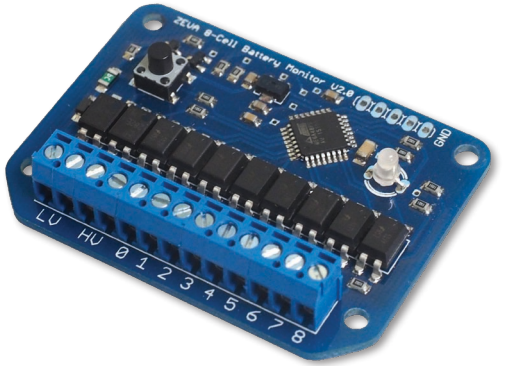
Zero Emission Vehicles Australia

http://www.zeva.com.au



8-cell Battery Monitor Module V2

Simple, reliable and economical protection for your LiFePO4 battery pack.

Please read these instructions carefully for proper installation and use of this product.

SPECIFICATIONS

- Monitor 2–8 cells per module
- Automatic cell count detection
- Over-voltage threshold: 3.4V – 3.8V
- Under-voltage threshold: 2.5V – 3.0V
- Dimensions: 60x45x12mm
- Dual Solid State Relay (SSR) outputs, 500mA max.
- Status LED for visual feedback

PROTECTING YOUR LITHIUM BATTERIES

Lithium batteries have been a revolution in energy storage and a major enabling factor in the resurgence of electric vehicles and off-grid power. However lithium batteries can be damaged if their voltage goes out of safe operating range – either too high (overcharging) or too low (over-discharging).

Battery packs are commonly built from a large number of individual cells in series to achieve higher voltages. Due to manufacturing tolerances, cells always have some variation in capacity, so there will always be some cells in a pack which get full or go flat before others.

In battery packs made up of many cells in series, the overall voltage gives little indication of the voltage of individual cells in the chain. As such it is important to have a system which monitors the voltages of each cell and take action if any individual cell goes out of range.

ZEVA's 8-Cell Battery Monitoring Modules (BMM8) offer a simple and economical way to monitor the voltage of your Lithium Iron Phosphate (LiFePO4) cells, and switch or signal external systems to protect the battery pack if a cell goes out of range. A single module can monitor 2–8 cells, or multiple modules can be cascaded for larger packs.

The BMM8 is microcontroller-based and uses two Solid State Relay (SSR) outputs to separately signal over-voltage or under-voltage conditions. There is also a bicolour LED which provides visual feedback on module status.

Battery management or monitoring systems are the last line of defence for your battery pack. In normal circumstances it should not interfere with the vehicle operation, only intervening when something goes wrong and protection is required.

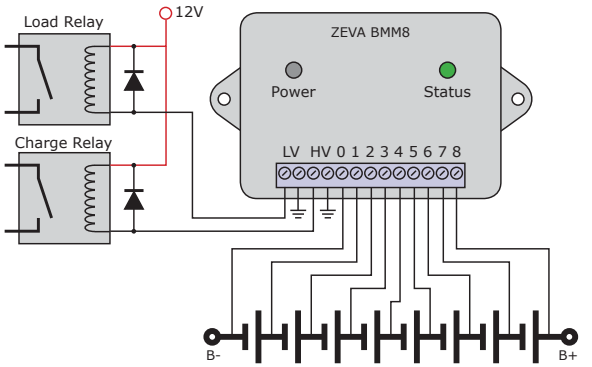
MODULE VARIANTS

Suited to LiFePO4 batteries in most applications, the default behaviour for modules is to have momentary switching of outputs with some hysteresis around voltage thresholds.

BMM8s can also be ordered without hysteresis, with latching outputs (i.e relays remain off once tripped), or with voltage thresholds to suit other battery chemistries such as LiCo and LiMn. Please contact us for ordering any non-standard module variants.

EXAMPLE WIRING DIAGRAMS

The following diagram shows an example wiring diagram for a BMM8 monitoring an 8-cell battery pack.



Follow a similar schematic when using multiple modules monitoring packs larger than 8 cells. SSR outputs are isolated so may be wired in series, and can be used for either directly switching power relays, or to signal external master control units.

Note that SSRs have a maximum rating of 60V and 500mA, so may require an intermediate relay or amplifier for

switching large contactors. Be sure to add spike suppression diodes (as shown in the diagram) such as a 1N4004 across any relay coils to suppress inductive voltage spikes which can damage SSRs.

In installations with a single “battery enable” relay, the LV and HV outputs may be wired in series such that an open circuit on either SSR will open the power relay.

INSTALLATION

The BMM8 should be securely fastened near the cells it is monitoring. If mounting the bare PCB variant to metal surfaces, use standoffs or an insulating layer to ensure the circuit board does not contact the metal. Modules should be installed in a location protected from water and debris – typically inside sealed battery enclosures is ideal.

Once mounted, connect wires from cells to the module plug. We recommend wire gauge around 24-30 AWG for cell connections - small enough to keep current low in cases of wiring faults, but large enough to offer mechanical strength for reliability. Ensure that all wiring is secured so it will not become damaged from vibration or abrasion.

If using fewer than 8 cells, start from terminal 0 and work up. Power is always taken from input #8, so you will need to add a wire jumper from your top-most cell to input #8. For example, if monitoring 4 cells add a small wire between input #4 and #8.

OPERATION AND USE

Once the BMM8 has been wired up and voltages at the terminals verified, simply press the power button briefly and the module should switch on. It will automatically detect the number of cells connected on startup, and the LED will flash the number of cells for visual confirmation.

During operation, if any cell exceeds 3.8V, the two terminals for HV output will go open circuit and remain that way until the cell voltage recovers to below 3.4V. This hysteresis window prevents rapid cycling of external charge systems.

For LiFePO4, 3.65V is the typical peak charge voltage so if your pack is in a good state of balance, the charger should complete its cycle without any cells reaching 3.8V, causing the BMM8 to intervene. (LiFePO4 cells do not suffer damage until unless they reach around 4.2V.)

Similarly if a cell goes below 2.5V, the LV output will go open circuit, and be re-enabled once the cell recovers above 3.0V. The BMM8 samples all cells four times per second, but uses an 8-sample moving average to reduce noise, so typically responds to over-voltage and under-voltage conditions within about 1 second.

Whenever all cells are within correct range, the status LED will be green. The LED will be solid red if any cells are over-voltage (and HV output has been disabled), or flash red if any cells are under-voltage (and the LV output disabled).

Any battery management system which powers itself from the cells it is monitoring risks discharging the cells if left running but unused for extended periods of time. To solve this, the BMM8 is able to switch its own power supply off if any cells get extremely low (under 2.0V), which reduces its power consumption to zero and avoids the possibility of cell damage through over-discharge.

If you need to power down the module for some reason, you can briefly disconnect the wire at terminal 8. (The wire can then be reconnected without the module powering up again until the button is pressed.)

TECHNICAL SUPPORT

If you have any queries not covered by this manual, feel free to contact us via our website: **www.zeva.com.au**

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

ZEVA is a 100% carbon neutral business. All products proudly designed and manufactured in Australia.