

# Motor Controllers

## AC Semiconductor Motor Controller

### Type RSHP Flexy



- Soft starting and stopping of 3-phase induction squirrel cage motors
- Low inrush and reduced vibration during starting
- User-selected ramping profiles
- Integral bypassing of semiconductors
- Rated operational voltage: up to 600VAC
- 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

**RSHP 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  $U_e$

220VACrms  
400VACrms  
480VACrms  
600VACrms

Rated operational current  $I_e$

25A AC-53b

38A AC-53b

45A AC-53b

RSHP2225CV21

RSHP2238CV21

RSHP2245CV21

RSHP4025CV21

RSHP4038CV21

RSHP4045CV21

RSHP4825CV21

RSHP4838CV21

RSHP4845CV21

RSHP6025DV21

RSHP6038DV21

RSHP6045DV21

## Supply Specification

Rated operational voltage

$U_e$  through L1, L2, L3

RSHP22.. 127/220 VAC $\pm$ 15%  
RSHP40.. 230/400 VAC $\pm$ 15%  
RSHP48.. 277/480 VAC $\pm$ 15%  
RSHP60.. 347/600 VAC $\pm$ 15%

Rated AC frequency 50/60 Hz $\pm$ 10%

Dielectric strength

Dielectric voltage 2 kV (rms)  
Rated impulse withstand volt. 4 kV (1.2/50 $\mu$ s)

## Input Specifications

Rated control input voltage  $U_c$ , A1-A2:

C:24-550 VAC/DC  
D:24-660 VAC/DC

Rated control input current

<1.5 mA

Rated AC frequency

50/60 Hz $\pm$ 10%

Dielectric strength

Dielectric voltage

2kVAC (rms)

Rated impulse withstand volt.

4kV (1.2/50  $\mu$ s)

## Load Ratings

	RSHP..25CV21	RSHP..38CV21	RSHP..45CV21
IEC rated operational current $I_e$ (AC-53b) @ 40°C	25 A	38A	45 A
Assigned motor rating @ 40°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 60 947-4-2	25A:AC-53b:4-5:65	38A: AC-53b: 4-5:85	45A: AC-53b: 4-5: 115
Number of starts per hour @ 40°C	50	40	30
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*	LED, red (intermittent)
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

<b>Line conductors:</b> <b>L1, L2, L3/T1, T2, T3</b>	
according to IEC 60 947	0.75...16mm <sup>2</sup>
maximum size	
solid	1.5...16mm <sup>2</sup>
finely stranded with end sleeve	1.5...16mm <sup>2</sup>
stranded	1.5...25mm <sup>2</sup>
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
<b>Secondary conductors:</b> <b>A1, A2, 11, 21, 22, P1, P2</b>	
according to IEC 60 947	0.75...2.5mm <sup>2</sup>
maximum size	0.5...2.5mm <sup>2</sup>
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)

