

Battery Guide 2020



BOSCH

Invented for life

THE eBIKE BATTERY GUIDE

FEEL THE FLOW

Bosch eBike Systems | EN
bosch-ebike.com



Contents

Succinctly stated



PowerPacks and PowerTubes are the energy sources for the Bosch Active Line, Active Line Plus, Cargo Line, Performance Line and Performance Line CX eBike systems. Useful pointers on how to determine their range, optimise their efficiency and maximise their service life are provided on the following pages.

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Bosch batteries and chargers

More energy for travelling

Bosch batteries are an efficient, long-life energy source. They combine impressive mileage, a long service life and low weight (approx. 2.5 to 3.5 kg) with an ergonomic design and convenient handling. The high-quality lithium-ion batteries have a Battery Management System (BMS) that detects significant potential sources of error and effectively protects cells against overload. Dual-Battery is the perfect solution for tourers, long-distance commuters, cargo bikers or eMountain bikers. The combination of two Bosch batteries delivers up to 1,250 Wh and can be installed in various battery combinations* from the manufacturer. The system switches intelligently between the two batteries both during charging and discharging.

* DualBattery is not available in combination with PowerPack 300 and PowerTube 400.



Bosch batteries

Powerful in every design



Frame battery

Sporty & dynamic: When used as a frame battery, the PowerPack 300, 400 or 500 sits close to the centre of gravity of your eBike to ensure optimal weight distribution.



PowerPack Frame

- ▶ PowerPack 300
- ▶ PowerPack 400
- ▶ PowerPack 500



Integrated rechargeable battery

Stylishly elegant: there are two types of PowerTube (horizontal or vertical) that are designed into the bike by the manufacturer. This brings more variety to eBike design. Available in 400, 500 or 625 W versions.



PowerTube

- ▶ PowerTube 400 **NEW**
- ▶ PowerTube 500
- ▶ PowerTube 625 **NEW**



Rack battery

Comfortably convenient: On step-through models, the rack battery frees up space and allows the rider to get on and off safely. Available in three different size variants: 300, 400 or 500 W.



PowerPack Rack

- ▶ PowerPack 300
- ▶ PowerPack 400
- ▶ PowerPack 500



DualBattery

Double the power: Combining two Bosch eBike rechargeable batteries provides an energy content of up to 1,000 and – something new – up to 1,250 Wh.*



DualBattery

- ▶ 2 x PowerPack
- ▶ 2 x PowerTube
- ▶ PowerPack + PowerTube

* DualBattery is not available in combination with PowerPack 300 and PowerTube 400.

Bosch charger

Reliable power source



Bosch chargers are handy, lightweight and robust. The sealed housing makes them extremely stable. Wherever your journey may take you: with the 2 A Compact Charger, 4 A Standard Charger and 6 A Fast Charger*, Bosch has developed three models that can charge Bosch eBikes quickly and reliably. All Bosch chargers operate silently and can also charge the Bosch PowerTube. They also feature a practical Velcro fastener for stowing the cable tidily.



Compact Charger

The companion

The Compact Charger is the ideal charger for all eBikers who travel a lot. It weighs less than 600 g and is 40% smaller than the Standard Charger – small enough to fit into many saddlebags. The Compact Charger can also be used in the USA, Canada and Australia with mains voltages of 100 to 240 V.



Standard Charger

The all-rounder

The robust and functional Standard Charger features a convincingly good balance between performance, size and weight and is suitable for every possible use.



Fast Charger

The fastest

The Fast Charger is the fastest Bosch eBike charger and will recharge a Bosch eBike battery in the shortest possible time. After just three hours, the powerful PowerPack 500 and PowerTube 500 are fully recharged. The Fast Charger needs just over one hour to charge a battery to 50% capacity. This makes it the perfect charger for fast recharging while on a trip. The Fast Charger is ideal for eBikes that are regularly in use and frequently charged, in particular for DualBattery with up to 1,250 Wh.

* Charging current is limited to 4 A for the PowerPack 300 and Classic + Line batteries.

