

RooDog Electric Bicycle



BATTERY CARE MANUAL

Important:

For your safety and for the longevity of the battery please read this booklet fully before using your new bike. All information given in this booklet is to be used only as a guide.



EN 15194 official standard.



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Battery:

In a Nut shell

Battery Care

- › **Avoid hot temperatures.** Lithium batteries do not like heat so keep the out of the sun and direct sunlight on hot days. Keep away from heat sources such as radiators or fires. Keep extreme heat to a minimum this will help prolong the life of your battery.
- › **Try to avoid excessively cold temperatures** when possible and ideally charge the battery at room temperature. It is important to acclimatise the battery before charging as quick changes in temperature are not good for it.
- › **If leaving the battery for long periods of time.** Such as storing over winter, try to leave it 40% - 50% charged as high cell voltage for long periods also contributes hugely to reduce battery life.
- › **Do not fully discharge the battery** whenever possible and do more little charges between uses. (Larger discharges shorten the cycle count because it puts stress on the battery). However please periodically run a full discharge and full recharge every 3-6 months to keep the battery cells balanced.



Charging

- › **When charging the battery** it is important to charge it correctly by using the charger that comes with it. It is specifically designed for the battery. Using an incorrect charger can not only invalidate your warranty by causing irreversible damage to the cells but it can also potentially cause the battery to catch fire or explode. Please note that even if 2 chargers look alike, they may be very different.
- › **Choose where to charge.** Charge on a dry, flat, non-flammable surface. Do not charge on soft surfaces, close to flammable materials or near hazardous substances. An additional precaution is also to avoid charging batteries in hallways, near doors or blocking escape routes.
- › **Charge your battery at least once every 4 – 6 weeks** whether you are using it or not. This will stop the battery from going it to a sleep state (Not working) and needing special expertise and equipment to revive. (Allowing this to happen could also affect your warranty)
- › **Avoid overcharging.** It is important to disconnect the battery and unplug the charger once the battery is charged.

Battery Life:

One of the most frequently asked questions is how long will my battery last before it dies and will need replacing:

Well as all battery cells are different it is very difficult to offer a conclusive answer as each battery will vary slightly, in general we say about 2-3years before it starts to drop capacity.

The above statement is often met with a cough and a splutter from customers, especially when the replacement cost of a new battery is raised. We simply just give you the customer all the facts so you can budget against a new battery in that time period. In reality your battery can and could quite easily last a lot longer providing it is cared for in the proper way and by following these guide lines in this booklet it will go a long way in helping you do that.

Unfortunately all batteries deteriorate over time and this is no different with your Ebike lithium battery.

It is a use it or loose it mentality: Your battery will decrease in its capacity whether it is used or not. This basically means you will get less and less miles per charge as your battery gets older. So make sure you use it as much as you can.

Batteries are also judged by how many charge cycles they can do before they die or drop capacity (80% or less). With lithium batteries 1 single battery charge cycle is made when the battery is charged fully then discharged fully. This can also be made up of lots of little charges. For example if you discharge the battery by 10% and then recharge it, this is simply 10% of a single charge cycle. So you will need 10 similar discharges and charges to make up 1 single charge cycle. Ebike batteries tend to be specified from 500 – 1000 charge cycles per lifetime or before replacement is needed.

Cycling:

Like most batteries there is a positive and a negative electrode. Each has its own job to do but with lithium batteries each also contributes to the degradation of the life of the battery. See below for the explanation and to help you understand how and why each work differently.

Negative electrode: ■

During charge, lithium inside the battery gravitates towards the graphite anode (negative electrode) and the voltage potential changes.

Removing the lithium again during discharge does not reset the battery fully.

A thin film consisting of lithium atoms forms on the surface of the anode called solid electrolyte interface (SEI).

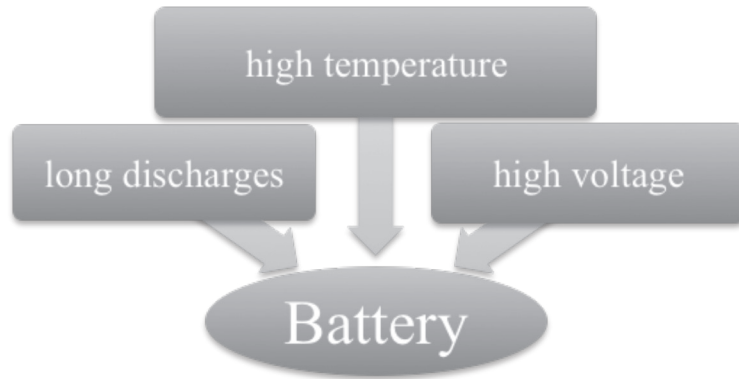
This is composed of lithium oxide and lithium carbonate. As the SEI layer grows as the battery cycles (is charged and then discharged). The film gets thicker and eventually forms a barrier that obstructs interaction with graphite causing the battery to be no longer useable. (you can reduce this by shortening the discharge and charge times) In layman's terms do shorter discharges and charges rather than discharging fully then recharging fully. This will help prolong the life of your battery.

