EV Power - A-Series 8 Cell, 16 Cell and 24Cell Chargers Installation & Usage Instructions.

A-Series Charger Features

- **Simple** to install and use, microprocessor control.
- **LiFePO4 dedicated chargers 8,16 and 24 cells**
- Active **Power Factor Correction (PFC) for high efficiency.**
- Sealed enclosure (IP64)
- Inbuilt fan cools the heatsink fins. Cooler operation = higher efficiency and longer life.
- May be mounted in any position
- High power output for small weight
- Three wire current control system.
- **Plug and play** with EV Power Battery management systems.
- Automatic switch off once peak voltage is reached

A-Series Charger Specifications

Max Dimensions	28 x 16 x 12 cm
Weight	4.3kg
AC Input Voltage	220VAC +/- 15%
AC Input Current	8.1A
AC Input Frequency	45-65Hz
AC Power Factor	≥0.98
Full Load Efficiency	≥93%
Mechanical Shock / Vibration	Conforms to SAEJ1378
Environmental	IP64
Operating Temperature	-40°C - +55°C
Output Voltage	58.4VDC Max
Output Current	0-25A DC
Battery Type	LiFePO4 - 16 cells

Objective of this manual

This manual will help with installation and operation of A series chargers in conjunction with EV Power Power Paks or EV Power LiFePO4 cells and BMS cell modules.

An understanding of electrical principles and competence with electrical tools is required. Ability to use the volts, amps and Ohms setting of a multimeter is a prerequisite.

Disclaimer

This is a guide only. Potentially lethal voltages and currents are involved when working with batteries. It is the responsibility of the installer to have the appropriate qualifications and skills for working with high voltages. No liability whatsoever will be assumed by EV Power for injury, accidents or damage resulting from the use of these instructions.

Please read these instructions several times before commencing installation.

Do not try to charge or discharge Lithium (LFP) batteries without a BMS installed. One over-charge or over-discharge may cause permanent battery damage.

Introduction

EV Power A-Series chargers are designed specifically to charge large format LiFePO4 batteries.
They have controllable output current via a three wire interface.
Chargers have a LED output for information.

Usage

A-Series chargers may be used in standalone mode if the charge enable cable is connected correctly.

Alternatively they can be controlled using a BMS control unit such as the EV Power BCU-PEV.

The charger will charge at the maximum rate until the peak charge voltage is reached. Then the current will taper to about 10% of the peak value, then switch off.

The charger will automatically re-engage when the battery voltage drops.

Charger LED indicator

Flashing Red = charging

Flashing Yellow = 80%

Flashing Green = 100% finished

Flashing Red/Green/off = battery is disconnected

Flashing Red/green/red/green/off = enable cable is disconnected or not enabled.