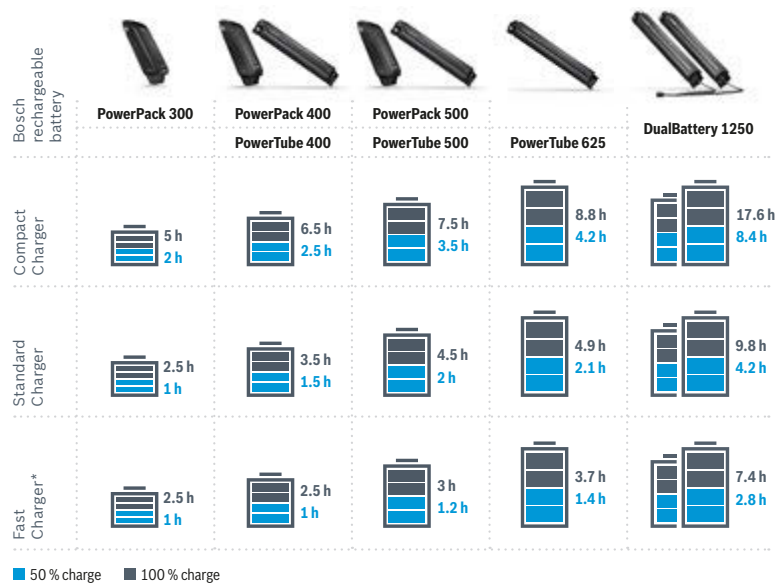
Charging time

As fast as you like



Charging time depends on the battery capacity and the charger type. The following diagrams show how quickly the various batteries can be recharged using each specific charger.

A Comparison of the Charging Times of the Charger Models:



* Charging current is limited to 4 A for the PowerPack 300 and Classic + Line batteries.



Range

What is the range of a single battery charge?

This is a common question for many eBikers. There is no definitive answer. The number and variety of influential factors is simply too great. Sometimes a single battery charge will take you less than 20 kilometres, while at other times it will take you much further than 80 kilometres. However, following a few tips can easily help maximise the range of the battery.



Product line ranges

Extending your range

The range graphics below show the distances the product lines can support with different batteries in favourable conditions (mean value). The range will be lower in difficult conditions.

	Favourable conditions*	Difficult conditions*
 Rider		
Cadence	50–70 rpm	70–90 rpm
Total weight (Overall weight consisting of rider incl. eBike and luggage)	105 kg 150 kg (Cargo Line)	115 kg 170 kg (Cargo Line)
Rider type/ rider performance	Average	Average
Bosch eBike system	Drive Unit, battery and Intuvia	Drive Unit, battery and Intuvia
Shifting system	Derailleur system	Derailleur system
Tyre tread	Trekking tyres	MTB tyres
Bicycle type	Touring bike	MTB
Terrain type	Hilly	Low mountain ranges
Surface	Mainly gravel and paved forest paths	Dirt tracks and off-road trails
Starting frequency	Bike ride with occasional standing starts	Bike ride with regular standing starts
Wind conditions	Slight wind	Moderate wind

eBike

Environment

Active Line



Active Line Plus



Cargo Line



Cargo Line Speed



Performance Line



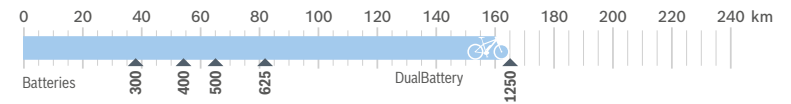
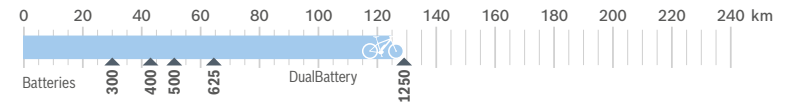
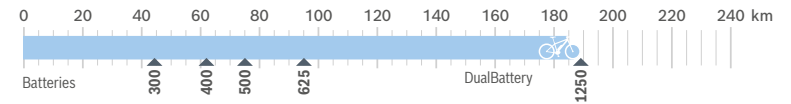
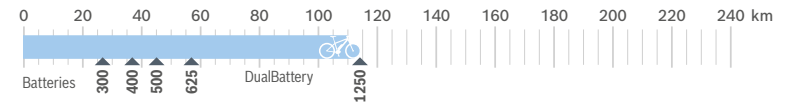
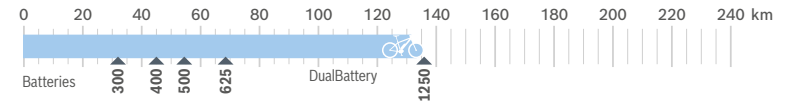
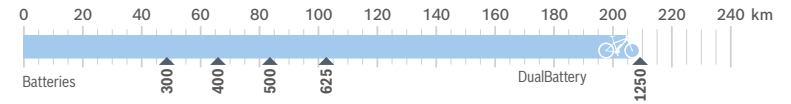
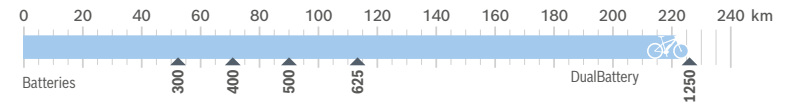
Performance Line Speed



