



Better Battery, Better E-bike

Phylion GoPedelec Training Files

Feb,08,2012

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I. Phylion Company Information

Better Battery, Better E-bike

1.Business: High Capacity, High Power Li-ion batteries for pedelecs, e-scooters, Electric Vehicles, etc.

2.Founded : in 2003.

3.Number of Staff : Around 800 , and about 20% are from R & D division.

4.Production Capacity : 60,000,000Ah per year, which is equal to 600,000 units 36V/10Ah batteries packs. Phylion is one of the largest li-ion battery manufacturers in China.

5.EU Local Support: Dutch office with technicians always there for 24*7(hour) support and Phylion French office to be established in 2012.



I. Phylion Company Information-

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Sales Figure



Among biggest manufacturers in China;
Among biggest li-ion battery suppliers in EU for e-bike applications;
Total sold battery pack around 1 million from 2006.

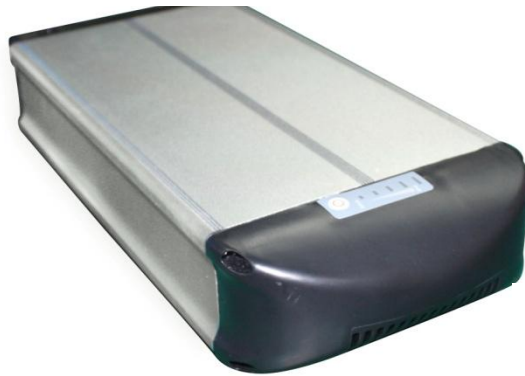


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II. Battery Brief Information-

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Part Pedelecs Batteries List



Certified



Certified

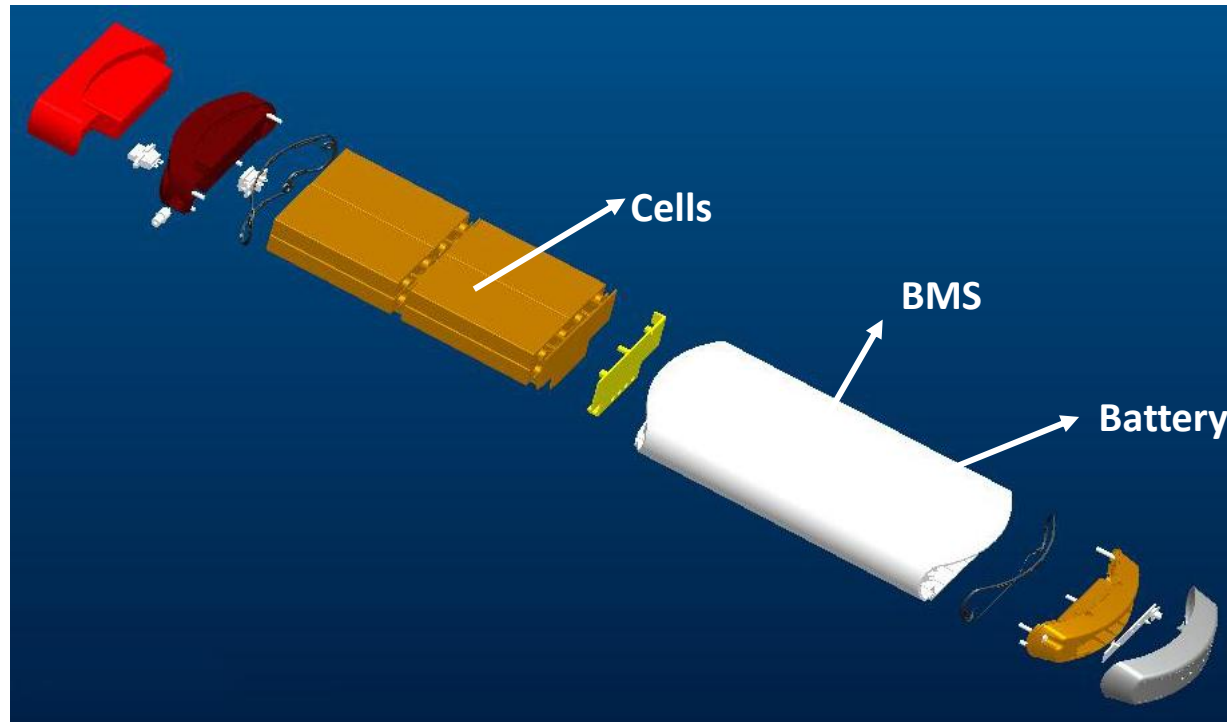
So far totally 5 Phylion battery models passed BATSQ certificates including some customized models.



