

Battery Guide 2022



BOSCH

Invented for life

THE eBIKE BATTERY GUIDE

FEEL THE FLOW

Bosch eBike Systems | NZ

[Bosch-ebike.com.nz](https://www.bosch-ebike.com/nz)

Contents

In short

PowerPacks and PowerTubes are the energy sources for Bosch eBike systems. Useful tips on how to determine and optimise their range, efficiency and service life are provided on the following pages, as well as pointers on safety and handling.

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Lithium-ion batteries

Everything you need to know about eBike batteries



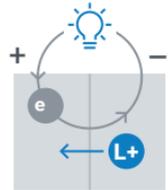
Areas of application

Lithium-ion batteries are used in smartphones, cordless screwdrivers and electric cars as well as eBikes.



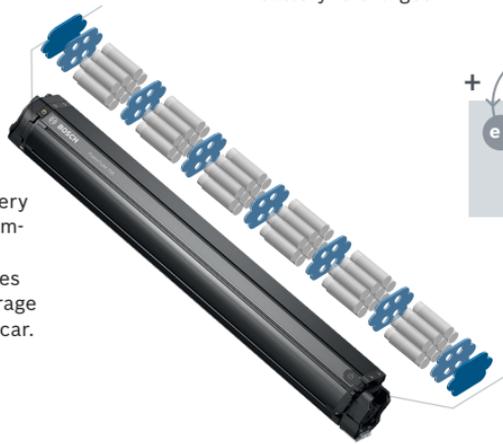
How it works

A lithium-ion battery generates the electromotive force by displacing lithium ions. While the eBike is in motion the electrodes move from the negative anode via the drive unit to the positive cathode. The lithium ions provide balance. The reverse process takes place when the battery is charged.



Engineering

A common eBike battery contains 40-60 lithium-ion cells. In terms of cell volume, 130 eBikes correspond to an average of about one electric car.



Costs



The cost of filling the tank of a passenger car is approx. €65 - the full charge of an eBike battery costs only 15 cents*. Thus, 433 eBike battery charges cost as much as filling the tank once.

Service life

In its service life, an eBike battery can take you a distance equivalent to up to 1½ times around the world.



Recycling



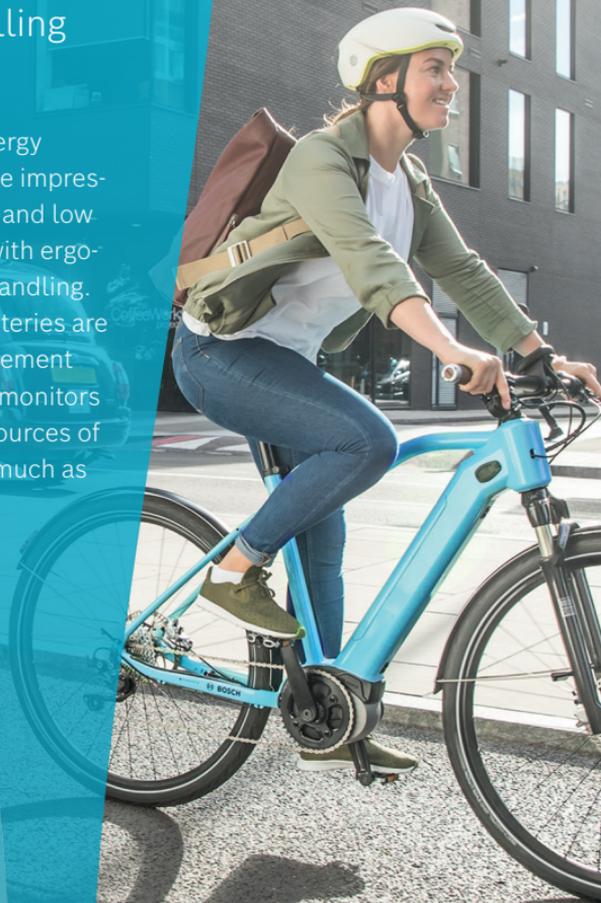
eBike batteries will be taken back by dealers free of charge and sent for recycling. Depending on the recycling process for a specific region, over 80% of the precious raw materials can be recovered and recycled.