Performance Line CX



Range of the various Bosch batteries in mixed mode*



* The ranges are typical values of new rechargeable batteries, which may vary if one of the conditions listed above changes.

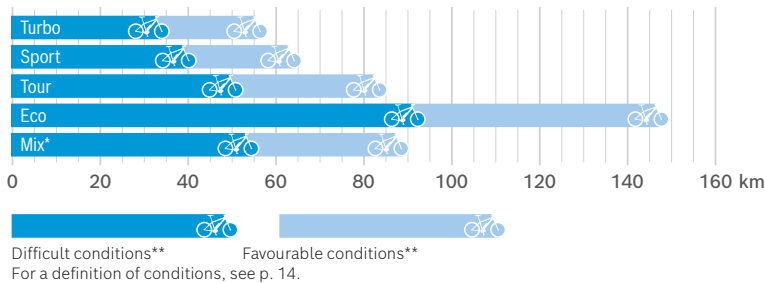
* Average of combined use of all four modes and favorable conditions.

Range and riding modes

How they relate

The range of the Bosch eBike system is largely dependent on the level of support. A choice of five different riding modes is available, each of which is described below. The graphic shows their effect on the range in favourable (light blue) and difficult (dark blue) conditions.

Range based on the example of the Active Line with PowerPack 500 or PowerTube 500 taking account of riding modes



* Average of combined use of all four modes and difficult and favourable conditions.

** The ranges are typical values of the new rechargeable batteries, which may vary if one of the conditions listed above changes.



Turbo

Direct, maximum support power up to highest cadence for sporty riding



Sport/eMTB

Powerful support for universal usage for both sporty riding and fast commuting in urban traffic

Depending on the eBike type, the eMTB mode replaces the Sport mode in the Performance Line and the Performance Line CX.

Progressive support for a natural riding sensation and optimal control on demanding terrain



Tour

Uniform support for rides with long ranges.



Eco

Effective support with maximum efficiency for the highest range.



Off

No motor support, but all on-board computer functions can still be accessed.

Easier planning

The Bosch Range Assistant

The range of the Bosch batteries is dependent on various factors. Range is influenced by the rider and the chosen support mode, as well as the drive or battery installed in the eBike. Environmental factors such as temperature, wind conditions and riding surface also play a key role in how far you can get on a battery charge. Our **range assistant** makes it possible to estimate a typical range under various parameters. The online tool will show important information on battery range in a visually appealing way.

Calculate the range yourself:
bosch-ebike.com/range



Tips and tricks for longer riding enjoyment

Cadence – Cadences above 50 revolutions per minute optimise the efficiency of the drive unit. In contrast, very slow pedalling is very costly in terms of energy.

Weight – The mass should be minimised by keeping the total weight of the bicycle and luggage from being unnecessarily high.

Starting & braking – As with a car, frequent starting and stopping is less economical than long distances at almost constant speed.

Gear shifting – Correct shifting also makes eBiking more efficient: It is best to start off and take inclines in a low gear, then shift to a higher gear in accordance with the terrain and speed. The on-board computer provides shift recommendations*.

Tyre pressure – Rolling resistance can be minimised by correct tyre pressure. Tip: In order to maximise the range, inflate the tyres to the maximum permissible tyre pressure.

Motor performance indicator – Monitor the motor performance indicator of the Intuvia, Kiox and Nyon on-board computers and adapt your riding style accordingly. A long bar means higher power consumption.