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II. Battery Brief Information

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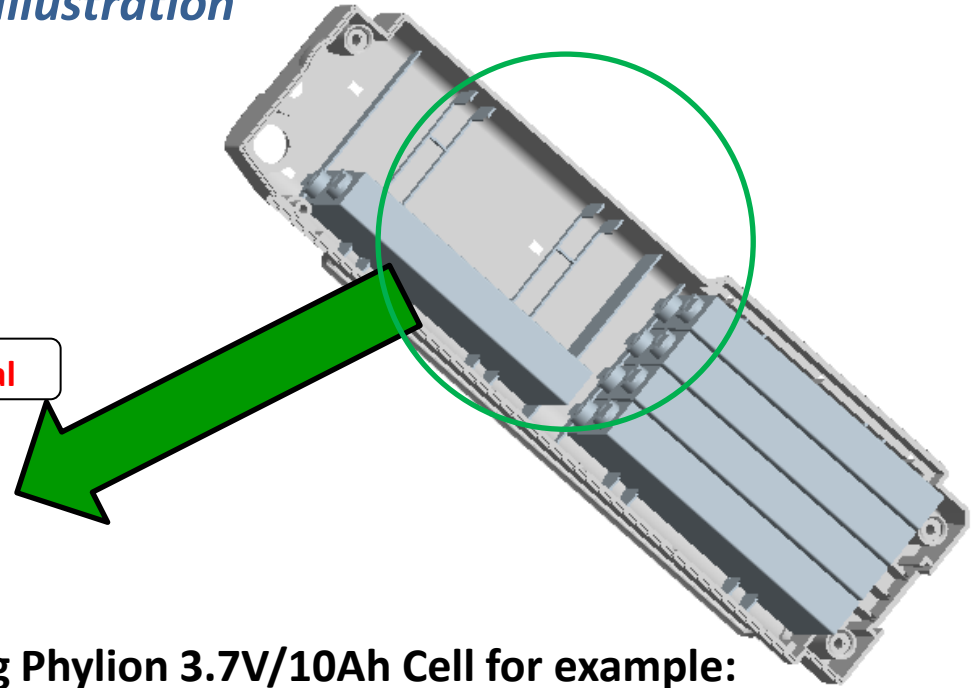
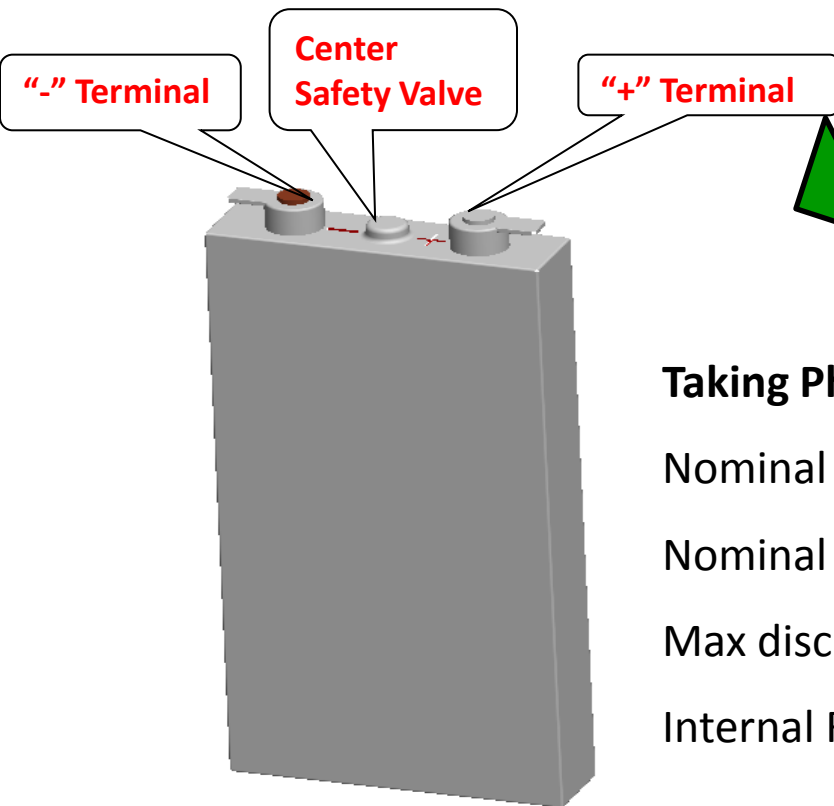


