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**Smart Precharger v1.3**

*Two-stage soft start / inrush protection  
for your motor controller*

**LV version (12-160V)**

## INTRODUCTION

Motor controllers for electric vehicles typically have a large internal capacitor bank on their input with very low ESR (Equivalent Series Resistance). As such they require inrush protection when first powering up to prevent a large current spike which can damage components – most commonly, welding contactors shut or blowing fuses.

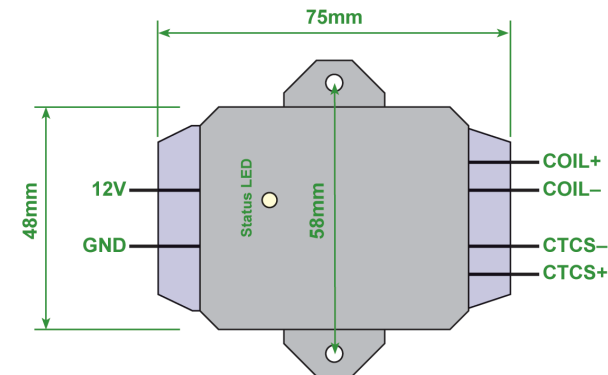
The ZEVA Smart Precharger is designed to offer a 2-stage soft start for motor controllers, limiting inrush current via a resistive circuit to charge up the internal capacitors before automatically closing the main contactor when the process is complete. It can also detect faults and safely discontinue precharge if it fails to start correctly (usually due to an external wiring fault or no battery voltage), or fails to complete within 5 seconds (usually due to unexpected loads or short circuits after the main contactor).

## SPECIFICATIONS

- Power supply: 8-18VDC (12V nominal, 3A max)
- Two models for 12-180V (LV) or 180-360V (HV) nominal packs
- Precharge resistance: 50 $\Omega$  (LV), 100 $\Omega$  (HV)
- Internal coil spike suppression
- Dimensions: 75x48x17mm

## INSTALLATION

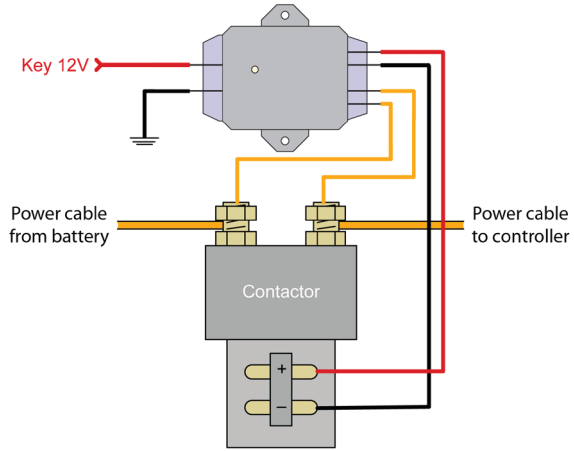
The precharger should be securely fastened to the vehicle using screws through the two  $\varnothing$ 4mm holes on either side of the housing. Module dimensions and hole spacing are shown in the following diagram:



The precharger may be installed in any orientation, and should not require any additional weather protection unless used in marine environments.

## WIRING

The following diagram shows the typical wiring of the Smart Precharger with your main contactor.



For more complete EV wiring diagrams, please consult the Tech Info section of our website at [www.zeva.com.au](http://www.zeva.com.au). Electrical connections are made using standard 1/4" spade crimp terminals. There are a total of six connections to make as follows:

- **12V:** A key-switched 12V input to turn the device on

- **GND:** Ground or 0V, typically the vehicle chassis
- **COIL+** and **COIL-**: Connect to the 12V coil of your contactor. Take note of polarity shown on contactor.
- **CTCS-** and **CTCS+**: Connect to the power terminals of your contactor. The + should go to the battery side, and the - connected on the motor controller side.

Ensure that your wiring has sufficient insulation rating for the voltage. For sufficient current rating and mechanical strength, we recommend around 18AWG / 1sqmm size.

The supply to the precharger should be fused. Most vehicles will already have a fuse on their key signal which is usually sufficient. If your vehicle does not, we recommend installing a fuse on the precharger supply rated at about 5 amps.

## OPERATION

If your wiring is correct, when voltage is applied to the 12V input, you should see a flashing red light on the board, indicating that precharge is in progress. If precharge completes successfully (determined by the voltage differential across the contactor being around <6V for the LV, <15V for the HV), the red light swaps to a green light and your main contactor should engage.

If an error was detected, such as an external wiring fault

or if precharge takes too long to complete, the device will disable the precharge circuit and the red light will stay lit, indicating an error.

## TECH NOTE ABOUT PRECHARGING

Prechargers can only work correctly if there are no continuous loads on the output side of the main contactor. By far the most common reason for precharge time-outs is some device after the precharger drawing power continuously while it is trying to precharge. Your main contactor should *only* be switching power to the motor controller. Other loads such as DC/DC converters, chargers etc should be wired in before the main contactor. If you do not wish to have these in circuit permanently, a second contactor is recommended (typically these do not require precharge).

## TECHNICAL SUPPORT

If you have any queries not covered by this manual, feel free to contact us via our website:

<http://www.zeva.com.au>

Products are covered against manufacturing faults for a period of 12 months from date of purchase. If you believe your device may be faulty, please contact us via the above website for RMA information.

*ZEVA is a carbon neutral business. All products proudly designed and manufactured in Australia.*