FACT SHEET: 02 – RANGE AND EFFICIENCY

POWER SYSTEM

The UBCO 2x2 is powered by an automotive level Lithium-ion cell pack. This provides the 2x2 with constant discharge ability along with excellent cyclic durability.

UBCO drives for a balanced approach which is focused on delivering the best overall performance and range whilst maintaining the lightweight and easy handling character of the 2x2.

Many people are still learning about what drives battery performance and naturally have a lot of questions. This document aims to answer the most common questions we get about the Power System and how it affects the performance of your vehicle.

How far can I go?

- Your range in a battery powered vehicle is affected by similar variables to a combustion engine vehicle which include: carried weight, load, incline, speed, terrain among others.
- The graphic below provides an easy to understand picture of how the speed and efficiency affect range. The UBCO 2x2 system is a high torque low speed system so its efficiency peaks lower than top speed. The ranges expressed below are tested on closed asphalt testing tracks with an 80 kg rider and are provided here for guidance only.
- Full speed at max throttle: Maximum distance (50 kph) was measured at 65 km.
- Most efficient speed: Maximum distance (32.5 kph) measured at 120 km.
- At full speed carrying any extra 37.2 kg of weight with an 80 kg rider affected range by -8.5%.
- Compared to full speed range, repeated starting and stopping was tested to affect range by only -3%.

Do you have regenerative braking?

The Flux drive in the 2x2 has regenerative braking. This is both passive (off throttle) and active (under braking). Regenerative braking can draw up to 20% of the motors rated power. For example for every hour you climb, you would need to descend for 5 hours to put the energy used back. This can deliver 2-10% of the capacity back to the Power System depending on terrain and length of the ride. Steeper descents will deliver more back than on a flat road.

BATTERY RANGE (CONSTANT SPEED WITH 80KG RIDER)

BATTERY CASING

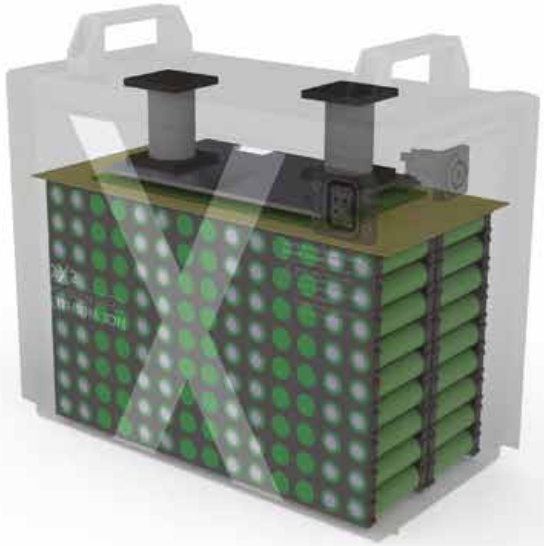
Battery case and lid are made from 5052 - H32 Aluminium.

INSULATION

Cell pack is insulated from the case with fibreglass sheet.

WEIGHT

Battery pack weight: 16 kg (35.2 lbs).



LID SECURED

Lid secured using 8x M5 Stainless steel button head screws. Lid has compressible foam seal to prevent moisture ingress.

SOCKETS

Input/ output sockets are sealed with silicone.

DIMENSIONS

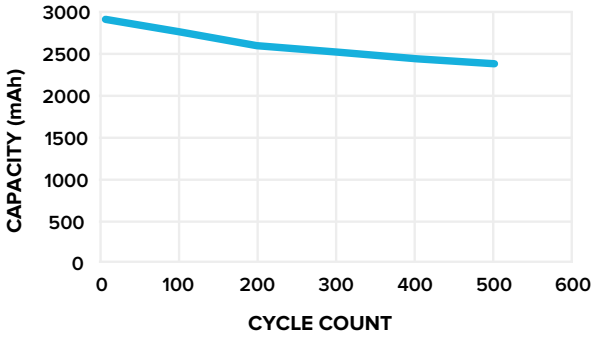
Battery dimensions (excluding weather seals and handles: LxHxW 300x255x150 mm (11.8x10x5.9 in).

How long will my battery last?

UBCO use automotive class cells from Panasonic. These are selected for their cyclic durability and safety. Battery performance and lifespan is affected by a range of things from everyday usage to environmental conditions. For normal users the battery pack should last a significant period of time.

The pack life is measured in 'Discharge Cycles'. The cells used are rated to retain 80% of their capacity after 500 full discharge cycles (0-100%). In the real world:

DISCHARGE CYCLE



- **Work Use:** Using the average distance travelled on farm each day of 25 km and full speed over the course of a year (365 days) it would drop 20% over 3.5 years (32,589 km).
- **Recreational Use:** Using the bike an average of 40-65 km per week at full speed over 52 weeks of the year (2,080 – 3380 km) it would drop 20% over 9.6 years.

Research indicates that partial charging (not to 100%) can significantly extend battery life if a full charge is not required. In the UBCO system that would mean using the 'Normal' setting on the charger (90%). Many applications don't require a full discharge.

The cell performance will degrade in either high heat (60 Celsius / 140 Fahrenheit) or very low temperatures (-17 Celsius / 0 Fahrenheit).

UBCO will operate a take back program which will provide rebates on new power system when it reaches its end of life. These will either be repurposed or recycled.

Do the batteries have a memory?

Unlike traditional Lead-Acid Batteries Lithium Ion does not have a memory and can be readily charged at a variety of battery levels. Good practice is to top the battery up when parked. Never leave an UBCO Power System in a discharged state as it can damage the battery.

An introduction to how battery packs are specified

Lithium-ion battery packs are comprised of cell groups connected in series (s) and parallel (p). Eg. A battery pack with 14 cells in series and 18 cells in parallel is described as 14s 18p.

The 2018 UBCO Battery Specification:

- 252 x 18650 Panasonic 2900 mAh Cells
- 14s 18p configuration delivering:
  - 50.4V nominal voltage
  - 48.6Ah total rated capacity

Advantages over traditional battery chemistry (lead-acid)

- Increased energy density
- About 1/3 of the weight of lead-acid (for the same capacity)
- Much more efficient in both charge and discharge
- Lithium-ion batteries can be discharged further than lead-acid
- Lithium-ion has vastly more discharge cycles
- Much better at maintaining voltage throughout discharge
- Lithium-ion is much friendlier on the environment in terms of manufacturing, length of life and recycling due to its lower toxicity.