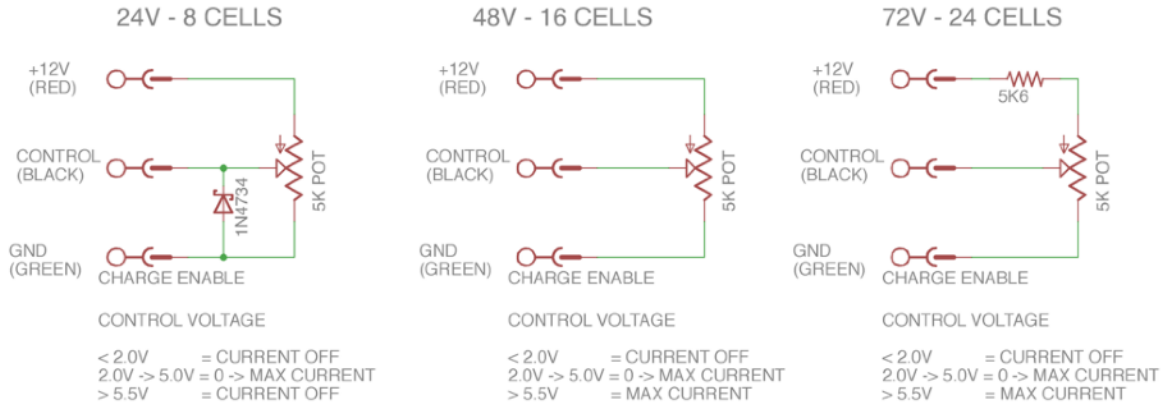
Three Wire control system

These chargers incorporate output current control via a three wire system.
Red - Output - +12V
Green - Output - Gnd
Black - Input - 2.0 - 5.0V signal controls 0 - max current

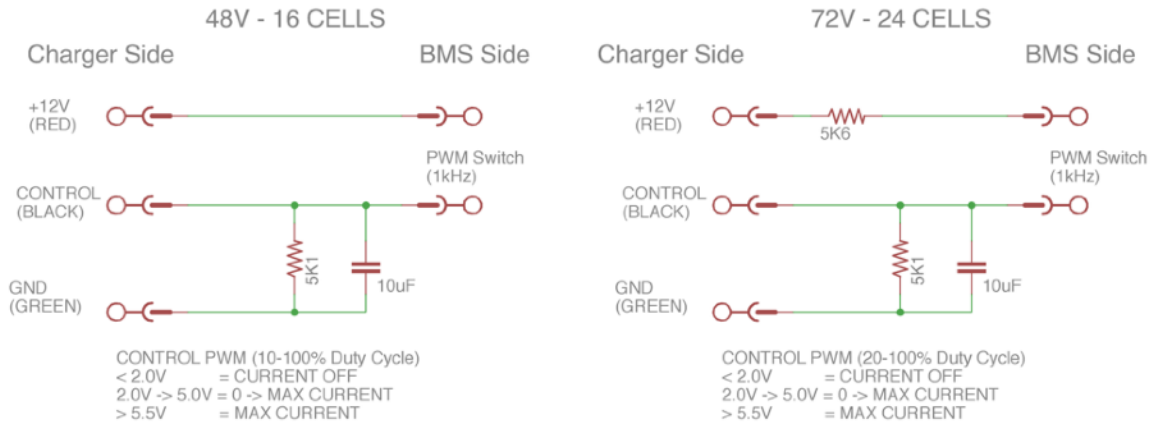
It is possible to control the output current with a simple voltage divider setup.

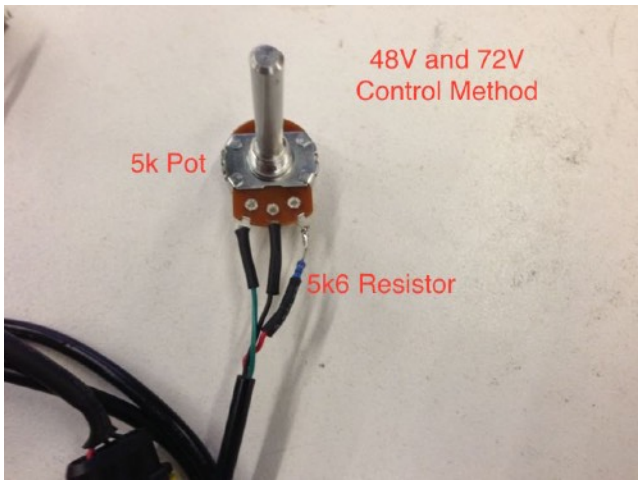
If the voltage input to the black wire is >5.0V the charger output may be suppressed.

EV POWER A Series LFP Charger Current Control Circuits - Potentiometer



EV POWER A Series LFP Charger Current Control Circuits PWM.





About Lithium Iron Phosphate (LIFEPO4) Batteries

A “battery” is made up of “cells”. Each cell is an individual unit that cannot be split into a lower voltage component.