Rechargeable battery & temperature – With decreasing temperature, the efficiency of a rechargeable battery is reduced, as the electrical resistance increases. In winter, you can therefore expect a reduction in the normal range.

* Excluding SmartphoneHub.

Handling, care and service life

Technology can be
this simple

The Bosch batteries are seated securely in their mounts, even when travelling over rough terrain. However, they are easily removed for storage or charging purposes. Simply open the lock, which serves as an attachment and remove the battery from the mount.

With their low weight, handy dimensions and precise fit between battery and mount, Bosch batteries can be easily and intuitively inserted. The rechargeable battery locks into its mount in a manner that is noticeable and audible, so that it is seated securely in the frame or on the eBike.



Handling

It is so easy to charge PowerPacks and PowerTubes

Charging on the pedelec – PowerPacks and PowerTubes are particularly easy to charge directly on the pedelec. You just need to insert the charging plug on the charger into the charging socket in the battery mount and insert the power plug into the wall outlet. Done.

PowerPacks – All PowerPacks are equipped with an ergonomic handle. It enables the PowerPacks to be conveniently inserted, removed, carried and charged.



PowerTube – A convenient function means that the PowerTube moves approx. 2 cm out of the frame when unlocked, making it easier to handle. In addition, a safety mechanism prevents the battery from falling out. The battery is also protected by the frame.

Removing the battery



Opening the frame cover (if available)



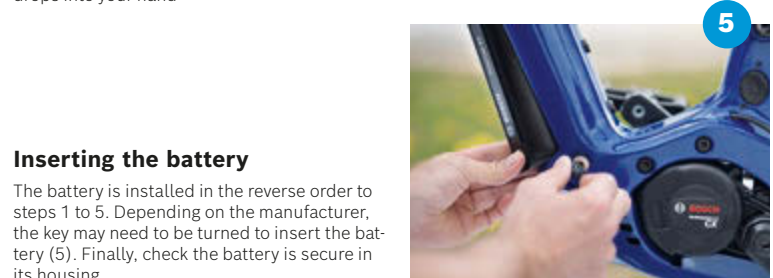
When the battery is unlocked using a key (depending on the manufacturer), it automatically drops into the restraint support



Push the top of the battery to detach it from the restraint support – the battery then drops into your hand



Removing the battery from the frame



Inserting the battery

The battery is installed in the reverse order to steps 1 to 5. Depending on the manufacturer, the key may need to be turned to insert the battery (5). Finally, check the battery is secure in its housing.

Care

How to increase the service life of the battery

The Bosch battery is an important eBike component, and with the correct care you can optimise its life.



Cleaning & care – We recommend using a damp cloth to clean the battery. The terminals should be cleaned occasionally and lightly greased. The battery should be removed before cleaning the eBike. To protect the electronic components, batteries must not be cleaned with direct water contact.

Winter use – During winter use (particularly below 0 °C) we recommend charging and storing the battery at room temperature before inserting the battery in the eBike immediately before riding it. For longer journeys in the cold, it is advisable to use thermal protective covers.

Charging – The batteries should be charged at room temperature in a dry location where a smoke detector is installed.

Storage during winter – Store the batteries in a dry location at room temperature. Fully charging or fully discharging results in higher loading of the battery. The ideal charge status for lengthy periods of storage is approx. 30 to 60% or two to three LEDs on the battery indicator.

Service life

Tips for maximising your charge

The service life of Bosch batteries is influenced primarily by the type and duration of the load. Like any lithium-ion battery, a Bosch battery naturally ages, even when not in use. Over time, its capacity diminishes.



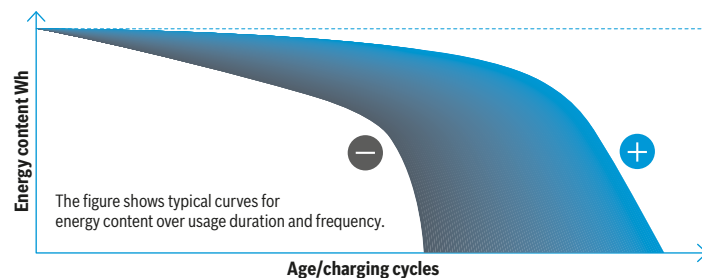
Factors that shorten the service life:

- ▶ Heavy-load use
- ▶ Storage at over 30 °C ambient temperature
- ▶ Prolonged storage in a fully charged or fully discharged state
- ▶ Parking the eBike in direct sunlight



Factors that extend the service life:

- ▶ Low-load use
- ▶ Storage at a temperature between 0 and 20 °C
- ▶ Storage at approx. 30–60% charge status
- ▶ Parking the eBike in the shade or a cool location



When travelling

Safety while on the go

Lithium-ion batteries store large amounts of energy. That's why some precautions are necessary during transport.