* Petrol price: € 1.35/l on average; Green energy: 30 cents/kWh. Thus, it only costs 15 cents to charge a battery with 500 Wh. Sources: ADAC battery test; Federal Environment Agency; Lithium-ion battery handbook

BOSCH BATTERIES AND CHARGERS

More energy for travelling

Bosch batteries provide the energy source for eBikes. They combine impressive mileage, a long service life and low weight (approx. 2.5 to 4.4 kg) with ergonomic design and convenient handling. The high-quality lithium-ion batteries are equipped with a Battery Management System (BMS): It continuously monitors the battery, detects potential sources of error and protects the cells as much as possible from overload.



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

Bosch batteries with lithium-ion cells can be charged quickly irrespective of your charge level at any time. Interruptions of the charging process do not harm the battery. Complete discharge is not required.

▶ Extremely low self-discharge

Even after long periods of storage, e. g. storage during winter, the battery can be used without recharging. For longer storage, a charge status of approx. 30 to 60% is recommended as is charging after a longer period in storage.

▶ Long service life

Bosch batteries are designed for lots of trips, miles and years of service. The intelligent, electronic Bosch Battery Management System (BMS) protects against excessive operating temperatures, overloading and deep discharge. The BMS checks every cell, extending the life of the 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 simple hand movements. The battery can therefore be charged and stored away from the eBike. This simplifies use, for example when using in the winter. As the battery delivers less power at low temperatures, in winter it should be stored at room temperature until shortly before setting off on a ride.

▶ Extremely efficient

Bosch batteries represent an economical drive solution. It costs no more than 15 cents to fully charge a PowerPack 500 (based on a 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.

Bosch batteries

Powerful in every design



Frame battery

PowerPack Frame

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



PowerPack 300
PowerPack 400
PowerPack 500



Integrated battery

PowerTube

Stylishly elegant: There are two versions of the PowerTube: horizontal or vertical. Both are installed by the manufacturer according to the eBike's specific design. Available in 400, 500 or 625 versions. There is a PowerTube with 750 Wh for the smart system.



PowerTube 400
PowerTube 500
PowerTube 625
PowerTube 750*



PowerPack 300
PowerPack 400
PowerPack 500



Rack battery

PowerPack Rack

Comfortably convenient: On step-through models, the rack battery frees up space and allows the rider to mount and dismount safely. Available in three variants: 300, 400 or 500.



2 x PowerPack
2 x PowerTube
PowerPack + PowerTube



DualBattery

DualBattery

Double the power: Combining two Bosch eBike batteries provides an energy content of up to 1,250 Wh.**

* Only available with components of the smart system.

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

Bosch chargers

Reliable power sources



Bosch chargers are handy, lightweight and robust. Wherever your journey may take you: The 2 A Compact Charger, the 4 A Standard Charger, the 6 A Fast Charger* and the 4A Charger for the smart system, supply Bosch eBikes with power quickly and reliably. All Bosch chargers work quietly and are suitable for all battery types. They also feature a practical velcro fastener for stowing the cable tidily.





Compact Charger

The faithful companion: The Compact Charger is the ideal charger for all eBikers who are constantly on the move. It weighs less than 600g 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, Australia and New Zealand with mains voltages of 100 to 240 V with a corresponding adapter.



Standard Charger

The all-rounder: The robust and functional Standard Charger features a unique balance between performance, size and weight and is suitable for every possible use.



Fast Charger

The fastest choice: The Fast Charger is the fastest Bosch eBike charger and will recharge a Bosch eBike battery in the shortest possible time. 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.



4A Charger (smart system)

Compact: As a small and lightweight charger, the 4A Charger is ideal when on-the-go and charges the PowerTube 750** in a short space of time.

* Charging current is limited to 4 A for the PowerPack 300 batteries.