Positive electrode: +

The cathode (positive electrode) develops a similar restrictive layer known as electrolyte oxidation. Dr. Dahn stresses that a voltage above 4.10V/cell at high heat causes this. A demise that can be more harmful than cycling. In layman's terms charging your battery using the wrong charger, or basically over charging the battery causes this! It is very important to always use the charger provided from manufacturer to prevent this from happening. The longer the battery stays in this condition, the worse the degradation gets. The build-up can result in a sudden capacity loss or simply less miles per charge. Or even a dead battery. Try whenever possible to take the battery off charge when it is finished.

In more detail:

As mentioned briefly (in a nut shell) there are three main reasons lithium batteries lose shelf life. HEAT, HIGH VOLTAGE AND LARGER/ LONGER DISCHARGES & CHARGES.



In no circumstances is it possible to avoid all of these things in a battery's lifetime nor do we think you should attempt to do so. Just simply try to cut down the exposure of these elements as much as possible to help prolong the life of your battery.

Charging:

Lithium batteries are unique in the fact they can be charged at any stage and will not suffer from any memory loss or have any adverse affects due to charging it before the battery is dead/fully discharged. With this in mind try and keep your battery charged up often to prevent the battery from going in to a protective sleep mode.

What's a sleep mode? In short this is where the battery BMS (battery management system) will shut down the cells in order to protect them from over discharging. This will only happen if left for long periods of time without charging or when left flat. The exception to this rule of leaving your battery not topped up is if you are planning on leaving your battery for a long period of storage. If this is the case try to leave it at about 40–50% charged (at room temperature) and charge it every 4-6 weeks for at least 1 to 2 hours as leaving the battery with high voltage in it causes stress and will therefore decrease the life span of the battery.

Heat:

When lithium batteries are exposed to heat it causes stress to the battery. (electrolyte oxidation).

Avoid leaving your battery exposed to a source of heat such as in the midday sun or on top of a radiator for example. Any excessive heat will cause your battery to degrade and loose capacity which ultimately means your battery will not last as long as it should.

High voltage:

Lithium batteries when exposed to high voltage cause the battery to get stressed. (Degradation of your battery occurs) Most Ebike batteries come with a built in battery management system (BMS) which is essentially the brain of the battery and that stops it from over charging when it is used with the correct charger.

To further improve your battery life you also do not always want to charge your battery fully if it is not necessary, equally though do not allow it to discharge too low either. (If fully discharged put on charge as soon as possible to prevent the battery going in to a sleep mode).

Long discharges:

Your battery can get stressed when it reaches the lower levels of the battery capacity, so it is well advised to keep your battery topped up when in every day use to prevent this from happening. With lithium batteries not suffering from degradation as a result of charging to early you can charge them at any time.

All batteries discharge slowly over time, so for example if you did not charge the battery after running it low/flat it can go in to what we call a sleep mode. This is a feature that is built in to protect the cells from over discharging. Once this happens your standard charger will no longer be able to charge your battery until it has received a specialist boost charge and in some cases will not recharge at all (resulting in a dead battery). There are measures put in place to prevent the battery from over discharging in every day use, for instance your bike will no longer power you even when there is still some charge left in the battery...in other words it stops powering before being flat, thus to give you time to get it on charge. **(Tip: always charge straight after a long bike ride).**

Disclaimer: All information in this booklet is given as a guide and should be only used for guide purposes only to help aid in the longevity of your RooDog Lithium bike battery. This means RooDog Ltd will not be held responsible for any misuse of the information provided. Most of the information was collected from www.batteryuniversity.co.uk where you can find more in depth details about all battery FAQ's and more...

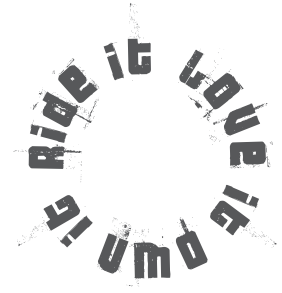
Replacement batteries:

If you have any questions we can offer advice and also replacement batteries for sale depending on individual circumstances. If you have any queries please contact us.

Please note: when replacing batteries it is important to purchase manufacturer recommended batteries which have safety certification for the product. Purchasing and using non-compatible or non-certified batteries could present a fire risk.

Battery disposal:

Batteries can be recycled at your local recycling center. It is a good idea when disposing of a lithium battery to check local scheme requirements. Alternatively, RooDog can accept old batteries and dispose of them.



www.RooDog.co.uk