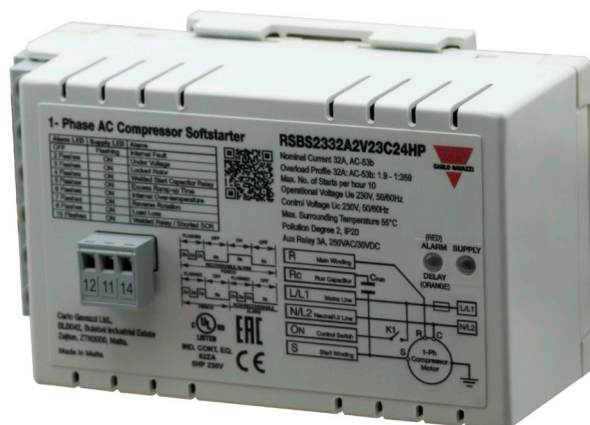


## 1-phase compressor soft starter



### Benefits

- **Easy to use.** No user adjustments required.
- **Space saving solution.** Compact DIN or panel mount versions available. Integrated start capacitor.
- **Integrated diagnostics.** Detection for voltage dips and interruptions. Detection of welded relay contacts.
- **Adjusts to load requirements.** The built-in HP function ensures that the compressor starts in < 1 second even under high pressure difference during start.
- **Guided model selection.** Easy to use online selection tool to select the appropriate soft starter model depending on the compressor brand/model. [http://gavazziautomation.com/nsc/HQ/EN/soft\\_starters](http://gavazziautomation.com/nsc/HQ/EN/soft_starters).
- **Reduces light flicker.** RSBS reduces the compressor start current by >50% to reduce light flickering.

### Description

The **RSBS....V23C..** is a single phase soft starter for 1 phase compressors up to 32 Arms.

The **RSBS** can limit inrush currents to 45 AACrms (under balanced conditions) and has a maximum ramp-up time of 600 ms. A special function (HP function) allows the **RSBS** to start compressors, even when pressures are not balanced, by allowing a maximum current of 80 AACrms. Following the ramp-up, the semiconductors will be bypassed by the internal electromechanical relay. The **RSBS** is rated for a maximum of 10 starts per hour (evenly distributed).

### Applications

- Scroll compressors, piston compressors

### Main features

- Limitation of compressor starting current
- Ramp-up time optimised to 600 ms
- Anti-short cycling function with built-in delay between starts
- Voltage dips/interruptions detection during bypass state

## Order code


**RSBS 23 32 A2 V23 ☐ HP**

Enter the code entering the corresponding option instead of ☐.

| Code                     | Option | Description                                | Notes                     |
|--------------------------|--------|--|---------------------------|
| R                        | -      | Soft starter                               |                           |
| S                        | -      |  |                           |
| B                        | -      | Compressor soft starter                    |                           |
| S                        | -      | Single phase control                       |                           |
| 23                       | -      | 230 VAC                                    | Rated operational voltage |
| 32                       | -      | 32 Arms                                    | Rated operational current |
| A2                       | -      | 230 VAC                                    | Rated control voltage     |
| V                        | -      | Options                                    |                           |
| 2                        | -      | Auxiliary relay output                     | Alarm status indication   |
| 3                        | -      | Third generation                           |                           |
| <input type="checkbox"/> | C24    | Internal start capacitor: 200 – 240 µF     |                           |
|                          | C17    | Internal start capacitor: 145 – 175 µF     |                           |
|                          | C10    | Internal start capacitor: 100 – 140 µF     |                           |
|                          | C00    | External start capacitor                   |                           |
| HP                       | -      | Control algorithm for high pressure starts | See caution notes         |



- The internal relays may be in an undefined state due to shocks during transportation. In case both relays are latched in the ON state, there will be a direct on line start of the compressor, even without a control signal.
- To avoid direct on line start, the user should do an initial power up with no load connected for a period of  $\geq 3$  seconds.
- Short circuit and overload protection are not provided with the RSBS and must be installed separately.
- The RSBS soft starter is not to be used as a safety device. The RSBS, on its own, cannot guarantee any safety and therefore other components need to be used to ensure that the system operates safely.
- Repeated starts under unbalanced pressure (resulting in HP starts) will reduce the lifetime of the RSBS.

## Selection guide



| Start capacitor size | Part number        |
|----------------------|--------------------|
| 200 – 240 µF         | RSBS2332A2V23C24HP |
| 100 – 140 µF         | RSBS2332A2V23C10HP |
| 145 – 175 µF         | RSBS2332A2V23C17HP |
| External             | RSBS2332A2V23C00HP |

For proper model selection refer to our online soft starter selector tool:  
[http://www.gavazziautomation.com/nsc/HQ/EN/soft\\_starters](http://www.gavazziautomation.com/nsc/HQ/EN/soft_starters)

## Selection guide

| Category  | Compressor maximum operating current ( $I_{MAX}$ ) | Model selection    |
|---|--|--------------------|
| Compressors   | 2.5 - 16 Arms                                      | RSBS2332A2V23C10HP |
|   | 16 - 32 Arms                                       | RSBS2332A2V23C24HP |
| Note: For compressors with $I_{MAX} \geq 25$ Arms that start with unequalised pressures ( $> 5$ bar) the model RSBS2332A2V23C00HP is recommended. |  |                    |

## Further reading

| Information             | Where to find it  |   |
|-------------------------|---|---|
| RSBS instruction manual | <a href="http://cga.pub/?a1f658">http://cga.pub/?a1f658</a>               |    |
| Troubleshooting guide   | <a href="http://cga.pub/?686d1f">http://cga.pub/?686d1f</a>               |   |
| CAD drawings            | 3D (.dwg) - <a href="http://cga.pub/?ada314">http://cga.pub/?ada314</a>   |  |
|                         | 2D (.dwg) - <a href="http://cga.pub/?e0d224">http://cga.pub/?e0d224</a>   |  |
|                         | Step (.stp) - <a href="http://cga.pub/?f889f6">http://cga.pub/?f889f6</a> |  |