LFP cells have a nominal voltage of 3.2-3.4V. This is the voltage that the cells drop back to when at rest. They will stay around 3.2V until about 90% discharged when the voltage will begin to decrease until fully discharged at 2.5V. It is highly recommended to discharge less than 80% of the cells total Amp Hour capacity. This will help to maximize the cell life.

LFP cells may be connected in “series” (+ to – to + etc) to obtain a higher nominal voltage. This creates a “battery”. They may also be connected in “parallel” (+ to +, - to -) to increase the Ah capacity. Under no circumstances should cells or a battery be short circuited, that is the + connected directly to the – to create a loop. This will damage the cells and most likely the operator also.

Under no circumstances should the cell voltage be allowed to fall below 2.5V for a sustained period. Permanent damage will result. It is possible that this situation may occur if the battery is allowed to stand for a long time (ie. months). In this situation the BMS will not allow recharge because a cell is outside the safe range. To try and rectify the problem a small 4.5V 300mAh DC plug pack type power supply can be applied to individual cells one at a time until the cell voltages rise above 2.5V and the BMS will allow normal charging to commence. Care must be taken with the first few charges as the battery may be severely unbalanced.

A visual check of the battery pack during charging should be made every 3 months. Switch off the BCU and on again to check that the contactor is operating correctly. Check the cells for corrosion or other damage.

Important Notes

- **Recharge fully regularly**
  LFP batteries do not have a memory. However every so often it is important to charge the battery pack completely until the charger switches off. Continual partial recharges will prevent the BMS balancing the pack and so may result in premature charger disconnects when the battery is next fully charged.
- **Never tap a portion of the battery for powering lower voltage peripheral devices.**
  This will unbalance the battery and result in continual charging errors. Use a suitable DC-DC converter to power low voltage devices.
- **Do not bypass the BCU during charging.**
  It is designed to protect your battery but cannot do so if it is disconnected. The charge current must be supplied via the BCU. If there is a problem with the BMS do not charge the battery until it is corrected.
- **Do not allow the battery to go flat.** **If it goes flat this is a very serious situation. The battery should be periodically charged when it is being stored to prevent self discharge. The BMS uses a small amount of power whether the battery is used or not so regular charging is important.**

- Take note that there is a 5 second precharge delay. Check that this is all working correctly and the contactor is not sticking closed.

Also check that discharge amps registers as a negative number and charge amps is positive.

Glossary

Ah (Amphour) - Unit of relative capacity measurement for batteries. 10 amps drawn for 5 hours = 50Ah. For lithium cells the Ah capacity is usually calculated over a one hour period. Note that Wh (Watthour) is a more accurate method for comparing batteries of different voltages.

Battery - a number of cells connected in series and/or parallel.

BCU - Battery control Unit. A battery management box that contains electronics to protect LFP batteries.

BMS - Battery Management System. Includes the BCU and cell modules.

Cell - one individual unit of a battery. Lithium (LFP) cells have a nominal voltage of 3.2-3.3V

Cell Module - a small electronic battery management device that connects between the positive and negative terminal of a lithium cell. It regulates the cell voltage during charging and reports back to the BCU if a cell falls outside its safe operating voltage of 2.5-4.2V.

Contactor - a big relay.

DOD - Depth of Discharge. Similar to SOC except it is expressed as a percentage down from full. eg. 100% DOD = empty.

LiFePO4 (LFP) - Lithium Iron Phosphate used in the EV Power battery chemistry.

Nominal Voltage - the resting voltage of a charged cell. For Lithium cells this is normally 3.2-3.3V. Series connection - electrical connection of cells daisy chained positive to negative to increase the battery voltage. Battery voltage = cell voltage x number of cells in series.