- Battery pack is mainly composed of:
- **Single cells in series or parallel;**
- **Battery Management System-BMS** (Overcharge protection & Over discharge protection & Big-current protection & Balancing Circuit, etc);
- **Battery casing** (could either be plastic or metallic subject to battery designs and applications)
- **Battery lock**-(to switch on/off battery power supply or battery connecting with e-bike);
- Other small parts like fuses, charge/discharge pins, **etc.**

II. Battery Brief Information-

Detailed Parts Illustration

Single Cell



Taking Phylion 3.7V/10Ah Cell for example:

Nominal Voltage: 3.7V

Nominal Capacity: 10Ah

Max discharge current: 20A

Internal Resistance: 6mΩ

Detailed Parts Illustration



Mechanical lock:

Usually placed with e-bike rear rack , to connect battery with e-bike-placement and anti-thief function



Electrick lock:

Integrated with battery discharge circuit, to switch on/off battery power supply.





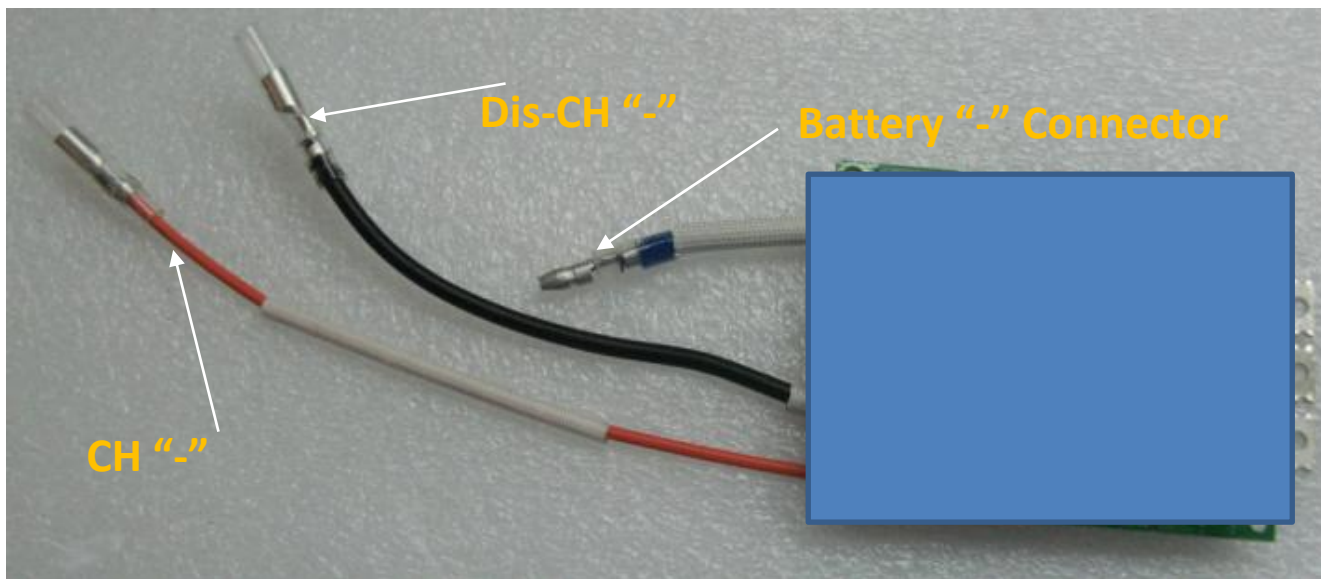
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II. Battery Brief Information-