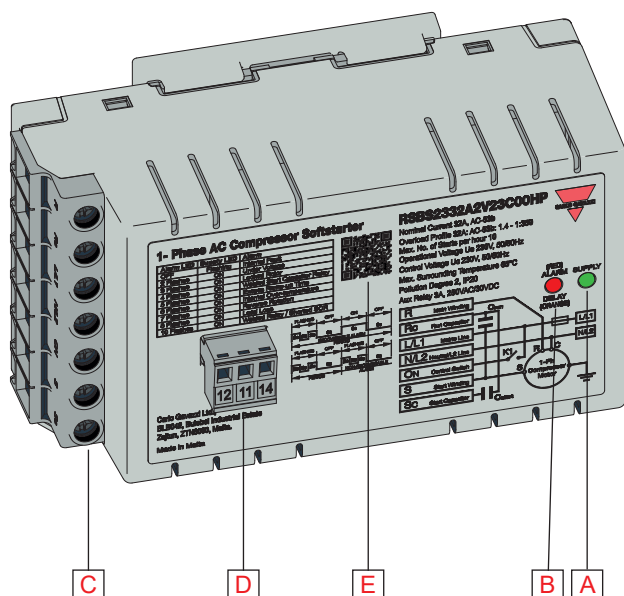
## CARLO GAVAZZI compatible components

| Purpose                      | Component name/code | Notes                         |
|------------------------------|---------------------|-------------------------------|
| External start capacitor kit | STARTCAP-200UF-SMA  | For RSBS2332A2V23C00HP models |

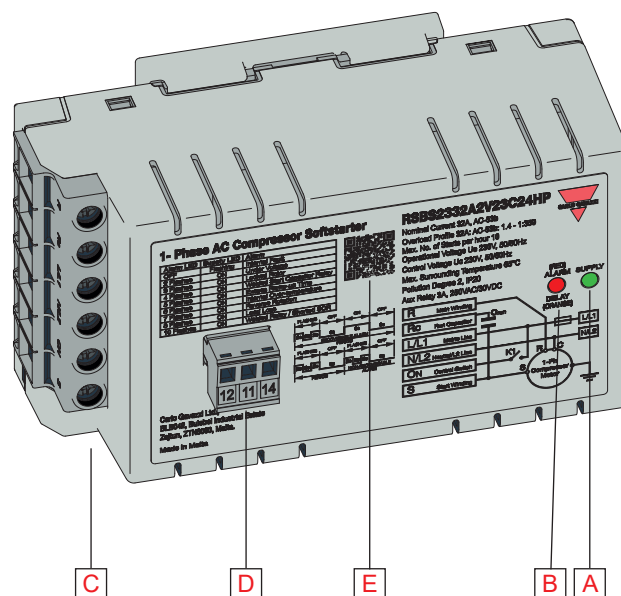
Note: Use a start capacitor with rated voltage of 330 VAC or higher. Start capacitor must also have a 15k $\Omega$  (2W) bleed resistor.

# Structure

RSBS2332A2V23C00HP



RSBS2332A2V23C..HP



| Element | Component      | Function  |
|---------|----------------|---|
| A       | LED indicators | Supply (Green). Indicates that the RSBS supply is ON.   |
| B       | LED indicators | Alarm (Red). Indicates that the RSBS is in alarm. The number of flashes indicates the alarm type.<br><br>Recovery between starts (Orange). Indicates that the recovery time between starts has not yet elapsed.<br><br>Note: During recovery between starts the RSBS will not respond to control voltage.   |
| C       | Outputs        | R: Connection to compressor main winding (R)<br>Rc: Connection to run capacitor<br>L / L1: Mains supply connection<br>N / L2: Supply neutral connection (L2 connection for U.S. applications)<br>ON: Control input signal (start signal)<br>S: Connection to compressor start winding (S)<br>Sc: Connection to external start capacitor (only for C00 versions) |
| D       | Alarm relay    | Alarm relay (Changeover)<br>11, 12: Normally closed (NC)<br>11, 14: Normally open (NO)  |
| E       | QR code        | Scan to link to troubleshooting guide.  |

## Mode of operation

The RSBS series of soft starters is designed for single phase compressors with a maximum start time of 1 second. Typical applications include scroll and piston compressors.

### Current limit algorithm

The RSBS soft starter series works on a current limit algorithm. When control signal is applied via the On terminal, the RSBS start the ramp-up sequence. The compressor start current is limited to 45 Arms. Once the compressor reaches full speed, the RSBS automatically detects this condition and switches on the bypass relay to reduce heat dissipation within the electrical panel. The RSBS will optimise the motor start time to around 600 ms (See Fig. 1).

If the motor does not reach full speed within a maximum of 1 second, the RSBS will trigger the excess ramp-up time alarm (5 flashes) to protect the internal relay from switching a too high current that would reduce the relay lifetime. The alarm will self-recover after 5 minutes.

### High pressure (HP) function

During the ramp-up sequence, the RSBS will check if the motor is rotating. If the RSBS finds that the motor is in locked rotor condition, it will trigger the HP function after  $\sim 250$  ms (See Fig. 2). During the HP sequence, the RSBS will gradually increase the current limit setpoint up to a maximum of 80 Arms. This mode of operation is required when the starting pressures are not balanced or where voltage supply is very weak.

Note: Starts under unbalanced pressure conditions can reduce the lifetime of the RSBS due to the higher current flowing through the components. Allow enough time between starts to ensure that starting pressures difference is kept to a minimum.