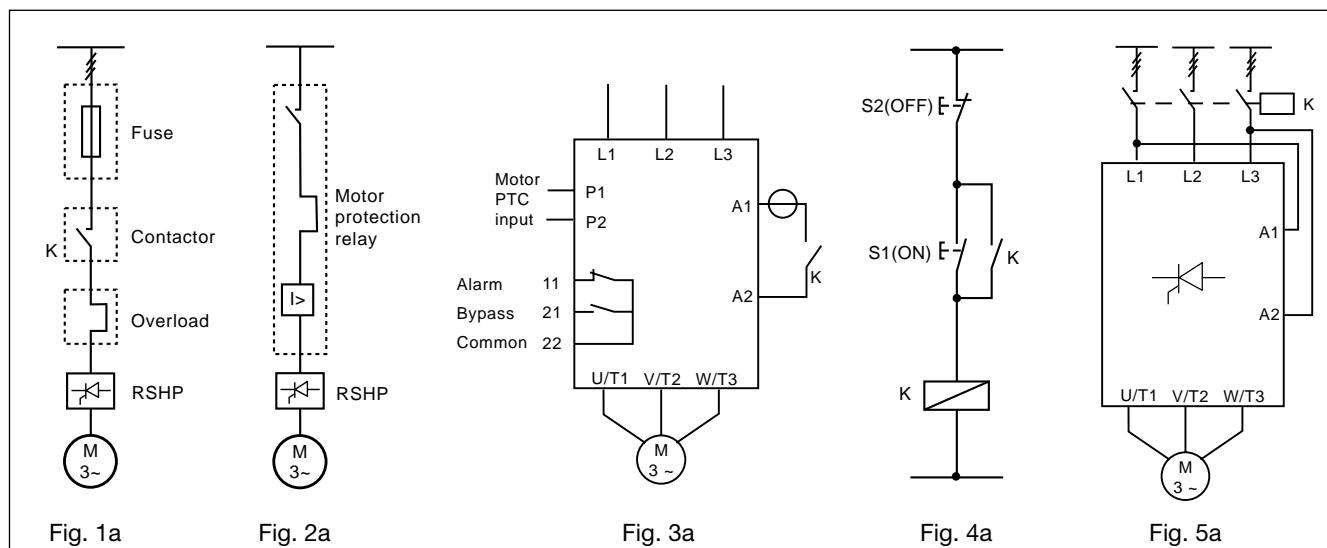
## Standards

	<b>RSHP..</b>
Approvals	UL, cUL, CSA pending
Markings	CE
Norms	IEC/EN 60 947-4-2

## Recommended Protection according to IEC/EN 60 947-4-2

	<b>RSHP..25CV21</b>	<b>RSHP ..38CV21</b>	<b>RSHP..45CV21</b>
Type of coordination: 2 Semiconductor fuse	Ferraz Shawmut 63A A, Class URQ, Art.No. 6.621 CP URQ27x60/63	Ferraz Shawmut 80A A, Class URQ, Art.No. 6.621 CP URQ27x60/80	Ferraz Shawmut 100 A, Class URQ, Art.No. 6.621 CP URQ27x60/100
Type of coordination: 1 Motor protection circuit breaker	Telemecanique: GV3-ME63 ABB: MS325 -25 Sprecher+Schuh: KTA3-25-25A	Telemecanique: GV3-ME40 ABB: MS450 -40 Sprecher+Schuh: KTA3-100-40A	Telemecanique: GV2-M22 ABB: MS450 -45 Sprecher+Schuh: KTA3-100-63A
RK5 fuse	TRS45R 45A	TRS70R 70A	TRS90R 90A

## Wiring Diagrams



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: 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.

