HPV1000-App_Note_20

Regen AC Quick Start Guide

Guide to sizing and installing Regen AC system

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This quick start-up guide details the sizing/selection and connection of the Regen AC system, including reactors.

Overview

This quick start-up guide details the sizing/selection and connection of the Regen AC system, including reactors.

The Regen AC system comprises the Regen unit itself, along with current suppression reactor sized on the expected regenerated power. A power coordinating reactor and RFI filter is also supplied, sized on the lift motor and inverter current ratings.
The Regen AC unit can also be supplied as a standalone panel in 7kW, 14kW and 28kW Geared or Gearless options. This will be supplied with the Power and Signal Connections marked for a drop in Regen option.

The Regen AC systems comprise the following Regen unit and current suppression reactor:

Regen AC Model		Regen Unit		Current Suppression Reactor
R1000-400-0003	=	CIMR-RC4A0003AAA	+	B1509105
R1000-400-0005	=	CIMR-RC4A0005AAA	+	B1509105
R1000-400-0007	=	CIMR-RC4A0007AAA	+	B1509106
R1000-400-0010	=	CIMR-RC4A0010AAA	+	B1509107
R1000-400-0014	=	CIMR-RC4A0014AAA	+	B1509108
R1000-400-0017	=	CIMR-RC4A0017AAA	+	B1509108
R1000-400-0020	=	CIMR-RC4A0020AAA	+	B1509109
R1000-400-0028	=	CIMR-RC4A0028AAA	+	B1509110
R1000-400-0035	=	CIMR-RC4A0035AAA	+	B1504118
R1000-400-0043	=	CIMR-RC4A0043AAA	+	B1509111
R1000-400-0053	=	CIMR-RC4A0053AAA	+	B1509112

Then the Current Suppression Reactor and EMC filter are selected based on the drive chosen, rather than the Regen AC size.

The selections for Filter and Power Coordinating Reactor by drive size are as follows:

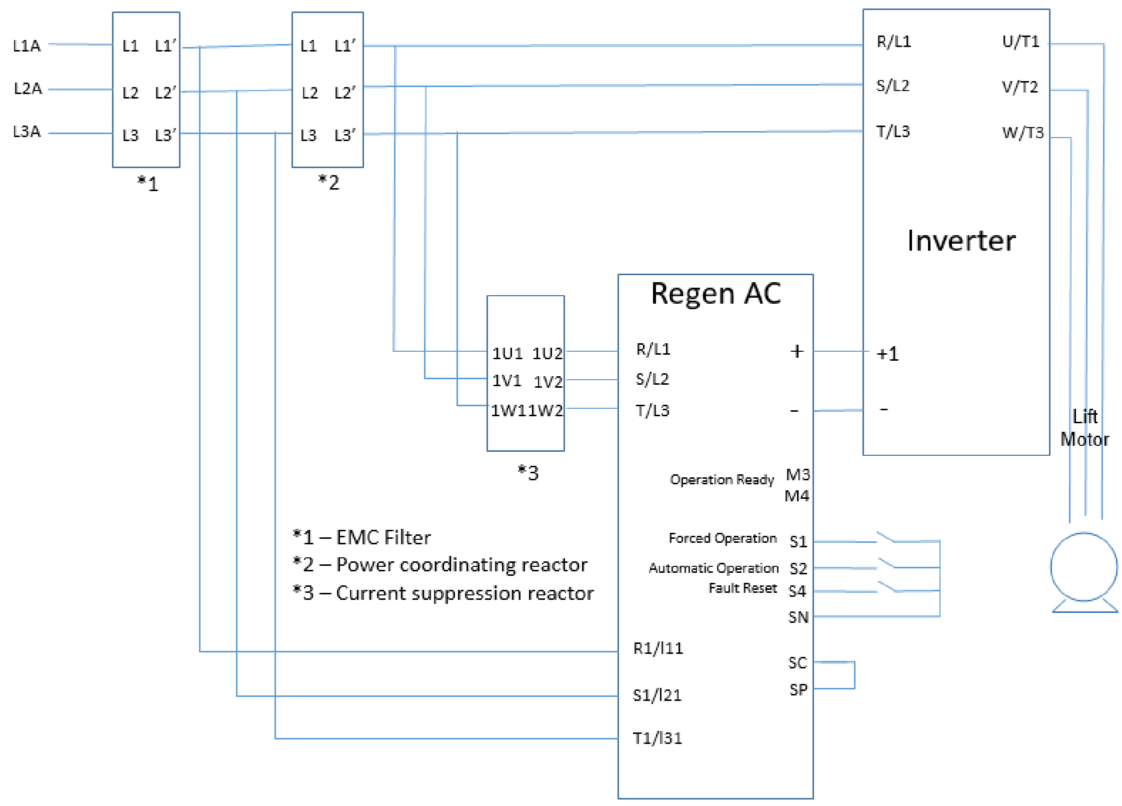
Model	EMC Filter	Power Coordinating Reactor
HPV1000-4009-BA-N02	HLD 110-500/12	B 1103136
HPV1000-4015-BA-N02	HLD 110-500/16	B 1103138
HPV1000-4018-BA-N02	HLD 110-500/30	B 1103138
HPV1000-4024-BA-N02	HLD 110-500/30	B 1103139
HPV1000-4031-BA-N02	HLD 110-500/42	B 1103140
HPV1000-4039-BA-N02	FB-40060A-E	B 1103141
HPV1000-4045-BA-N02	FB-40060A-E	B 1103141
HPV1000-4060-BA-N02	FB-40072A-E	B 1103142
HPV1000-4075-BA-N02	FB-40105A-E	B 1103142
HPV1000-4091-BA-N02	FB-40105A-E	B 0910013
HPV1000-4112-CA-N02	FB-40170A-E	B 0910013
HPV1000-4150-CA-N02	FB-40170A-E	B 1411053