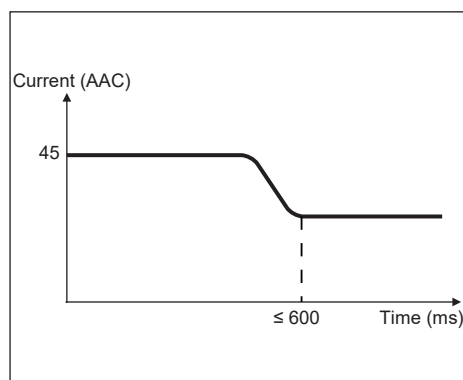


Fig. 1

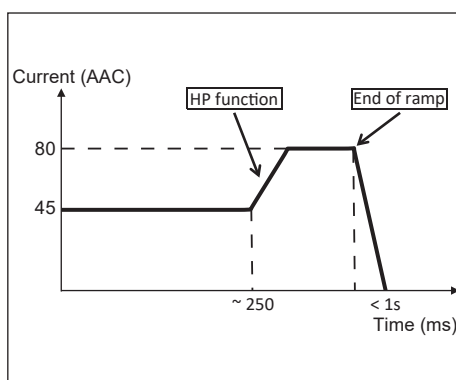
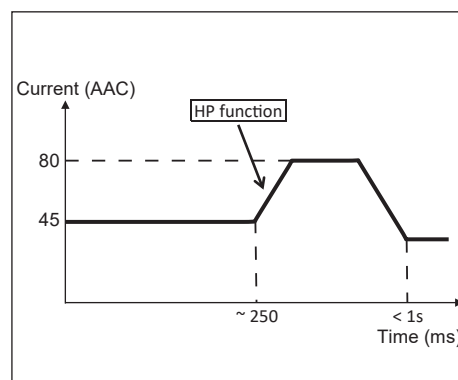


Fig. 2

# Features

## General data

|                      |               |
|----------------------|---------------|
| Material             | PA66          |
| Assembly             | DIN or panel  |
| Touch protection     | IP20          |
| Weight               | Approx. 450 g |
| Overvoltage category | II            |