Transport

A safe start to the holidays

By car

If the eBike is transported with a bicycle rack, the battery must be removed first and stored safely inside the car.

By plane

The air transportation organisation IATA has forbidden the transportation of eBike batteries on passenger planes. We recommend renting a Bosch eBike battery upon arrival at your destination.

By train

In trains with a bike compartment, pedelecs (up to 25 kph) may mostly be transported without any hassle. All you need is a bike ticket. On IC and EC trains you will need to reserve a space for your eBike. On ICE trains eBikes can only be transported on specific routes. If you are not seated near the eBike during the journey, you should keep the on-board computer and battery safely with you at your seat.

By public transport and long-distance bus

You can transport eBikes by public transport outside of regional peak times upon purchase of a bike ticket. Arrangements for the transport of pedelecs vary depending on the transport provider. You should make inquiries in good time before starting your journey.

Safety

Safe handling of batteries

Bosch batteries are lithium-ion cells, which are developed and manufactured to the state-of-the-art. In their charged state, these lithium-ion batteries have a high energy content. The constituents of lithium-ion cells are flammable under certain conditions. The operating manual contains instructions on safe handling.

Doubly protected – Each individual cell in a Bosch rechargeable battery is protected by a rugged steel cup and held in a plastic or aluminium housing. The housing must not be opened. Direct impact, major impacts, dropping and excessive heat must also be avoided at all costs, as they could damage the battery cells and cause flammable contents to leak out.

Safe charging – In conjunction with the Battery Management System integrated in the battery, Bosch chargers protect the battery against overload during charging, damage caused by extreme overcharging and short circuits. Bosch rechargeable batteries should only be charged with original Bosch chargers. Bosch chargers are designed exclu-

sively for eBikes with Bosch drives and components, and thus ensure a perfectly matched charging and discharging process. The battery storage recommendations are even more important for charging: batteries must not be charged in the vicinity of heat sources or flammable materials. We recommend storage in uninhabited rooms with smoke detectors that are not designated for use in escape routes. After charging, batteries and chargers should be disconnected from the power supply.

Storage – Excessive heating and direct sunlight must be avoided. Bosch batteries and chargers must not be stored in the vicinity of heat sources or flammable materials. We recommend disconnecting the bat-



tery from the eBike for storage purposes and storing it in rooms fitted with smoke detectors. Dry locations with an ambient temperature of roughly 20 °C are the most suitable. Bosch batteries must not be stored below -10 °C or above 60 °C.

Inspection – Using the Bosch DiagnosticTool, the dealer can check the status of the eBike, especially the battery, and determine the number of completed charging cycles.

Cleaning – To protect the electronic components, do not clean the batteries with direct water contact.

Disposal – eBike rechargeable batteries are considered as industrial batteries and should not be disposed of as household waste or in the usual battery collection containers. Selected bicycle dealers will take used or defective batteries back for free and ensure proper disposal.



Bosch eBike batteries must never be opened – not even if they are being repaired by third parties. Opening the battery always means interfering with the condition that has been approved by Bosch and thus introduces safety-related risks. For other important information relating to the safety risks and dangers associated with battery repairs, see pages 32 and 33.

Benefits

Good reasons for choosing eBike batteries from Bosch

Efficient, durable, state-of-the-art technology – there is a good reason why Bosch eBike batteries are some of the most popular on the market:

No memory effect – The Bosch rechargeable batteries with lithium-ion cells can be briefly charged at any time regardless of their charge state. Interruptions of the charging process do not harm the battery. Complete discharge is not required.

Very low self-discharge rates – Even after prolonged storage, such as during the winter, it is possible to use the rechargeable battery without recharging it. For longer storage, a charge status of approx. 30 to 60% is recommended.

