
X = "E" for 110 - 400 VAC, "F" for 24 VAC/DC control voltage versions
Y = "1" No relay output (CE approval only), "2" = with relay output (CE approval only), "5" No relay output (CE & cULus approved), "6" = with relay output (CE & cULus approved)
Z = "V" for VDE approved versions

* Applicable to RSBT models from 55A to 95A only

Motor Controller
AC Semiconductor Motor Controller
Types RSB..15-B

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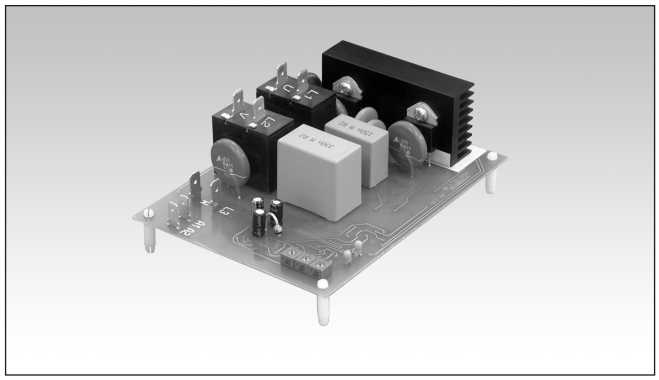

- **Soft starting and stopping of 3-phase squirrel cage motors**
- **Board-level solution**
- **Rated operational voltage: up to 480 VACrms, 50/60 Hz**
- **Rated operational current: 15 AAC 53 b**
- **Transient overvoltage protection built-in**
- **Integral bypassing of semiconductors**

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, 5 mA
Rated AC frequency	50/60 Hz -5/+5Hz
Rated insulation voltage 60664)	630 V rms Overvoltage cat. III (IEC
Dielectric strength Dielectric voltage Rated impulse withstand volt.	 2 kVAC (rms) 4 kV (1.2/50 µs)

Supply Specifications

Power supply 60664) through terminals L1-L2-L3	Overvoltage cat. III (IEC Rated operational volt. (U_e) (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
CE marking	Yes
Norms	IEC/EN 60947-4-2
Form designation	Form 1
Degree of protection	IP00
Pollution Degree	2

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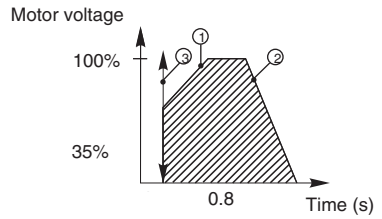
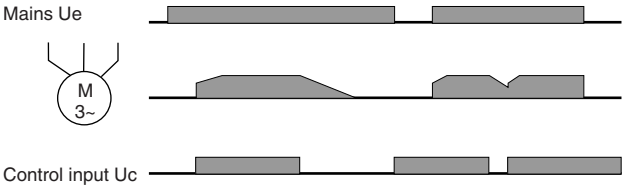
Operation Diagram 1



(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

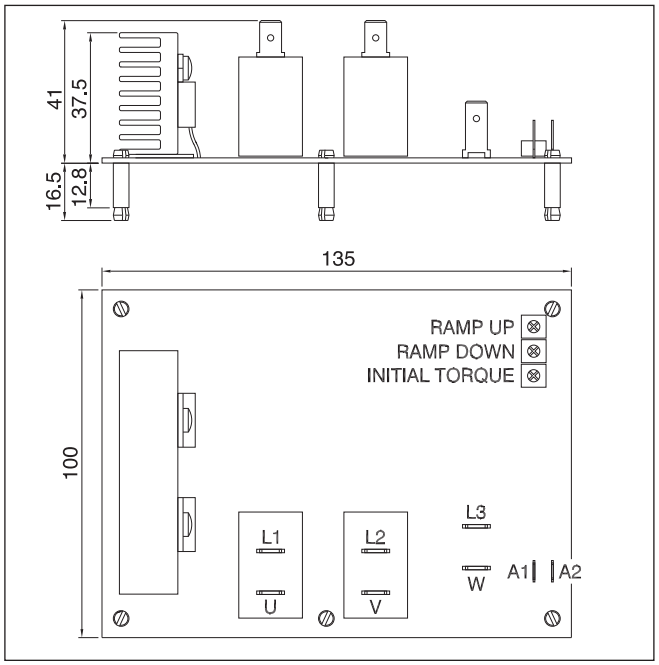
1. Recommended semiconductor protection fuses