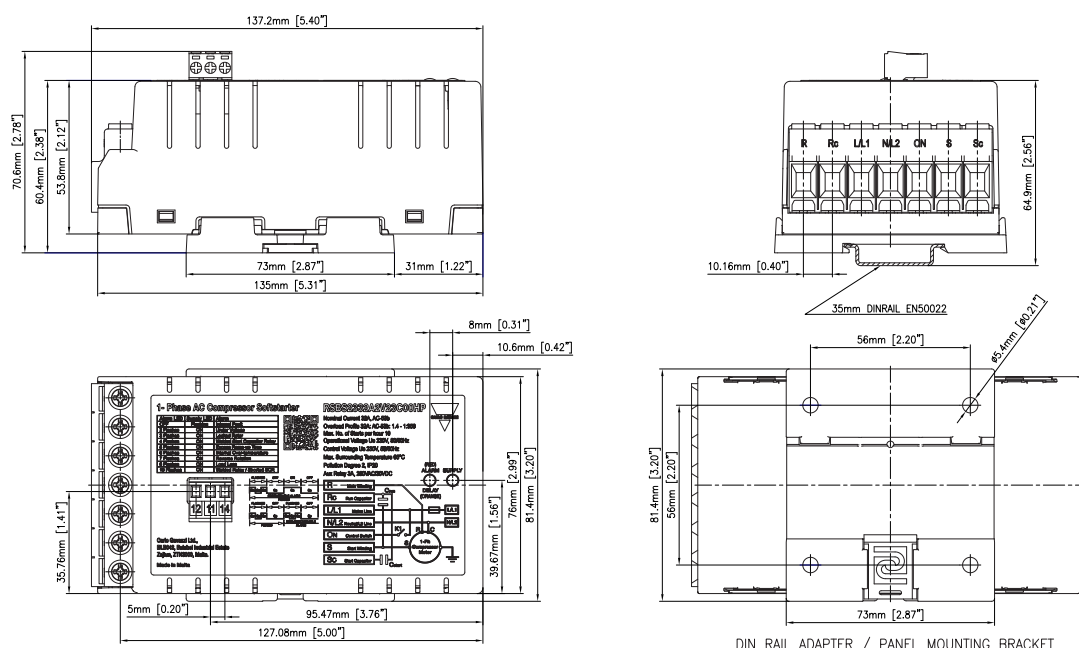


Fig. 3 RSBS2332A2V23C00HP

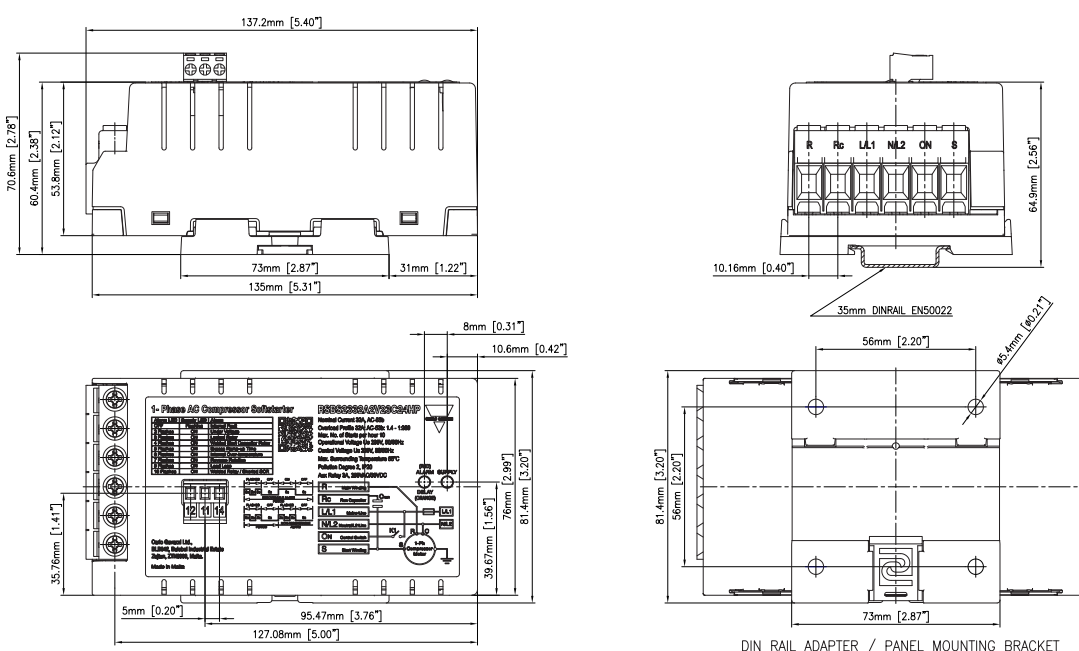


Fig. 4 RSBS2332A2V23C..HP

## Settings

|                |          |
|----------------|----------|
| Ramp-up time   | ≤ 600 ms |
| Ramp-down time | 0 s      |




## Power supply

|                           |                     |
|---------------------------|---------------------|
| Operational voltage range | 195.5 – 264.5 VAC   |
| Supply current at idle    | ≤ 15 mA             |
| Blocking voltage          | 1200 Vp             |
| Rated AC frequency        | 50/60 Hz (+/- 5 Hz) |
| Rated insulation voltage  | 250 VAC             |
| Integrated varistor       | Yes                 |
| Pickup voltage            | 90 VAC              |
| Drop out voltage          | 25 VAC              |

## Environmental

|                       |   |
|-----------------------|---|
| Operating temperature | RSBS2332A2V23C00HP: -20°C to +65°C (-4°F to +149°F)     |
|                       | RSBS2332A2V23C..HP: -20°C to +55°C (-4°F to + 131°F)    |
| Storage temperature   | - 30°C to + 70°C (- 22°F to +158 °F)                    |
| Relative humidity     | <95% non condensing @ 40°C                              |
| Pollution degree      | 2   |
| Installation category | II  |
| Installation altitude | 0 - 1000 m  |
| Vibration resistance  | 2 g / axis (2 - 100 Hz, IEC60068-2-6, EN50155, EN61373) |
| Impact resistance     | 15/11 g/ms (EN50155, EN61373)                           |
| EU RoHS compliant     | Yes   |

## Compatibility and conformity

|             |   |
|-------------|---|
| Conformance | IEC/EN 60947-4-2, UL60947-4-2   |
| Approvals   |    |

| Electromagnetic compatibility (EMC) - immunity |  |
|--|--|
| Electrostatic discharge (ESD)                  | EN/IEC 61000-4-2<br>8 kV air discharge, 4 kV contact (PC2)   |
| Radiated radio frequency                       | EN/IEC 61000-4-3<br>3 V/m, from 80 MHz to 1 GHz (PC1)<br>3 V/m, from 2 to 2.7 GHz (PC1)  |
| Electrical Fast Transient (Burst)              | EN/IEC 61000-4-4<br>Output: 2 kV, 5 kHz (PC2)<br>Input: 1 kV, 5 kHz (PC2)  |
| Conducted Radio Frequency                      | EN/IEC 61000-4-6<br>3 V/m, from 0.15 to 80 MHz (PC1)   |
| Electrical Surge                               | EN/IEC 61000-4-5<br>Output, line to line: 1 kV (PC2)<br>Output, line to earth: 2 kV (PC2)<br>Input, line to line: 0.5 kV (PC2)<br>Input, line to earth: 1 kV (PC2) |
| Voltage dips and interruptions                 | EN/IEC 61000-4-11  |

| Electromagnetic compatibility (EMC) - emissions |   |
|---|---|
| Radio interference field emissions (conducted)  | CISPR 11, EN/IEC 55011<br>Class B <sup>1</sup>                  |
| Harmonics                                       | IEC/EN 61000-3-2 <sup>1</sup><br>IEC/EN 61000-3-12 <sup>1</sup> |
| Disturbance power                               | CISPR 14, IEC/EN 55014-1 <sup>1</sup>                           |
| Flicker   | IEC/EN 61000-3-11 <sup>1</sup> (load conditions apply)          |

1. Applicable when current limit is  $\leq 45 A_{rms}$

Note:

- Performance Criteria 1 (PC1): No degradation of performance or loss of function is allowed when the product is operated as intended.
- Performance Criteria 2 (PC2): During the test, degradation of performance or partial loss of function is allowed. However when the test is complete the product should return operating as intended by itself.
- Performance Criteria 3 (PC3): Temporary loss of function is allowed, provided the function can be restored by manual operation of the controls.

## Inputs

|                               |   |
|-------------------------------|---|
| Control voltage (Uc)          | 230 VAC ( $\pm 15\%$ )                    |
| Control voltage range (Uc)    | 195.5 – 264.5 VAC                         |
| Maximum pick-up voltage       | 90 VAC                                    |
| Minimum drop out voltage      | 25 VAC                                    |
| Rated AC frequency            | 50 / 60 Hz ( $\pm 5$ Hz)                  |
| Rated insulation voltage (Ui) | 250 VAC                                   |
| Control input current         | 3 mA <sub>rms</sub> – 6 mA <sub>rms</sub> |

## Outputs

|   |                         |
|---|-------------------------|
| Overload cycle @ 40°C<br>surrounding temperature<br>(acc. to IEC/EN 60947-4-2)          | AC53b: 1.9 - 1 : 359    |
| Maximum number of starts/hr<br>@ rated overload cycle @ 40°C<br>surrounding temperature | 10 (evenly distributed) |
| Rated operational current @<br>40°C   | 32 Arms                 |
| Current limit   | 45 Arms                 |
| Maximum starting current  | 80 Arms                 |
| Minimum load current  | 2.5 Arms                |
| Minimum time between starts   | 6 minutes               |
| Minimum time between stop to<br>start   | 3 minutes               |