** Only available with components of the smart system.

Charging times

As fast as you like



The charging time depends on the capacity of the battery and the charger type. The graphics below show how quickly the various batteries can be charged with a particular charger.





 <p>PowerTube 625</p>	 <p>DualBattery 1250**</p>	 <p>PowerTube 750***</p>
 <p>approx. 8.8 h approx. 4.2 h</p>	 <p>approx. 17.6 h approx. 8.4 h</p>	 <p>approx. 6 h approx. 2.3 h</p>
 <p>approx. 4.9 h approx. 2.1 h</p>	 <p>approx. 9.8 h approx. 4.2 h</p>	<p>The smart system</p>
 <p>approx. 3.7 h approx. 1.4 h</p>	 <p>approx. 7.4 h approx. 2.8 h</p>	

* Charging current is limited to 4 A for the PowerPack 300 batteries.

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

*** Only available with components of the smart system.

RANGE

What is the range of a single battery charge?

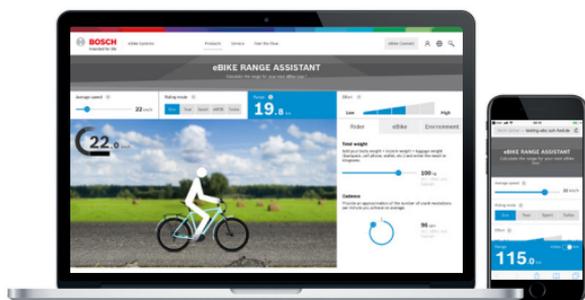
This is a common question for many eBikers. There is no definitive answer. The number and variety of influential factors is simply too great. Sometimes a single battery charge will take you less than 20 kilometres, while at other times it will take you much further than 100 kilometres. However, following a few tips can easily help maximise the range of the battery.



The Bosch Range Assistant

Easier planning

The range of Bosch batteries depends on numerous different factors. Range is influenced by the rider and the chosen support mode, as well as the drive unit 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** tool makes it possible to estimate typical range under various parameters. The online tool will show important information regarding battery range in a visually appealing way.

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



Product line ranges

Extending your range

The range graphs show how far the product lines can get with different batteries under favourable conditions (average value of all support levels). The range will be reduced in difficult conditions.

			
		Favourable conditions*	Difficult conditions*
 Rider	Cadence	50–70 rpm	70–90 rpm
	Total weight (Total 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
 eBike	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
 Environment	Surface	Mainly dirt tracks and off-road trails	Dirt tracks and off-road trails (e. g. trail biking)
	Starting up frequency	Trip involving occasional standing starts	Trip involving frequent standing starts
	Wind conditions	Slight wind	Moderate wind