Alternatively, the enclosed Regen AC panel has these parts selected based on kW rating and geared or gearless application. The following enclosure part numbers include Regen Unit, Current reactor, Power reactor, RFI filter and power terminations to suit geared or gearless applications from 7kW to 28kW:

Part Number
ENC-7kW-GEARED
ENC-7kW-GEARLESS
ENC-14kW-GEARED
ENC-14kW-GEARLESS
ENC-28kW-GEARED
ENC-28kW-GEARLESS

Connections

The Regen AC unit should be connected as follows:



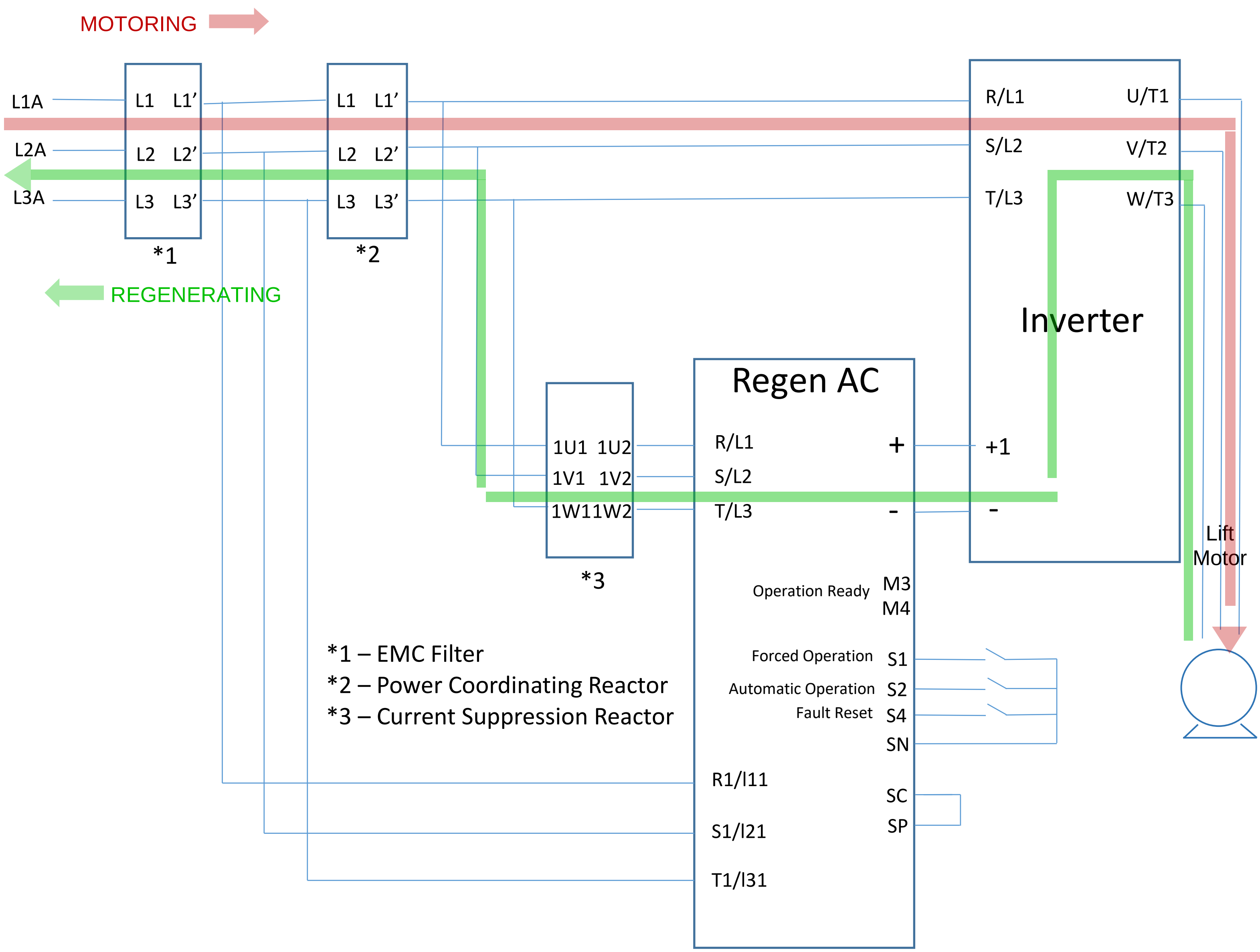
For signal wiring:

- The control system should monitor a healthy output from the Regen AC
- The unit will only operate when an input is given from the SN terminal to either S1 or S2 for "Forced" or "Automatic" operation.
- A fault reset input can be wired to reset faults when input S4 is closed.

Operation

When a lift motor runs without a regen unit, in the regenerative direction (Empty Car Up/Full Car Down) the drive DC Bus voltage will climb to around 800V, at which point the drive will begin to dump excess power to be burnt off with a braking resistor.

However, power flows as follows with the Regen Unit:

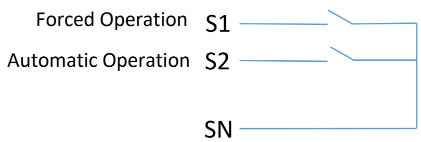


When using Regen AC, the Regen unit monitors the drive DC Bus terminals (+) and (-), and regulates the voltage to suit the incoming line.
The Regen AC unit will take regenerated power from the DC Bus, and output it on the R, S and T terminals, via the Current Suppression reactor, then Power Coordinating Reactor to the mains. This stops the DC Bus voltage from rising.

The Regen AC unit monitors, and synchronises to, the incoming supply after the filter, but before the Power Coordinating Reactor using terminals R1, S1 and T1

Automatic and Forced Operation

The Regen AC has two operating modes, Forced and Automatic, issued by closing input S1 or S2.
The preferred input should be closed when the lift is running.



Forced Operation

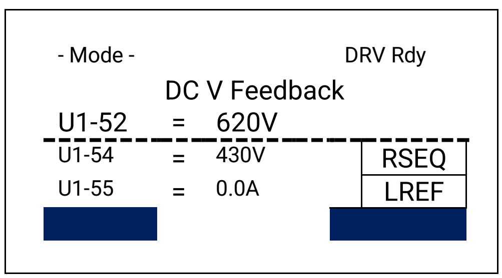
Forced Operation is the operating mode when input S1 is closed.
In forced operation, the Regen AC Unit is constantly regulating the DC Bus of the Inverted to a fixed level depending on the incoming supply, regardless of whether the lift is regenerating or motoring. This means the unit is always synchronised to the line, and the output transistors are always running.

Automatic Operation

Automatic Operation is the operating mode when input S2 is closed.
In automatic operation, the Regen AC unit monitors the DC Bus, and only becomes active when the DC Bus starts to climb. The unit then synchronises to the line, and the output transistors begin to fire.

Display Unit

On power up, the Regen AC unit will display the following:



U1-52 displays the DC Bus voltage of both the Regen AC unit, and the Lift Inverter (HPV1000, HPV900S2 etc) since they are linked.
U1-54 shows the incoming line voltage monitored by the R1, S1 and T1 terminals.
U1-55 displays the regenerated current back to the supply.