## Auxiliary relays

|                              |  |
|------------------------------|--|
| Number of output relay       | 1  |
| Function of relay            | Alarm  |
| Rated operational voltage    | 250 VAC / 30 VDC                                     |
| Rated insulation voltage     | 250 VAC  |
| Dielectric withstand voltage | 2.5 kV   |
| Overvoltage category         | II   |
| Type of control circuit      | Electromechanical relay                              |
| Number of contacts           | 2  |
| Type of contacts             | Changeover: Normally closed (NC), Normally open (NO) |
| Type of current              | AC / DC  |
| Rated operational current    | 3 Arms @ 250 VAC, 3 Arms @ 30 VDC                    |

## Performance

Current / power ratings: kW and HP @ 40°C

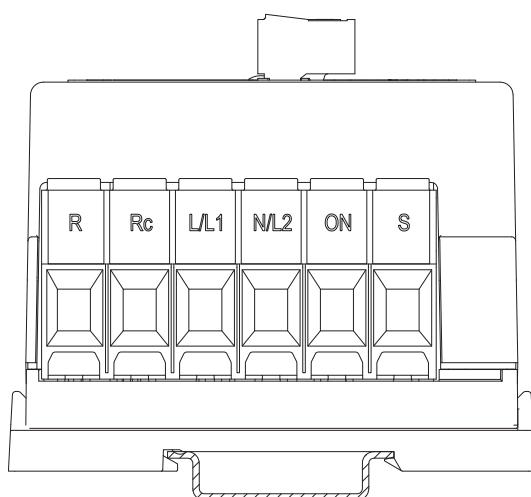
| Model | IEC rated current | RSBS2332A2V23Cxx |
|-------|-------------------|------------------|
| RSBS  | 32 Arms           | 4.4 kW / 5 HP    |

Ratings:

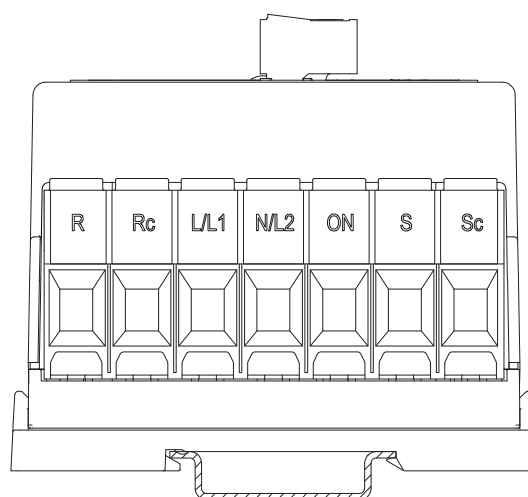
kW rating according to IEC/EN 60947-4-2

## Connection Diagrams

Terminal markings



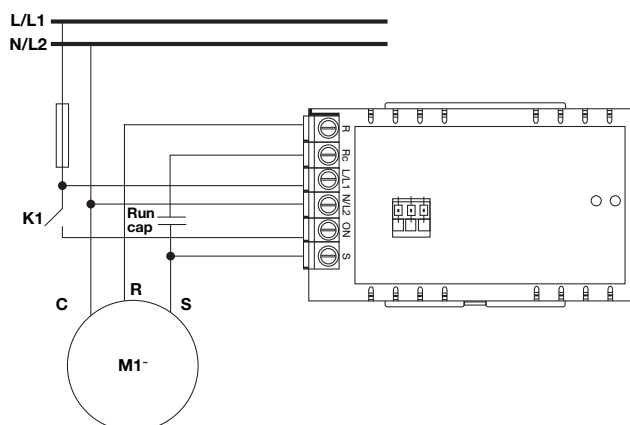
RSBS2332A2V23C..HP



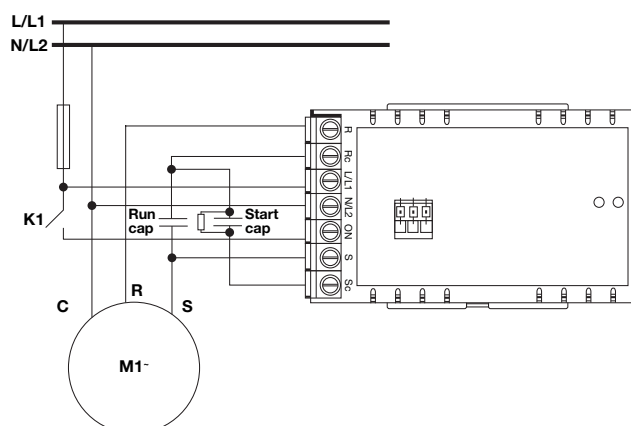
RSBS2332A2V23C00HP

| Marking |   |
|---------|---|
| R       | Connection to compressor main winding (R)                       |
| Rc      | Connection to run capacitor                                     |
| L / L1  | Mains supply connection   |
| N / L2  | Supply neutral connection (L2 connection for U.S. applications) |
| On      | Control input signal (start signal)                             |
| S       | Connection to compressor start winding (S)                      |
| Sc      | Connection to external start capacitor                          |

## Wiring Diagrams



Wiring diagram - RSBS..V23C..HP



Wiring diagram - RSBS..V23C00HP

Note: Install a 15 kΩ (2W) resistor in parallel to the start capacitor in case of RSBS..C00HP.