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Detailed Parts Illustration

Battery Management System-BMS

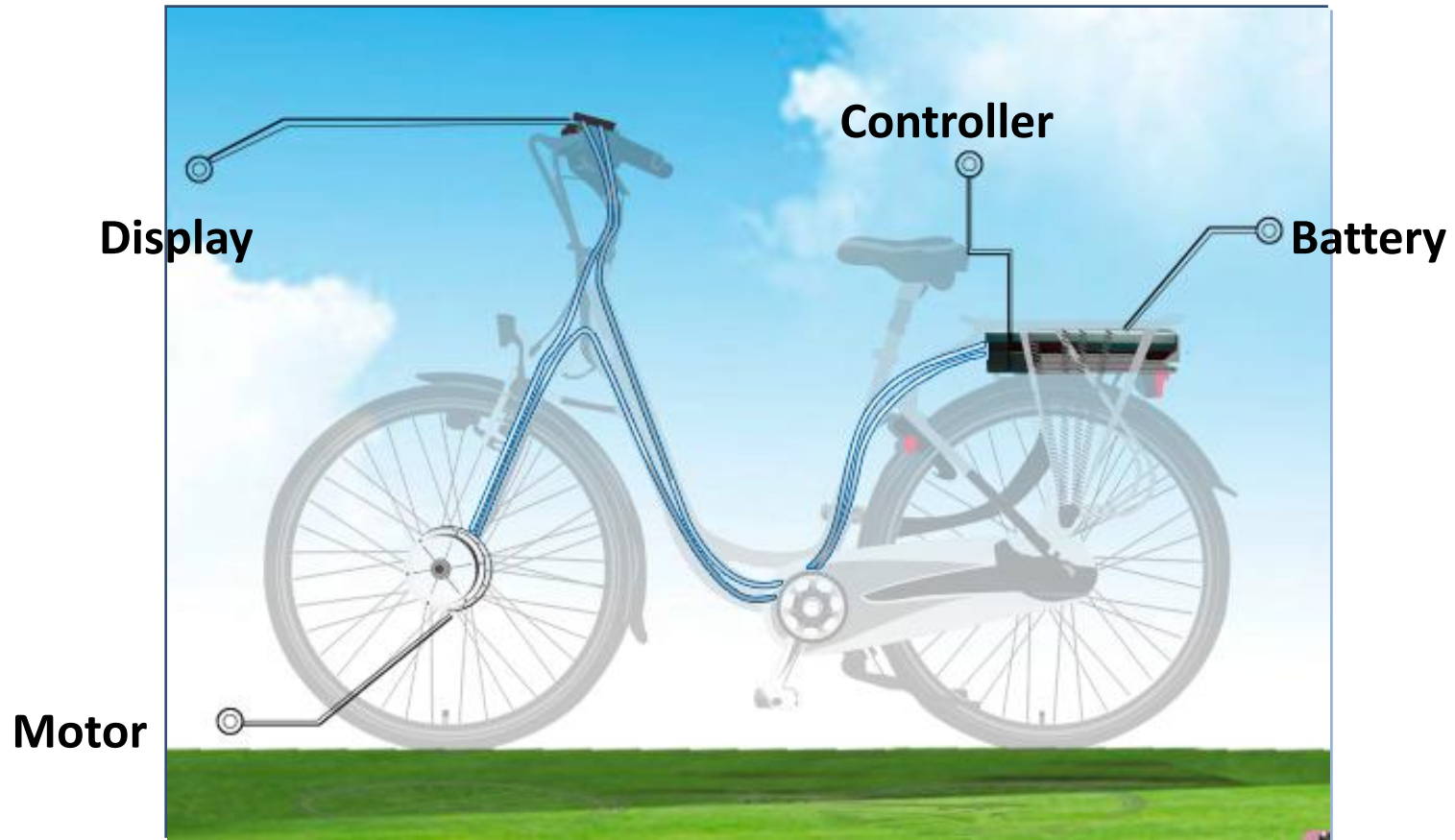


For Phylion standard BMS:

- 1. Over-Charge Protection:** To ensure battery safety and performance when battery over-charged.
- 2. Over-discharge Protection:** To ensure battery performance when battery over-discharged.
- 3. Over-current Protection:** When over current in battery circuit, BMS will cut off to ensure battery reliability.
- 4. Balancing function:** Balancing function added when charging, so single cells voltages could be better kept in same level.