Moving up to the “Monitor” menu will allow different displays to be viewed. Other useful displays include U9-06 (Total kWh regenerated). If the Power Unit Price is configured in O4-19, the total power savings to be displayed as a monetary value.
U1-10 and U1-11 can be used to monitor the input and output terminal status.

Parameters

The Regen AC Unit should run in most applications without the need to change settings.
The following settings can be adjusted for certain applications:

Parameter Code	Parameter Name	Setting	Notes
B1-17	Run Command at Power Up	1 Cycle Ext Run (Default) 0 Accept Ext Run	If the run input (Forced or Automatic) is cycled between runs, the default setting of 1 can be used. If the Run input is permanently linked, this setting while need to be changed to 0 to allow the unit to work after a power cycle
04-19	Power Unit Price	Cost per 1kWh	Sets a price per kWh. This can be configured to allow the total power savings to be displayed as a monetary value in U9-14
L8-07	Input Phase Loss Protect	1 Enabled (Default) 0 Disabled	For most applications, the default value of 1 (Enabled) will work. For driven UPS operation, this parameter should be changed to 0 if the controller is monitoring a healthy output.* H2-02 should also be changed to Not Fault
H2-02	Relay M3-M4	6 Operation Ready (Default) 10E Not Fault	For most applications the default value of 6 (Operation Ready) will work. For driven UPS operation, if the healthy output is being monitored by the controller, this output should be set to 10E (Not Fault) to ensure this output closes when the mains supply is lost.* Used in conjunction with L8-07

Regen AC Selection

For the HPV1000 drive, we include an option for Regen AC selection on our sizing tool located at
http://www.elevatordrives.com/elevator/HPV1000SizingTool
This allows the Regen AC unit, filter and reactors to be sized quickly and easily.

Another option, is a standalone panel for 7kW, 14kW and 28kW Geared or Gearless applications. This can be supplied with the Power and Signal Connections marked.

For the HPV900S2 and applications where Regen AC will be retrofit into an existing lift panel, the unit should be selected as below. We're using the HPV900S2 drive as an example for the reactor and filter part numbers, but this can be applied to other drive manufacturers, simply use the drive's rated current.

1) Determine Rated Current of the Motor
2) Determine overload rating of the motor. If unavailable, use the following guidelines: -

   Up to 1m/s – 200%
   >1m/s – 250%

3) Calculate peak regen current using the following formula: -

$$Peak\ Regen\ Current = Rated\ Motor\ Current * X1 * X2 * X3$$

Where: -
X1 – 0.75 for induction. 0.85 for PM
X2 – 0.45 for worm gear. 0.75 for planetary gear. 1.0 for PM.
X3 – overload factor vs rated current ie 200% overload = 2.0

4) Select the appropriate regen system from the following table: -

Peak Regen Current (200% of rated)	EU Regen Kit (inc. power module and current reactor)
<=16A	R1000-400-0005
<=22A	**R1000-400-0007**
<=32A	R1000-400-0010
<=44A	**R1000-400-0014**
<=54A	R1000-400-0017
<=64A	**R1000-400-0020**
<=86A	R1000-400-0028
<=108A	R1000-400-0035
<=132A	R1000-400-0043
<=162A	R1000-400-0053

Rows in grey aren't routinely stocked in the UK

5) Select the Reactor and filter to suit the drive's rate output current. For example, with the HPV900S2 drive:-

Drive	Reactor Part Number	RFI Filter
HPV900-4008	B1103138	HLD 110-500/12
HPV900-4012	B1103138	HLD 110-500/16
HPV900-4016	B1103139	HLD 110-500/30
HPV900-4021	B1103140	HLD 110-500/30
HPV900-4027	B1103141	HLD 110-500/30
HPV900-4034	B1103141	HLD 110-500/42
HPV900-4041	B1103142	FB-40060A
HPV900-4052	B1103142	FB-40060A
HPV900-4065	B0910013	FB-40072A
HPV900-4072	B0910013	FB-40105A
HPV900-4096	B1411053	FB-40170A

Example:-

PM gearless motor rated at 12A
Contract Speed 1m/s
No overload information provided so based on 1m/s assume 200%

Drive selected would be the HPV900-4012

Regen current = 12 x 0.85 x 1.0 x 2.0 = **20.4A**

Therefore: -

Regen kit = **R1000-400-0007**
Power Coordinating Reactor = **B1103138**
RFI Filter = **HLD 110-500/16**