Active Line



Active Line Plus



Cargo Line



Performance Line Sport



Performance Line



Performance Line Speed



Performance Line CX

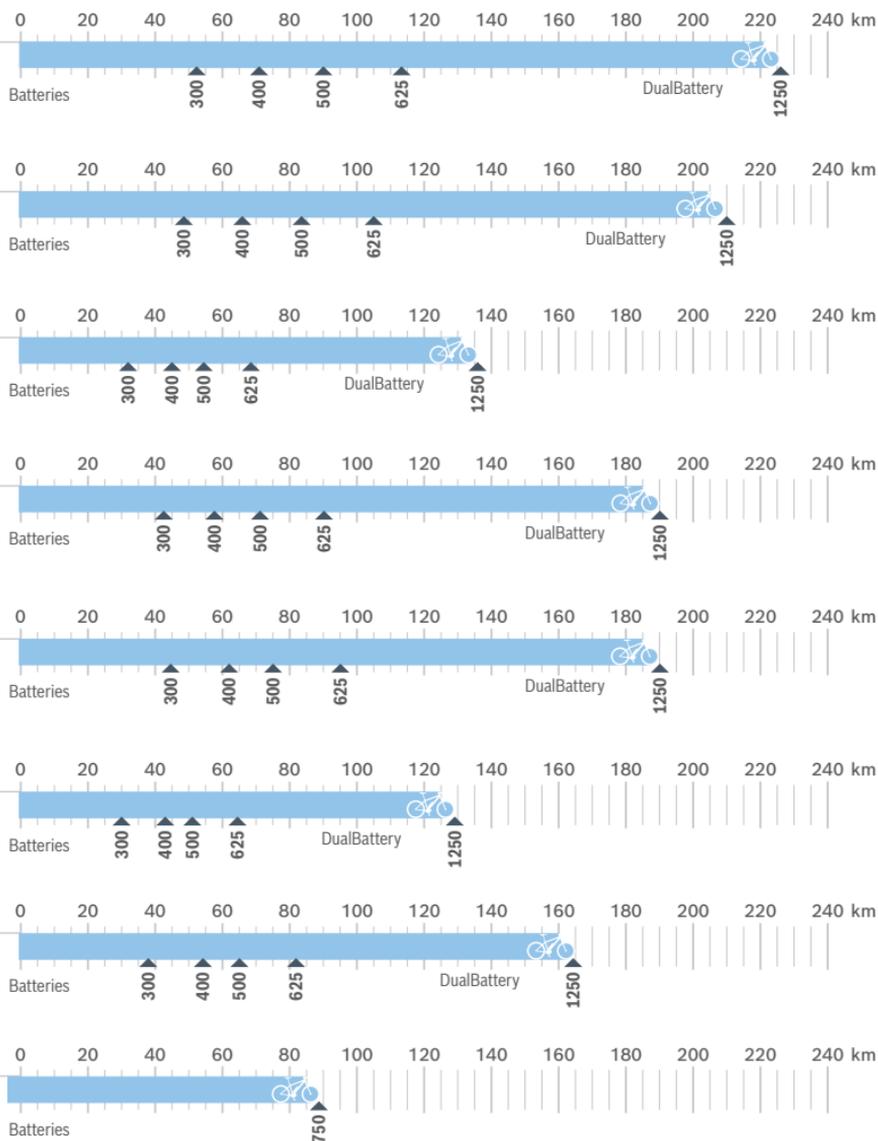


Performance Line CX



The smart system

Range of the various Bosch batteries in mixed mode**



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

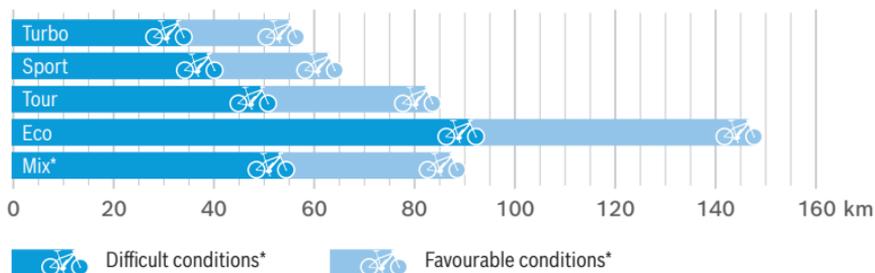
** Average of combined use of all modes and favourable conditions.

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 different riding modes is available. 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 motor with PowerPack 500 or PowerTube 500 taking into account mixed riding modes



* Definitions of conditions: see Page 14. The ranges are typical values of new batteries, which may vary if one of the conditions listed changes.

Overview of riding modes



Turbo

Maximum power right up to the highest cadences for steep ascents.



Sport*

Powerful support for universal use – both in sporty riding as well as fast commuting in the city.



eMTB*

Dynamic support for a natural riding sensation and optimum control when eMountain biking.



Tour+**

Smooth incremental support for energy-saving riding and a natural riding sensation for sporty rides.



Tour**

Uniform support for rides with long ranges.



Eco

Low level support with maximum efficiency for the greatest possible range.



Off

No support (all display functions are still available).

* Depending on the eBike type, eMTB mode can replace Sport mode in the Performance Line and Performance Line CX. In eMTB mode the support level varies between Tour and Turbo riding modes.

** In the case of the Performance Line CX, Tour+ mode can replace Tour mode. In Tour+ mode, the level of support varies between Eco and Turbo riding modes.