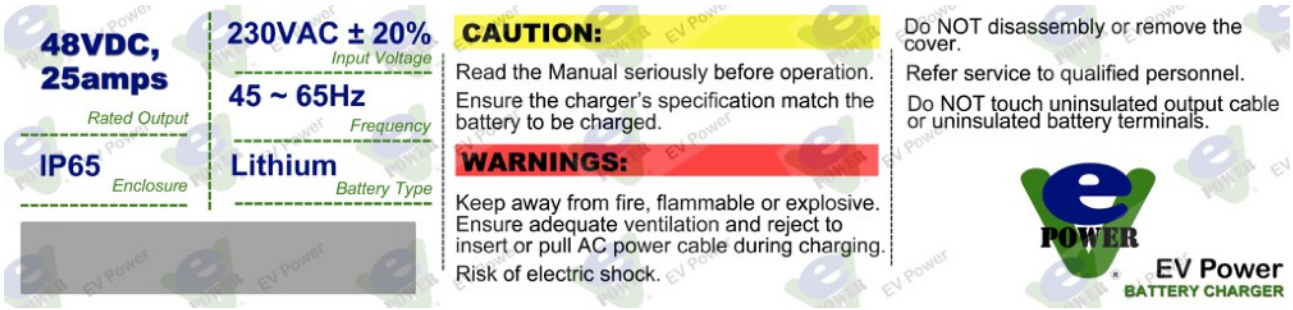
Parallel connection - electrical connection of cells positive to positive, negative to negative. This **increases the amp hour capacity but maintains the same cell voltage**. Battery capacity = cell capacity x number of cells in parallel.

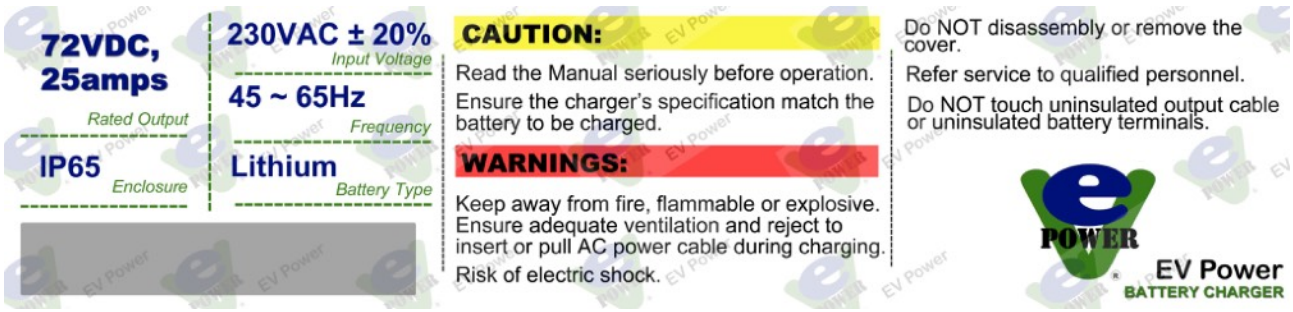
Series Connection - electrical connection of cells positive to negative in a daisy chain. This **increases battery voltage the but maintains the same amp hour capacity**. Battery voltage = cell voltage x number of cells in series.

Relay - a switch controlled by an electrical signal.

SOC - State of Charge, normally expressed as a percentage of the total Ah capacity of the battery. eg. 100% SOC = Full

Watts (W) - a measure of electrical Power. Watts = Amps x Volts , (P = I . V)


48VDC,
25amps
Rated Output
IP65
Enclosure
230VAC ± 20%
Input Voltage
45 ~ 65Hz
Frequency
Lithium
Battery Type
CAUTION:
Read the Manual seriously before operation.
Ensure the charger's specification match the battery to be charged.
WARNINGS:
Keep away from fire, flammable or explosive. Ensure adequate ventilation and reject to insert or pull AC power cable during charging.
Risk of electric shock.
Do NOT disassembly or remove the cover.
Refer service to qualified personnel.
Do NOT touch uninsulated output cable or uninsulated battery terminals.
POWER
EV Power
BATTERY CHARGER


72VDC,
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