Long service life – Bosch rechargeable batteries are designed for many rides, miles and years of service. The intelligent, electronic Bosch Battery Management System (BMS) protects against excessive operating temperatures, overload and deep discharge. The BMS checks every cell, extending the life of the rechargeable battery.

Rapid charging – Bosch chargers are available in a range of different sizes and performance levels, and enable rapid charging according to your needs.

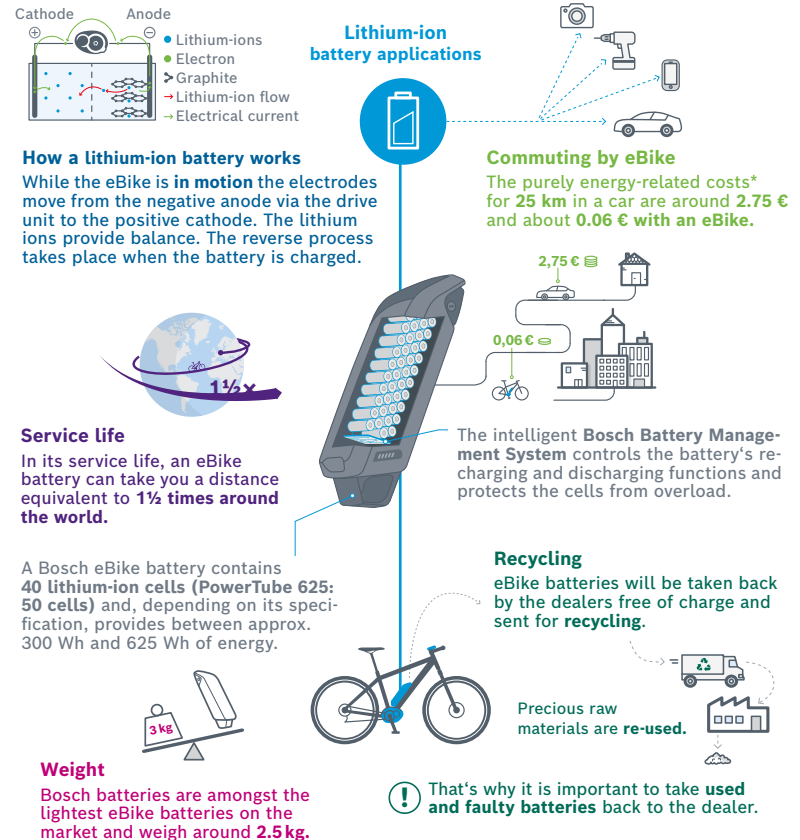
Easy to remove – Bosch batteries can be removed in just a few hand movements. The battery can therefore be charged and stored away from the eBike. This simplifies winter use, for example. Because the battery delivers less power at low temperatures, in the winter it should be stored at room temperature until just before use.

Extremely efficient – Bosch batteries represent an economic drive solution. It costs no more than 15 cents to fully charge a large PowerPack 500 (assumption: green electricity rate of 30 cents per kWh).

Competent service – Bosch batteries are well-protected and require hardly any maintenance. However, should help be needed, a competent service team is available to provide assistance.

The eBike battery

How do lithium-ion batteries actually work? Where are they used? How powerful is an eBike battery? Our infographic has all the answers.



* Petrol price: € 1.35 €/l; Green energy: 0.30 €/kWh. Thus, it only costs 15 cent to charge a battery with 500 Wh. Sources: ADAC battery test; Federal Environment Agency; Lithium-ion battery handbook

Questions & Answers

Everything you need to know about batteries

▶ **What should I do if water gets into the battery mount?**

The mount is designed in such a way that water can drain off and the contacts can dry. To ensure that this happens, the mount and plug area should be kept clean. The contacts are supplied with a coating which protects the surface against corrosion and wear. Terminal greases or technical Vaseline may also be used if required.

▶ **Can batteries be „reconditioned“?**

Some providers claim they can recondition batteries. Bosch strongly advises against this because the safety and optimum interaction with the Battery Management System cannot be guaranteed in this case. In addition, there is a safety risk and opening or modifying the battery may invalidate guarantee and warranty claims.