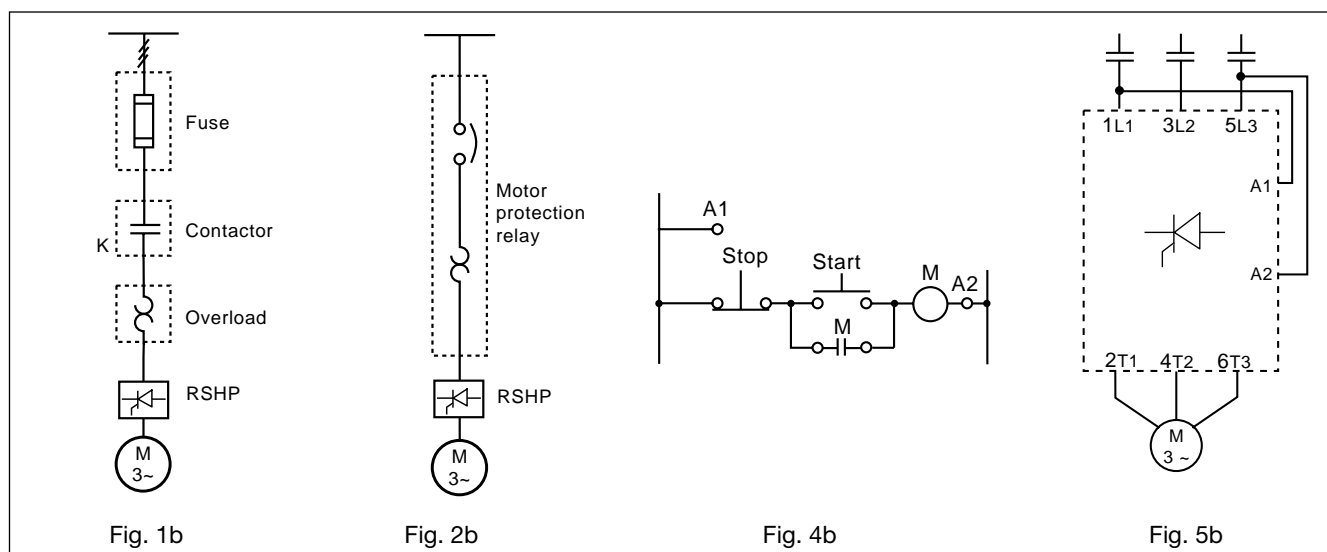
3.3: Auxiliary Relays. The Alarm relay 11, 21 (NC) can be connected in series with the supply to the coil of a mains contactor. The Bypass relay 21, 22 (NO) can be used in series with the supply to the coil of an external bypass contactor.

### 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.

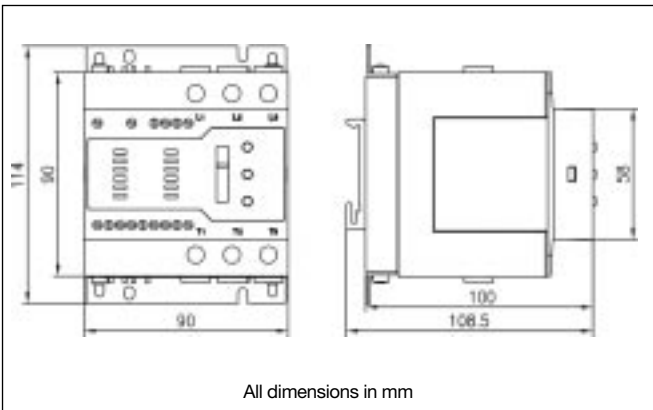
### Figure 5: Control using 2 phases

Connecting input A1, A2 to two of the incoming lines will soft start the motor when C1 is operated. When C1 is switched off, the motor will stop (no soft stop).