## Connection Specifications

| Main conductors (R, Rc, L / L1, N / L2, ON, S, Sc) |                                       |
|--|---------------------------------------|
| Flexible (solid or stranded)                       | 0.5 – 16 mm <sup>2</sup> , AWG 20 - 6 |
| Terminal screws                                    | M4                                    |
| Maximum tightening torque                          | 1.19 Nm (10.5 lb-in)                  |
| Stripping length                                   | 8.0 mm                                |

| Auxiliary conductors (11, 12, 14) |   |
|-----------------------------------|---|
| Flexible (solid or stranded)      | 0.2 – 1.5 mm <sup>2</sup> , AWG 30 - 12 |
| Terminal screws                   | M3                                      |
| Maximum tightening torque         | 0.5 Nm (4.5 lb-in)                      |
| Stripping length                  | 7.0 mm - 8.0 mm                         |

Note: Use 75°C Copper (Cu) conductors

# Troubleshooting

## LED and Relay status indications

| State  | Supply<br>(Green LED) | Delay<br>(Orange LED) | Alarm<br>(Red LED) | Relay contact<br>position (12, 11, 14) |
|--|-----------------------|-----------------------|--------------------|--|
| Idle   | ON                    | OFF                   | OFF                | 11, 12                                 |
| Ramping  | ON                    | OFF                   | OFF                | 11, 12                                 |
| Bypass   | ON                    | OFF                   | OFF                | 11, 12                                 |
| Alarm  | ON                    | OFF                   | Flashing           | 11, 14                                 |
| Alarm recovery                                 | ON                    | OFF                   | Flashing           | 11, 14                                 |
| Recovery time <sup>2</sup><br>(between starts) | ON                    | ON                    | OFF                | 11, 12                                 |
| Internal power supply<br>fault                 | Flashing              | OFF                   | OFF                | 11, 12                                 |

2. If supply on RSBS is removed before the recovery period (6 mins) has elapsed, when supply is restored, the remaining delay will continue until the remaining recovery time (before supply removal) is over.

## Alarms

The RSBS includes a number of diagnostics and protection features each of which is signalled through a flashing sequence on the red LED.

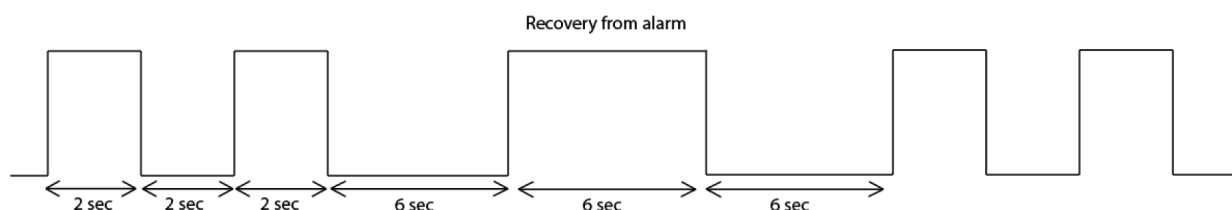
Note: In case there is a fault in the internal power supply (PSU) of the RSBS, the green LED (and not the red LED) will start flashing. In this condition, the relay contact will not change state.

## Flashing sequence

Every alarm that the RSBS will trigger will be signalled via a specific flashing sequence on the red LED. The specific alarm will flash with a period of 2 s ON, 2 s OFF.

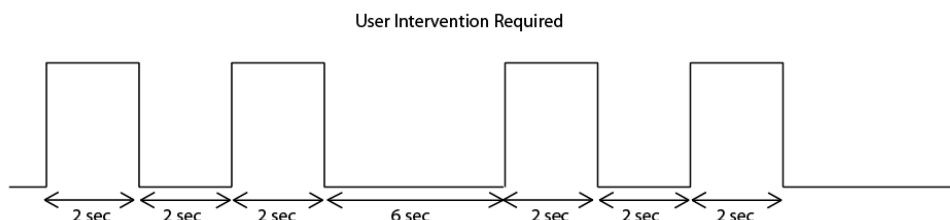
### Flashing sequence during recovery from alarm

When the alarm can self-recover, the flashing sequence of the red LED will be interleaved with a 6 s ON-OFF-ON flashing sequence and then the flashing sequence will repeat (see diagram below).



### Flashing sequence when user intervention is required

In the case where user intervention is required to perform a hard reset, the flashing sequence of the alarm will be followed by a 6 s OFF period followed by the flashing sequence. This flashing sequence will repeat itself until a hard reset is performed.



|  |  |
|--|--|
| <b>Number of flashes</b>                 | 2  |
| <b>Alarm</b>                             | Under voltage <sup>3</sup>   |
| <b>Alarm description</b>                 | The under voltage alarm will be triggered when the supply voltage (Ue) is:-<br>Condition 1: $U_e < 190 \text{ VAC}$ for $\geq 1 \text{ s}$<br>Condition 2: $140 \text{ VAC} < U_e < 160 \text{ VAC}$ for $\geq 200 \text{ ms}$<br>Condition 3: $90 \text{ VAC} < U_e < 140 \text{ VAC}$ for $\geq 100 \text{ ms}$<br>Condition 4: $U_e = 0 \text{ VAC}$ for $> 50 \text{ ms}$ (+20 ms) |
| <b>Alarm recovery period</b>             | 5 mins (from the moment when voltage is within operational range)  |
| <b>Consecutive alarms for hard reset</b> | N/A  |
| <b>Action to recover alarm</b>           | The alarm will self-recover after the recovery period. Voltage dips/interruptions during recovery between starts and/or alarm recovery shall be ignored.   |
| <b>Troubleshooting</b>                   | <ul style="list-style-type: none"> <li>• Check for any loose connections on L / L1 and N / L2 terminals.</li> <li>• Check quality and level of supply voltage after compressor starts.</li> </ul>  |