Type: 6.921 CP URQ 27x60 / 50, Ferraz Shawmut

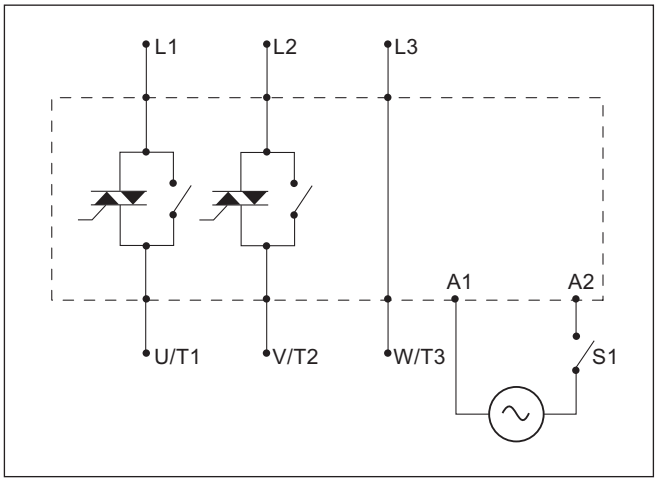
2. Recommended motor protection circuit breakers

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.

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Wiring Diagrams

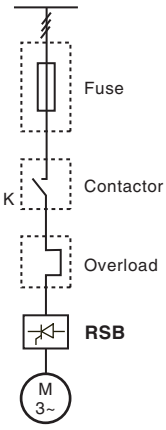


Fig. 1a

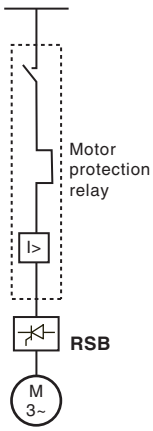


Fig. 2a

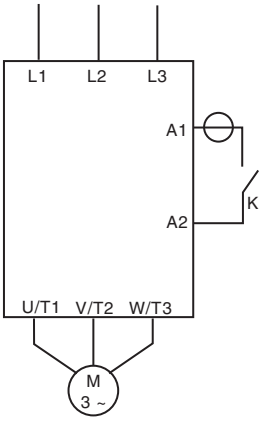


Fig. 3

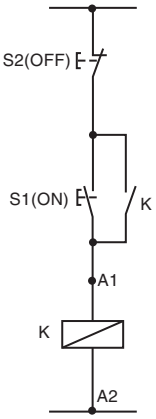


Fig. 4a

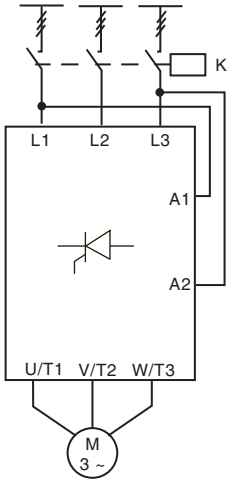


Fig. 5a

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.

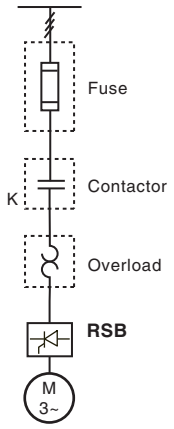


Fig. 1b

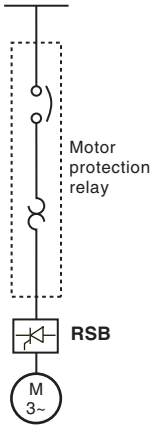


Fig.2b

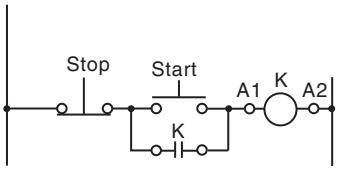


Fig. 4b

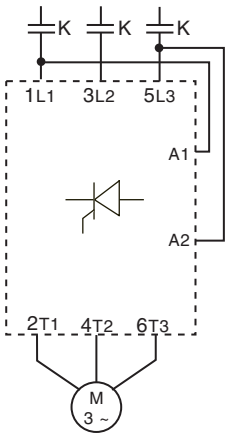
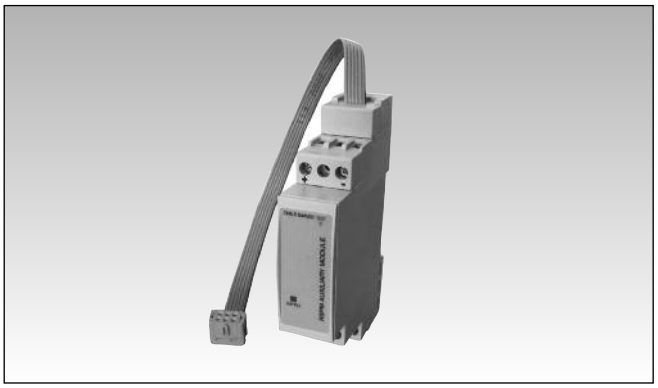