Tips & tricks

For longer riding enjoyment

► Cadence

Cadences above 50 revolutions per minute optimise the efficiency of the drive unit. Very slow pedalling, especially in high gears, on the other hand, costs the battery more energy.

► Weight

Weight 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.

► Shifting system

Correct gear shifting also makes eBiking more efficient: It is best to start off and tackle 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 with the right 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 with the motor performance indicator of the Intuvia, Kiox and Nyon on-board computers and adapt your riding style accordingly. A longer bar indicates a higher power consumption.

► Battery & temperature

With decreasing temperature, the performance and range of a battery is temporarily reduced, as the electrical resistance increases. Therefore, in cold temperatures, a temporary decrease in the usual range is to be expected.

* Except Purion, SmartphoneHub, COBI.Bike and Kiox 300.



HANDLING, CARE AND TRANSPORT

High-tech can still be simple

Batteries are highly complex components and some simple rules and instructions should be followed for handling, caring for and transporting them. This makes it easy to handle batteries and also has a positive effect on their service life.



Charging

At home and on the road

Charging on the eBike

PowerPacks and PowerTubes are particularly easy to charge directly on the eBike itself. 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! The batteries should be charged at room temperature in a dry location where a smoke detector is installed.

Charging a removed battery

If the battery cannot be charged directly on the eBike, the Power-Pack and PowerTube can also be easily removed.



Charging while on the move

The infrastructure of charging stations for eBike batteries is now well developed in many regions.

eBikers will find an overview of the charging stations currently available at [bosch-ebike.com/tourism](https://www.bosch-ebike.com/tourism)



Removal and installation

A few simple steps

Bosch batteries are seated securely in their mounts, even when traveling over rough terrain. However, they are easily removed for storage or charging purposes: Simply open the lock and remove the battery from the mount.

Bosch batteries can also be reinserted just as easily and intuitively. Their low weight, handy dimensions and the precise fit of battery and mount make this possible. The battery engages positively in its holder and thus sits firmly in the frame or on the eBike.

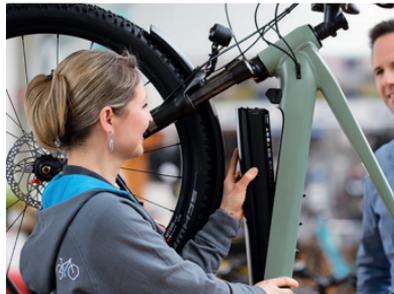
► PowerPacks

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 applicable)



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



Push the top of the battery to detach it
from the restraint support. The battery
then lowers into your hand.



Removing the battery from the frame

Inserting the battery

The battery is inserted by following
steps 1 to 5 in the reverse order.
Depending on the manufacturer, the
key must be turned (5) to insert the
battery. Finally, the battery must be
checked for a secure fit.



Care

How to increase the service life of the battery

The Bosch battery is an important component of the eBike. With the correct handling and care its service life can be lengthened.

Cleaning & care

A damp cloth is recommended to clean the battery. The plug connections should be cleaned occasionally and lightly greased. The battery should first be removed before cleaning the eBike. To protect the electronic components, the batteries must never be cleaned with a direct jet of water or high pressure hose.

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.

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 cold conditions, it is advisable to use thermal protective covers.



Service life

Tips for maximising your charge

The service life of Bosch batteries is influenced mainly by the type and duration of use. Like every lithium-ion battery, a Bosch battery also ages over time, even if you do not use it. Over time it loses capacity.