▶ **What happens to defective batteries?**

Heavily damaged batteries should not be touched with bare hands as electrolyte may leak out, causing skin irritation. Damaged batteries are best stored in a safe place outdoors with the connection contacts taped over before being taken to the dealer for disposal.

▶ **What are the important points in winter?**

If the eBike is not used in winter, the battery should be removed and stored as described on page 28/29. The eBike itself can also be stored outside, provided it is protected from snow and rain. The best option, however, is a garage or basement.

▶ **I have found a used battery for the Bosch eBike system online. Can I use it?**

When purchasing used batteries, always make sure that they have not been damaged by their previous owner. Damaged or repaired batteries are offered online from time to time; these pose a high risk and can lead to dangerous malfunctions. Sometimes illegal or stolen goods are available online as well. If applicable, no ownership can be acquired with such goods in a legal manner, in accordance with § 935 BGB [Bürgerliches Gesetzbuch, German civil code].

▶ **Can I use replacement batteries from other manufacturers?**

Original Bosch spare parts are the only way to guarantee your safety. The Bosch eBike system components are perfectly adapted to one another and provide maximum efficiency and safety.

▶ **Are chargers from other manufacturers safe to use?**

Bosch chargers are adapted specifically to the Bosch eBike System and have the correct software for charging and managing the Bosch battery efficiently. Using a different charger risks a shorter battery life and could cause the eBike system to malfunction.

▶ **Can Bosch batteries be opened to replace individual cells?**

Bosch eBike batteries must never be opened – not even if they are being repaired by third parties. Opening the battery always means interfering with the condition that has approved by Bosch and introduces safety-related risks. There is a risk that the Bosch eBike battery, once opened, may catch fire during assembly due to e. g. crushed or incorrectly routed cables, detached components or poor quality electrical connections due to a short circuit.

After opening, the seal of the housing can no longer be guaranteed, so that the ingress of water or dust can lead to damage to the monitoring electronics (Battery Management System) or to the cells. Here, too, there is a risk that the Bosch eBike battery could catch fire due to a short circuit.

These dangers also exist at a later point in time if an eBike battery, once opened, is used again.

For safety reasons, rechargeable batteries must generally satisfy the requirements of EN50604-1 and UN-T 38.3 if they are to be transported commercially. The test schedule according to UN-T 38.3 entails various safety tests on a prescribed number of rechargeable batteries that push the test specimens to their limits. Tests include, for example, overload tests, impact tests, short circuit tests, vibration and thermal tests, etc.

Even the simple replacement of original battery cells with apparently identical individual cells as part of a repair poses a threat to safety-relevant components. This would necessitate re-testing according to the safety test regime described above, however these tests cannot be carried out on individual repaired batteries.

Test bench measurement R200

Comparable battery performance



In addition to greater range, safety and comfort, comparability is also gaining increasing importance. In order to be able to measure the range capabilities of eBikes in a standardised way, Bosch eBike Systems has collaborated with the German bicycle industry association (ZIV) and other companies in the bicycle industry to develop a suitable test. For the first time, manufacturers, dealers and customers can objectively compare the range of different eBikes with the “standardised range test R200”.

Same conditions for unique values

In field tests regarding the eBike range, the results so far depend heavily on the rider and the external conditions, such as total weight, tyres, air pressure, surface & weather, etc. The R200 measurement method compares the performance of eBikes by measuring at a uniform support factor of 200 % (hence: R200). This means that the tested drive system provides support of 140 watts with an average rider performance of 70 watts. This corresponds to a medium-to-high support factor.



R200 provides practical comparability

For an objective comparison, R200 also sets values for speed (20 kilometres per hour) and cadence (60 revolutions per minute). For other factors such as weight, terrain, surface, starting frequency and wind conditions, typical example values were set. The defined parameters represent the mean values for real riding conditions and thus render the standard highly practical. At the end of the test we have a concrete indication of how many kilometres an eBike will travel under these standard conditions. Due to different frame and bike specifications, manufacturers need to test each model individually using the R200 method.

R200 is carried out in qualified laboratories – the operator simply needs to enter the values of the requirements catalogue. The first manufacturers have already commissioned Velotech and the ETI at the Karlsruhe Institute of Technology to test the performance of eBikes according to the R200 measurement method.

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