



## Charge Profile

The battery needs a charge voltage of at least 14.2v to charge properly. Charge voltages below this voltage will put power into the battery but not activate the cell balancers. The cell balancer keeps the battery pack healthy so it can provide many years service.

A charge voltage range of 14.2 – 14.7 will work fine. The battery's protection will not allow over-voltage. It is normal for the battery protection to activate at the end of the charge cycle, this is how the battery tells the charger it is full if it hasn't already backed off.

A charger with a dedicated lithium profile would always be the best choice. We recommend Victron products as they have a great warranty and performance for the cost.

The batteries can be used with chargers that are suitable for GEL, Sealed Lead Acid and AGM batteries. Chargers which are purely designed for Flooded Lead Acid are generally NOT suitable due to low charge voltage.

GEL profiles tend to charge at 14.2v-14.4v

Sealed Lead Acid and AGM tend to charge at 14.4v-14.7v

Flooded Lead Acid chargers may only put out 13.8v which is too low. Although this may seem to work the battery will fail prematurely.

## Storage

Our batteries can be stored between -20 and +60 degrees centigrade.

The battery should be charged to at least 50% State of Charge before long term storage. Charging to 100% is recommended.

Self-discharge is between 1-3% per month and our batteries have been proven in storage for 1 year provided they are fully charged before being stored.

There is no benefit to 'float' charging whilst in storage, this is only necessary for acid batteries. Long term float charging may eventually 'bypass' the battery protection and damage the battery.

## Cold Temperatures

Lithium batteries do not cope well with being charged when below 0 degrees centigrade but can be discharged at temperatures as low as -20. High charge currents delivered when the cells within the battery are below 0 degrees will cause permanent damage.

All our batteries do have cold temperature protection and will start resisting a charge at 3 degrees centigrade.

Most good quality solar regulators have a low temperature cut off. Victron's default cut off is 5 degrees centigrade at the controller.

Our heated range of batteries will allow the battery to charge in low temperatures by heating the cells when a charge current is connected.

The heater system in our batteries only uses charge current and does not take power from the battery to warm the cells.

### **Low Voltage Protection**

LVD or Low Voltage Disconnect is a safety feature to prevent complete discharge as this would damage your battery. When your battery reaches 10.5 volts the internal battery management system will switch it off.

When your battery is in low voltage disconnect mode, it will appear to be completely dead but it is fine and just 'sleeping'. It is important to charge the battery as soon as possible if it enters low voltage disconnect.

Most chargers will be able to wake the battery up i.e. Solar, Mains or engine charge. If your charging system cannot wake the battery up, you just need to briefly connect an alternative 12v volt source to wake the battery up then immediately charge the battery before it goes back to sleep.

### **Remaining Capacity – State of Charge**

We recommend either an external shunt, ideally a Victron Smart Shunt or one of our batteries which has a built in Bluetooth monitor to know how much power is remaining.

If you don't have either of these options, you can use a voltage meter to approximate the power remaining with the help of the chart below. To get a true voltage reading the battery must be fully rested. Allow 30-60 minutes since receiving a charge or powered equipment before reading voltage.

<b>Voltage</b>	<b>Capacity</b>
13.6V	100%
13.4V	99%
13.3V	90%
13.2V	70%
13.1V	40%
13.0V	30%
12.9V	20%
12.8V	17%
12.5V	14%
12.0V	9%
10.5V	<b>URNS OFF (LVD)</b>
10.0V	0%