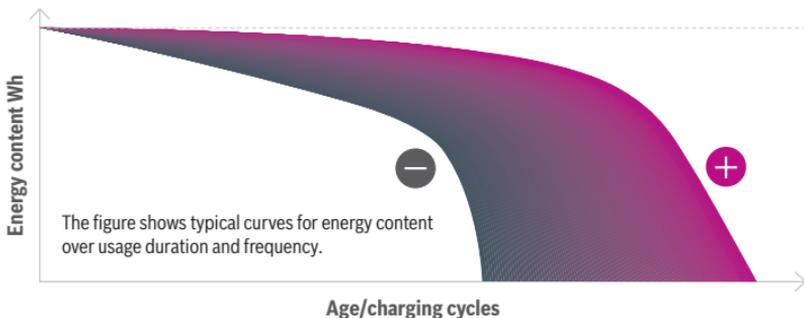
Factors that shorten the service life:

- ▶ Heavy-duty use
- ▶ Storage at over 30°C ambient temperature
- ▶ Prolonged storage in a fully charged or fully discharged state
- ▶ Parking the eBike in direct sunlight
- ▶ Regular complete "discharge" of the battery



Factors that extend the service life:

- ▶ Low load
- ▶ Storage at a temperature between 10 and 20°C
- ▶ Storage at approx. 30 – 60 % charge status
- ▶ Parking the eBike in the shade or in a cool location



Transport

Safety while on the go

Lithium-ion batteries store large amounts of energy. That's why some precautions are necessary during transport. Ideally, the battery should be set to approx. 30% discharged and only fully charged again at the destination.





By Car

If the eBike is being transported with a bike rack, remove the battery first and place it in a safe location inside the car.



By Plane

Air transportation organisation IATA has forbidden the transportation of eBike batteries on passenger planes. We recommend renting a Bosch eBike battery at your destination. You should check in advance whether the airline will transport eBikes without a battery.



By Train

In trains with bicycle compartments, there is usually no issue with carrying eBikes. You often need to get an extra bike ticket and make a reservation for the eBike. The eBike battery must remain permanently installed during the journey and must not be charged. Before starting your journey, you should contact the respective service provider for precise information on the transport conditions. In some cases, it is not possible to take them on all routes.



On commuter services and long-distance buses

On commuter services, for example on light rail services, it is often permissible to take a bike on board at regional off-peak times, provided you have purchased a bicycle ticket. It is advisable to obtain information from the relevant transport authority before travelling. The policies for transporting pedelecs on long-distance buses varies from company to company. In this case you should also enquire in good time before starting your journey.



A eBike battery is a hazardous item. **When shipping,** the special regulations of the hazardous goods law apply. It is therefore practically impossible for private individuals to ship a battery.

REPLACE OR REPAIR?

When the battery starts to run down

eBike batteries are wearing parts and all lithium-ion batteries lose capacity over time. But then what? For safety reasons, faulty, old or 'worn out' batteries should not be repaired or refreshed, but should be recycled in the appropriate manner.

Risks attached to repairing or refreshing Bosch eBike batteries

Lithium-ion batteries are complex, finely tuned systems with a high energy content. In the case of repair or "refreshing", i.e. when replacing originally installed cells with supposedly identical individual cells as part of a repair, correct function and optimum interaction with the Battery Management System can no longer be guaranteed. There is a risk that the Bosch eBike battery pack, once opened, will catch fire due to a short circuit as a result of improper repair. After opening, the seal of the housing can no longer be guaranteed. Ingress of water or dust can damage the monitoring electronics or to the cells themselves. Here, too, there is a risk that the Bosch eBike battery could catch fire due to short circuiting. These dangers also exist at a later point in time if an eBike battery, once opened, is used again.

In addition, there is a safety risk and opening or modifying the battery may void any warranty or guarantee claims. Furthermore, approval for transport and safety of the battery, which has been carefully developed and tested as a type according to international regulations, will be rendered void.

For safety reasons, batteries must pass an elaborate series of tests in which the test specimens are pushed to their load limits. Only then may the batteries be brought to market. These series tests are not feasible for an individual repaired battery due to the number of test samples required. All of this can have safety-relevant consequences.



For safety reasons Bosch strongly advises against having batteries repaired. In such cases it is necessary to replace the entire product.

RECYCLING

Sustainable use of raw materials

The CO₂ footprint of an eBike is largely determined by the production, use and recycling of the battery. The longer an eBike is used and the more trips by other means of transport it replaces, the better for the environment. To ensure that valuable raw materials can be reused at the end of their lifetime, the battery must be properly recycled.