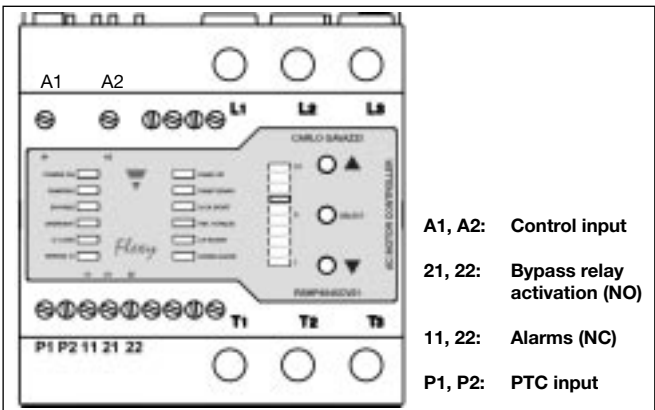




Dimensions



Terminal Diagram



Operation Diagrams for RSHP

Diagram 1: normal operation

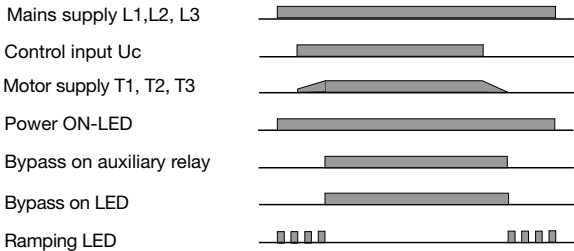


Diagram 2a: device Over-temperature alarm

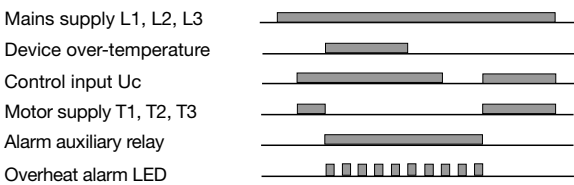


Diagram 2b: Motor PTC Alarm

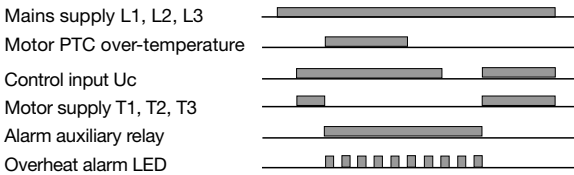


Diagram 2c: Phase Loss Alarm

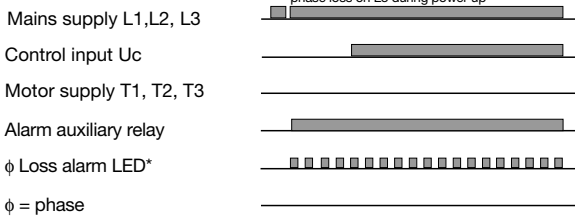
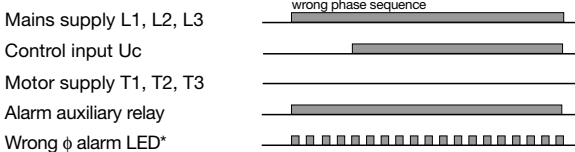


Diagram 2d: Wrong Phase Sequence Alarm



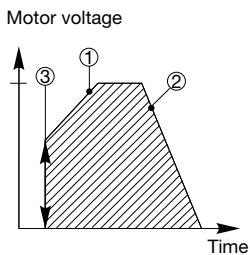
Note 1: A phase loss on L1 or L2 causes the device to reset as these phases provide the internal power supply.

Note 2: Phase sequence and phase loss alarms are only detected if they occur during power up, when L1, L2, L3 are switched ON.

Operation Diagram 3

Multi ramp starting strategies suitable for all applications are designed into the RSHP

Excluding 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.

Setup position [9]

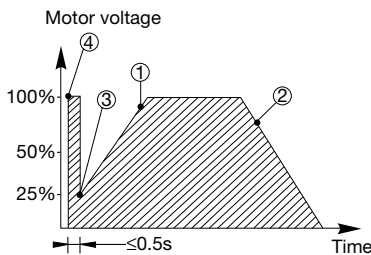


Table 1: Level 1 Parameters

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

## 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 PRE-DEFINED 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 pre-defined 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 pre-defined ramp:

Use the UP and DOWN arrow buttons to move the flashing bargraph 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 bargraph 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.

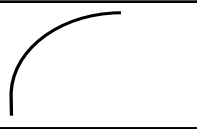
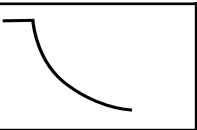
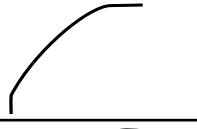
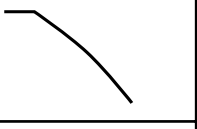
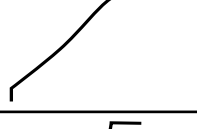
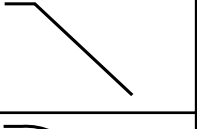
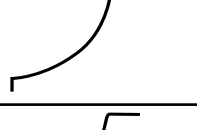

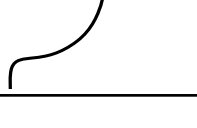
#### Attention!

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.

## Ramp Shapes

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	-	-

1		1	
2		2	
3		3	
4		4	
5		5	