3. The under-voltage alarm is only active in bypass state

|  |  |
|--|--|
| <b>Number of flashes</b>                 | 3  |
| <b>Alarm</b>                             | Locked rotor   |
| <b>Alarm description</b>                 | The locked rotor alarm will be triggered when the measured current (in bypass state) exceeds 32 AAC. The alarm trigger time will vary according to the chart below.                    |
| <b>Alarm recovery period</b>             | 5 minutes  |
| <b>Consecutive alarms for hard reset</b> | 4  |
| <b>Action to recover alarm</b>           | The alarm will self-recover after the recovery period. If this alarm is triggered on 4 consecutive starts, user intervention will be required to reset the power supply (L/L1 & L2/N). |
| <b>Troubleshooting</b>                   | <ul style="list-style-type: none"> <li>• Check compressor windings resistance to check if motor is damaged.</li> <li>• Check for any blockage in the system.</li> </ul>                |

| Measured current (Arms) | Time to trip (s) |
|-------------------------|------------------|
| 33.6                    | 1                |
| 35.2                    | 0.5              |
| 38.4                    | 0.2              |
| 41.6                    | 0.1              |
| $\geq 44.8$             | 0.05             |

|  |  |
|--|--|
| <b>Number of flashes</b>                 | 4  |
| <b>Alarm</b>                             | Start capacitor relay protection   |
| <b>Alarm description</b>                 | This alarm will be triggered when the RSBS detects a faulty start capacitor electro-mechanical relay (EMR).  |
| <b>Alarm recovery period</b>             | 5 minutes  |
| <b>Consecutive alarms for hard reset</b> | 2  |
| <b>Action to recover alarm</b>           | The alarm will self-recover after the recovery period. Before attempting a second start, the RSBS will check the status of the EMR. If the EMR is found to be still faulty, the RSBS will remain in the alarm state. User shall then reset the mains supply to reset the RSBS. |
| <b>Troubleshooting</b>                   | <ul style="list-style-type: none"> <li>• Check that the proper RSBS model (start capacitor size) is being used.</li> <li>• Check for proper wiring.</li> </ul>   |

|  |  |
|--|--|
| <b>Number of flashes</b>                 | 5  |
| <b>Alarm</b>                             | End of ramp (EOR)  |
| <b>Alarm description</b>                 | <p>The RSBS will trigger this alarm if it cannot start the compressor within a maximum of 1 second. The EOR alarm will be triggered if, after the initial current limit and the subsequent HP phase (during ramp-up) the compressor does not reach nominal speed within a maximum of 1 second. The EOR alarm will prevent the RSBS from switching a high transitional current.</p> <p>Note: The EOR alarm may also be triggered if there is a damaged run and/or start capacitor. This results in less starting torque and therefore the compressor might not start.</p>             |
| <b>Alarm recovery period</b>             | 5 minutes  |
| <b>Consecutive alarms for hard reset</b> | 4  |
| <b>Action to recover alarm</b>           | The alarm will self-recover after the recovery period. If during the second consecutive attempt, the same alarm is triggered, the RSBS will remain in the alarm state. User shall then reset the mains supply to reset the RSBS.   |
| <b>Troubleshooting</b>                   | <ul style="list-style-type: none"> <li>• Check that the proper RSBS model is being used.</li> <li>• Check for high pressure difference during compressor start.</li> <li>• If pressure difference is too high, allow more time between starts.</li> <li>• For the models RSBS...C00 check the value of the run and start capacitors. If the capacitance value is lower than expected, replace the capacitor.</li> <li>• For the models RSBS...C10/C17/C24, check the value of the run capacitor. If the capacitance is lower than the rated value, replace the capacitor.</li> </ul> |

|  |  |
|--|--|
| <b>Number of flashes</b>                 | 6  |
| <b>Alarm</b>                             | Internal over-temperature alarm  |
| <b>Alarm description</b>                 | The RSBS will trigger this alarm if it measures an internal temperature > 115°C for ≥ 1s   |
| <b>Alarm recovery period</b>             | Typically 5 mins – RSBS might need a longer recovery period depending on the surrounding temperature level.  |
| <b>Consecutive alarms for hard reset</b> | 4  |
| <b>Action to recover alarm</b>           | The alarm will self-recover after the recovery period.   |
| <b>Troubleshooting</b>                   | <ul style="list-style-type: none"> <li>• Check that there is proper ventilation around RSBS.</li> <li>• Ensure that the vents of RSBS are not obstructed.</li> </ul> |

|  |  |
|--|--|
| <b>Number of flashes</b>                 | 7  |
| <b>Alarm</b>                             | Compressor running in reverse  |
| <b>Alarm description</b>                 | The RSBS shall detect that the compressor is rotating in the reverse direction within 2 seconds. The alarm is active in bypass state only. |
| <b>Alarm recovery period</b>             | 5 minutes  |
| <b>Consecutive alarms for hard reset</b> | 4  |
| <b>Action to recover alarm</b>           | The alarm will self-recover after the recovery period.   |
| <b>Troubleshooting</b>                   | <ul style="list-style-type: none"> <li>• Check for unstable or low supply voltage level.</li> </ul>  |