Recycling

Once a battery has reached the end of its lifetime, it must be disposed of appropriately. We would urge the users of our eBike systems to take defective or disused batteries to their local specialist dealer, who will ensure they are disposed of in the appropriate manner. Remember: For eBikers, the return and recycling of batteries are free of charge. Appropriate recycling practices save resources and valuable raw materials are returned to the materials cycle.

Second use

Our batteries are specially designed and certified for use with eBikes. We cannot guarantee reliable operation in other application areas.

More on sustainability:
[bosch-ebike.com/sustainability](https://www.bosch-ebike.com/sustainability)



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.

► Double the protection

Each individual cell in a Bosch battery is protected by a rugged steel cup and held in a plastic or aluminium housing. This housing must not be opened. Direct impact, major shocks, dropping and excessive heat (including unnecessary direct sunlight) must also be avoided at all costs, as this could damage the battery cells and cause flammable contents to leak.

► Safe charging

In conjunction with the Battery Management System integrated within the battery, Bosch chargers protect the battery against overload during charging, as well as damage caused by extreme overcharging and short circuits. Bosch batteries are to be charged exclusively with authentic Bosch chargers because

these are designed exclusively for eBikes with Bosch drives and the components ensure a perfectly coordinated charging and discharging process. Batteries must only be charged in a dry state and must not be charged in the vicinity of heat sources or flammable materials. We recommend storage in dry, well-ventilated and 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 heat 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 removing the battery from the eBike for storage purposes and keeping it in well-ventilated rooms fitted with smoke detectors. Dry locations with an ambient temperature of approx. 20 °C are the most suitable. Bosch batteries must not be stored at below 10 °C or above 40 °C.

► Inspection

Using the Bosch DiagnosticTool, the bicycle dealer can check the status of the eBike, especially the battery, and determine the number of completed charging cycles. The CapacityTester can also be used to determine the current energy content of the battery.

► Cleaning

Cleaning with a damp cloth is recommended. To protect the electronic components, the batteries must never be cleaned with a direct jet of water or high pressure hose.



► Disposal

Used batteries must be disposed of properly at the end of their service life. All specialist bicycle dealers will accept the return of used or defective batteries free of charge and take care of their proper disposal. eBike batteries do not belong in the household waste or in ordinary battery collection containers.



Bosch eBike batteries must never be opened – not even if they are being repaired. Opening the battery always means interfering with its certified condition and entails safety risks. Further important information about safety risks and risks from battery repairs can be found on Pages 28 and 29.

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 to maintain the contacts if required.

► **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.

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

Original Bosch spare parts are the only way to guarantee your safety. Bosch eBike Systems components are precisely matched and certified as a complete system. They offer the highest level of reliability and efficiency.

► **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 Bosch batteries optimally. Using a different charger may reduce the service life of the battery or cause other damage or malfunctions in the eBike system.

► **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 possible high safety risk and can lead to dangerous malfunctions. Sometimes illegal, e.g. stolen goods are also sold online.

TEST BENCH MEASUREMENT R200

Making battery performance comparable

In order to be able to measure the range of eBikes in a standardised way for comparison purposes, Bosch eBike Systems, working in cooperation with ZIV (Germany's bicycle industry association) and other companies from the bicycle industry, has developed the 'standardised range test R200'. This will enable manufacturers, dealers and customers to compare the range of different eBikes on an objective basis.



The same conditions for transparent values

Previous test results for eBike range depended heavily on the rider and the external conditions (total weight, tyres, air pressure, surface, weather, etc.). The R200 measurement method compares eBike performance with a uniform support factor of 200% (hence the name: R200). This means that the tested drive system supports an average rider performance of 70 watts with 140 watts, which corresponds to a medium to high support factor.

R200 provides practical comparison

The result of the test is a specific indication of how many kilometres an eBike will cover under these standard conditions. However, manufacturers need to test each model individually using the R200 method. The operator simply enters the values from the list of requirements.



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