Via Phylion Smart BMS, battery precise capacity & single cells voltages & using history record, etc could be read out.

III. Battery Electronic System Information



Whole e-bike electronic components composed of: Battery & motor & controller & display, throttle, sensor, etc.

And subject to different pedelecs designs, batteries will be put under rear rack, under saddle, on front frame, etc.



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III. Battery Electronic System Information

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Motor:

- Nominal power of motor effects the continuous discharge current and the riding speed directly. Generally, motor power should be below 250W. The voltage platform of motor should be matched with the battery.
- Rated speed of motor is related with cycling distance. With same capacity remained, the faster speed, the less cycling distance.

Controller:

- Rated voltage: matched with the voltage of the battery(such as 24V/36V)
- Cut-off voltage: only when the voltage of the battery is above it, can the controller supply power to the motor. For 24V batteries, the cut-off voltage is suggested to be 21V, and for 36V batteries, 31.5V
- Current control: the maximum discharge current in a short time is usually set up between 6 to 10A, not more than 15A.
- Generally, the controller should have low consumption rate and function of sleeping mode for lower power consumption. Otherwise, battery storage time will be shortened (the battery is easily to be over discharged)

Display:

- To switch on/off whole e-bike system, to show remained battery capacity, etc;
- Phylion battery capacity could either be read out by voltage based or algorithmic method.

1. **Questions:** How many kinds pedelecs batteries in terms of battery materials in current market?

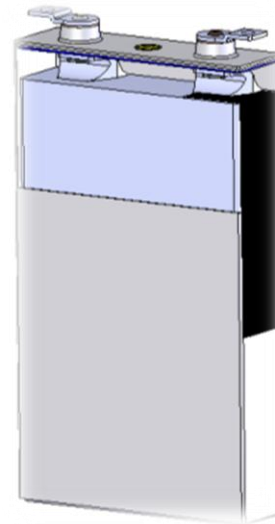
Answer: NiMH, NCM(Nickel, cobalt and manganese), Li-ion manganese; Li-Phosphate batteries. And all Phylion Pedelec batteries are of Li-ion manganese.

2. **Questions:** Most common cells shapes for li-ion batteries?

Answer: Cylindrical & prismatic ones with some picture as below:



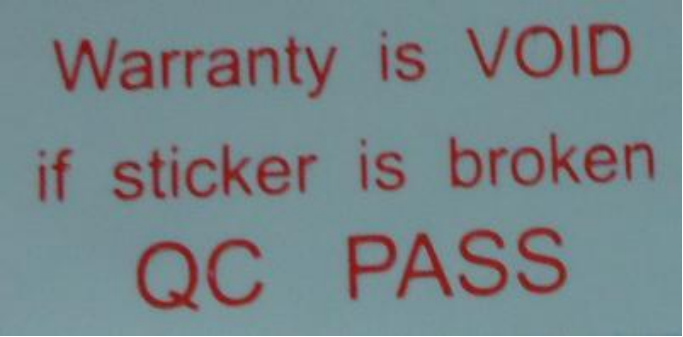
Cylindrical



Prismatic

3. **Question:** Shall batteries are allowed for disassembling?

Answer: Given specific nature of li-ion batteries, people or organizations without Phylion training or authorization are not allowed to disassemble batteries. Otherwise, batteries will be out of warranty. If below warranty sticker found torn off, then such battery is out of warranty.



Warranty is VOID
if sticker is broken
QC PASS

4. **Question:** Will over-time charging affect battery packs?

Answer: Over-time charging will not affect battery if Phylion charger used. Because BMS inside is of over charge protection function. Once the voltage is higher than preset protection voltage, BMS will cut off automatically to stop charging. But any how it is not suggested to connect battery with charger after battery already fully charged.