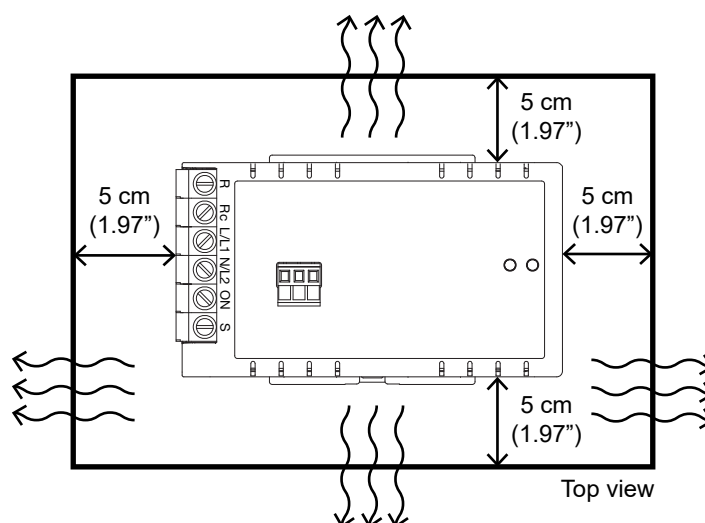
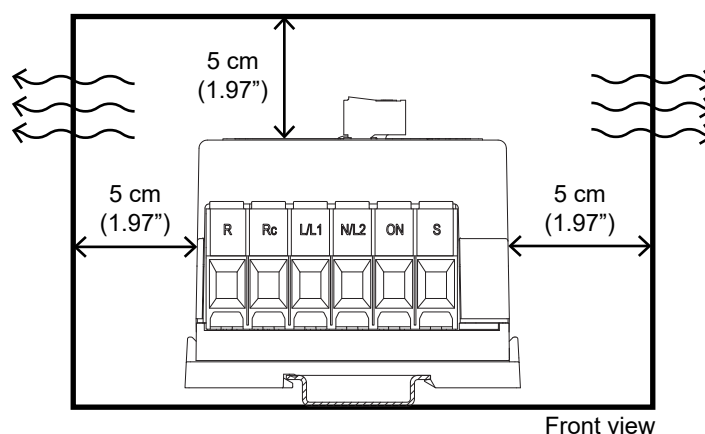
|  |   |
|--|---|
| <b>Number of flashes</b>                 | 8   |
| <b>Alarm</b>                             | Load loss   |
| <b>Alarm description</b>                 | <p>This alarm will be triggered when the load current is <math>\leq 2</math> AAC for <math>\geq 1</math> mains cycle. The alarm will be active during ramp-up and bypass mode.</p> <p>Ramp-up: As soon as the ON signal is turned ON, the RSBS will start the ramp-up function. If the measured current is <math>\leq 2</math> AAC then the RSBS will not attempt a start and will raise the load loss alarm.</p> <p>Bypass: If during bypass the measured current is <math>\leq 2</math> AAC for <math>\geq 1</math> mains cycle, the RSBS will trigger the load loss alarm.</p> |
| <b>Alarm recovery period</b>             | 5 minutes   |
| <b>Consecutive alarms for hard reset</b> | N/A   |
| <b>Action to recover alarm</b>           | <p>The alarm will self-recover after the recovery period. Load current will not be monitored during recovery from alarm. If, during transition from alarm recovery to start of ramp-up, the measured current is <math>\leq 2</math> AAC <math>\geq 1</math> mains cycle the RSBS will re-trigger the alarm.</p> <p>The alarm will self-recover after 5 minutes.</p>   |
| <b>Troubleshooting</b>                   | <ul style="list-style-type: none"> <li>• Check that the compressor (or a load <math>&gt; 2</math> Arms) is connected to the RSBS.</li> <li>• Check quality of supply. This alarm may also be triggered when there is complete supply voltage interruption.</li> </ul>   |

|  |   |
|--|---|
| <b>Number of flashes</b>                 | 10  |
| <b>Alarm</b>                             | Welded main relay, Shorted SCR, Welded bypass relay   |
| <b>Alarm description</b>                 | <p>This alarm will be triggered when :-</p> <ol style="list-style-type: none"> <li>1. The RSBS detects a current on the "L" connection when it is in IDLE state. (Fault: Welded main relay). In this case the RSBS will trigger the alarm after 100 ms.</li> <li>2. The RSBS detects a current <math>&gt; I_{max}</math> HP during ramp-up state (Fault: SCR short or bypass relay welded). The RSBS will trigger the alarm after <math>\approx 100</math> ms.</li> </ol> |
| <b>Alarm recovery period</b>             | Non-recoverable alarm   |
| <b>Consecutive alarms for hard reset</b> | 1   |
| <b>Action to recover alarm</b>           | The alarm will not self-recover. In case of a main relay weld condition the user needs to provide an external means to disengage the compressor from the mains. (Since the auxiliary winding will remain connected to L and N through the main relay and run capacitor).  |
| <b>Troubleshooting</b>                   | <ul style="list-style-type: none"> <li>• Replace RSBS and contact your local Carlo Gavazzi representative.</li> <li>• Check compressor winding resistance and verify that this is within manufacturer specifications.</li> </ul>  |

|  |  |
|--|--|
| <b>Number of flashes</b>                 | Fully ON   |
| <b>Alarm</b>                             | Critical over-temperature alarm  |
| <b>Alarm description</b>                 | The RSBS will trigger this alarm if it measures an internal temperature $>130^{\circ}\text{C}$ for $\geq 100$ ms   |
| <b>Alarm recovery period</b>             | Alarm does not self-recover  |
| <b>Consecutive alarms for hard reset</b> | 1  |
| <b>Action to recover alarm</b>           | This alarm is considered to be a critical condition and the RSBS will immediately switch OFF its output. The alarm is non-resettable. Once this alarm is triggered the user needs to replace the RSBS. |
| <b>Troubleshooting</b>                   | <ul style="list-style-type: none"> <li>• Check that there is proper ventilation around RSBS.</li> <li>• Replace the RSBS with a new one.</li> </ul>  |

## Installation

Provide sufficient air circulation space for cooling as shown in the examples below. Do not obstruct the RSBS vents.



## Short circuit protection

Type 1 protection implies that after a short circuit, the device under test will no longer be in a functioning state. The product variants listed in the table hereunder are suitable for use on a circuit capable of delivering not more than 5,000 symmetrical Amperes, 240 Volts maximum when protected by fuses. Tests at 5,000 A were performed with Class RK5 fuses; please refer to the table below for maximum allowed Ampere rating of the fuse. Use fuses only.

## Protection co-ordination Type 1 according to UL 60947-4-2

| Part No.           | Prospective short circuit current [kArms] | Max fuse size [A] | Class | Article no.                             |
|--------------------|---|-------------------|-------|---|
| RSBS2332A2V23C..HP | 5   | 45                | RK5   | FLSR45<br>(manufacturer:<br>Littelfuse) |



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