Fig. 5b

Auxiliary Output Module
RSBT Accessory
Type RSPMV



- **17.5mm DIN rail housing**
- **LED indication for supply ON**
- **Plug'n'play design**
- **Output (1):100mA, Open collector, Normally Open (NO)**
  Output (2): 3A SPDT relay *
- **RoHs compliant**
- **CE, cULus (accessory of listed RSBT)**

* Only applicable to RSPMV120

Product Description

The RSPM accessory is a DIN mounted module intended to be used as an additional accessory for RSBT soft-starter. There are two variants of this product RSPMV110 with a single open-collector output and RSPMV120 which offers an additional SPDT relay contact. The RSPM is designed to provide alarm information, generated by RSBT softstarter, to an external circuit. When connected to this external circuit, the open collector output may be used to provide higher level user information on the RSBT status and alarms.

Ordering Key

RS P M V 1 2 0

- **Side-mounting**
- **Plug In**
- **Module**
- **Version**
- **DIN mounted**
- **Number of Outputs**
- **Cable Length**

Type Selection

Type	Number of Outputs	Output type	Mounting	Cable length
RSPMV110	1	Open-collector (NO)	DIN	150mm
RSPMV120	2	SPDT Relay (No/NC), Open-collector (NO)	DIN	150mm

General Specifications

Reaction time	
Alarm ON delay	< 200 ms
Alarm OFF delay	< 300 ms
Status indication LEDs	
Power supply ON	LED, green
Environment	
Degree of protection	IP20
Pollution degree	2
Operating Temperature	-20°C to +60°C (-4°F to 140°F)
Operating Humidity	<95% non condensing @ 40°C
Storage Temperature	-30°C to +70°C (-22°F to 158°F)
Housing	
Dimensions (DxWxH)	67 x 17.5 x 90 mm
CE Marking	Yes
Approvals	CE, cULus Listed
ROHS compliant	Yes
EMC	
Immunity	IEC/ EN 61000-6-2
Emission	IEC/ EN 61000-6-3
LVD	IEC/EN 60947-5-1

Housing Specifications

Weight	50g (approx.)
Housing colour	RAL7035
Protection category	IP20

Conductor Data

Output terminals	
Screw type (11,12,14, +, -)	M3
Tightening torque	0.4Nm (3.54 lb.in)
Stripping length	6.0 mm
Cross sectional area of cable (stranded) (11,12,14, +, -)	0.34 - 0.75mm^2
Cross sectional area of cable (solid) (11,12,14, +, -)	0.34 - 0.75mm^2
UL/ cUL rated data	
Rigid (solid or stranded)	AWG 1 x 22 .... 18 AWG 2 x 22 18
Rigid (stranded)	AWG 1 x 22 + AWG 1 x 18

Input Specifications

Supply Input	Supply to the RSPM is provided via the cable connector when connected to the RSBT

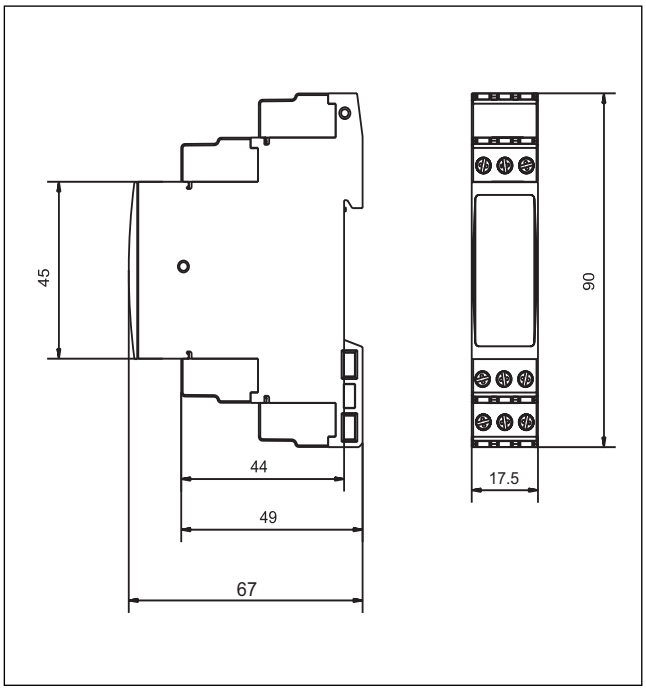
Output Specifications

Outputs	RSPMV110	1
	RSPMV120	2
Relay Output		SPDT relay* NO, NC, Changeover
NPN/PNP Output		Open collector, NO
Output current		
Maximum load current		
NPN-PNP Output		100mA
Maximum Voltage		40VDC
On-state power loss		< 800mW
Contact Ratings*		
Relay:	UL	3A @ 240VAC
	IEC	3A @ 250VAC, 3A @ 30VDC