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IV. Frequently Asked Questions-FAQ

Better Battery, Better E-bike

5. **Question:** How long is the cycling distance for pedelecs with Phylion battery?

Answer: Cycling distance is subject to air resistance, cyclist weight, road condition, e-bike load, motor efficiency, controller efficiency, etc, no accurate figure of this. For this, we suggest you check pedelec users' manual.

6. **Question:** How to solve in case of battery short distance(low capacity)?

Answer: For battery with standard BMS, capacity could be checked by Phylion discharge machine, after, capacity could be read out in that machine; for battery with smart BMS, capacity could also be read out by computer or display. If remained capacity < warranty standard, then replacement battery to be offered to end consumers; otherwise return to end consumers.

7. **Question:** How to solve in case of battery can not charge?

Answer: Charge such battery with another good Phylion charger, if can be charged, then return such battery to end consumer, otherwise, return such battery to e-bike after sales service center.

Another good charger should be of the same DC connectors(3 models for Phylion batteries) and of same output voltage which could be shown charger rear side sticker.(i.e.**right red circled**)



A



B



C





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IV. Frequently Asked Questions-FAQ

Better Battery, Better E-bike

8. **Question:** How to solve in case of battery LED board can not light?

Answer: Charge such battery with matched good charger for about 4 hours, after, if still can not light, replacement battery should be offered, otherwise, return such battery to e-bike after sales service center.

9. **Question:** How to handle in case of battery can not charge or discharge?

Answer: Return such battery to e-bike after sales service center for further analysis.

10. **Question:** How to handle battery when transport e-bike in car rack?

Answer: Remove battery from e-bike and put in ventilation-proof place of car.

11. **Question:** How to handle in case fail to find replacement Phylion batteries?

Answer: Please e-mail us via eu@phylion.com, our Customer Service Division will be glad to help.

- ◆ No disassembling without permission, because disassembling batteries need some devices and with much know-how, we do not suggest dealers to disassemble batteries.
- ◆ How to charge battery
 - Connect batteries first and then power supply when charging.
 - According to related standards, new batteries offered by Phylion are around 50% charged. So please charge as soon as possible after purchasing. First charging is the same as subsequent charging for 8-12 hours, without special treatment.
 - No memory effect of Li-ion batteries, it is good for life time of batteries to charge once after using. It is recommended every time 6-8 hours charging. When the light of the charger change from red to green, it means the battery has been fully charged. It is recommended charging more 1-2 hours to reach the best state.
 - Battery packs should be charged for 2 hours before long-term storage and also be charged 2-3 hours every 2 months during the storage.

- ◆ Good using habit will prolong using time
- Power off after ridding.
- Batteries should be avoided severe vibration, shock as well as crush in the course of riding.
- Liquid or metallic components should be avoided into the charger when charging. Because chargers are not built for outdoor use, hence they are only allowed for indoor use.
- Other chargers not from Phylion is not allowed to use for this battery.
- Never charge by discharge port or discharge by charge port.

- ◆ Storage, maintenance and transport
- Storage temperature range: $-20\sim 35^{\circ}\text{C}$, discharge temperature range: $-20\sim 45^{\circ}\text{C}$, charge temperature range: $0\sim 45^{\circ}\text{C}$, operating relative humidity $80\leq\%RH$.
- The battery and charger should be stored in clean, dry and well-ventilated circumstance, away from corrosive substance, fire and heat source.
- Battery should be packed into carton for transportation, and keep it away from severe vibration, impact and extrusion, direct sunshine and water logging.
- Remove battery from E-bike for long-term storage.



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VI. Some Open Discussion

Better Battery, Better E-bike

➤ Safety still of increasing importance, given this, BATSO will be of increasing awareness.

- **BATSO-Battery Safety Organization**
- BATSO certificate is for battery safety performance + Transportation requirement, BATSO approved batteries are safe and reliable.
- BATSO is a cooperation founded by ExtraEnergy e.V., ITRI, TÜV Rheinland and the Underwriters Laboratories (UL).
- Phylion batteries are designed as per BATSO standard and is the **first** company of the world to gain BATSO certificate.

➤ Battery will be smarter and more communication between battery and other components?

➤ Etc.



www.batso.org

Thank you!

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