* Applicable to RSPMV120 only

Dimensions

Cable Length	150 mm



All dimensions in mm

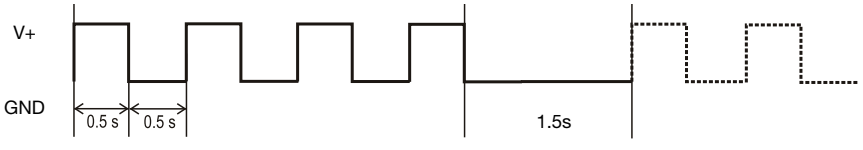
Mode of Operation

The output module shall operate as per below table monitoring the following alarms

Status/Alarm condition	Relay Contact	No. of pulses PNP/ NPN/ O/P *
Wrong Phase Sequence	11/12	2
Under/Overvoltage	11/12	3
Frequency out of range	11/12	4
Locked Rotor Condition (during ramping)	11/12	5
Ramp-up time > 1sec	11/12	6
Device Overtemperature	11/12	7
Overcurrent (during bypass)	11/12	8
Supply Voltage Unbalance	11/12	9
Supply Phase Loss	11/12	N/A
IdleState	11/14	N/A
Ramping State	11/12	N/A
Bypass Mode	11/14	N/A

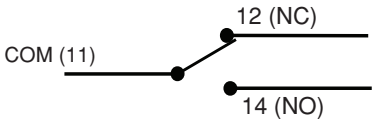
* Pulse duration as per diagram below

Open Collector Pulses (during alarm conditions)

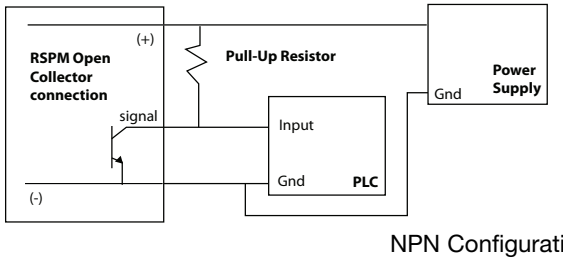


* Open collector pulse sequence when open collector output is wired with NPN configuration as shown below.

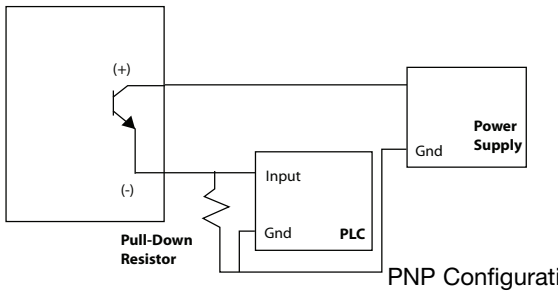
Relay Output Configuration



Open Collector Output Configuration



NPN Configuration



PNP Configuration

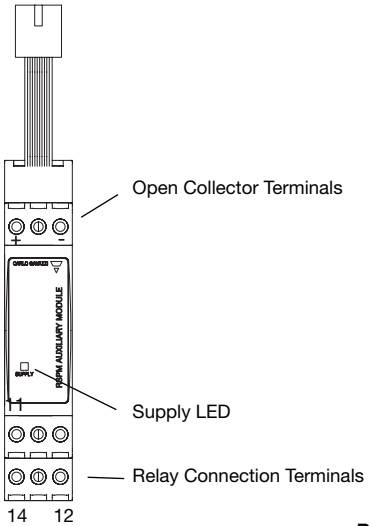
Mode of Operation

RSPM is supplied through the RSBT front terminal connection via the ribbon cable (provided with RSPM) when connected. Indication of the presence of the supply is provided via the green LED. When the RSBT softstarter triggers an alarm, the RSPM open collector output will start pulsating according to the alarm that is raised by RSBT. On the other hand, the relay contact position will be in accordance to the table overleaf.

Note: For more detailed operation on the alarms please refer to the RSBT datasheet.

Terminal Layout

RSPMV110



RSPMV120

Short Circuit Protection (according to EN/IEC 60947-5-1)

Type of coordination: 2
Rated short circuit current: 1kA when protected by semiconductor fuses
SIBA 4A, Class gr Art. no. 5017906.4

По вопросам продаж и поддержки обращайтесь:

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