EN

OPERATING INSTRUCTIONS

ZF BIKE ECO SYSTEM

OVERALL SYSTEM

4179.700.009 2025-03-27

Table of Contents

1 Introduction

1.1 About this original operating manual

This operating manual for the ZF Bike Eco System from ZF Micro Mobility GmbH is part of the original operating instructions for the entire pedelec. It is therefore another applicable document for the entire documentation on the components of this system installed in your pedelec.

ZF Micro Mobility GmbH uses the term “pedelec” for electrically power assisted two-wheel vehicles in accordance with EN 15194:2017+A1:2023 instead of the broader term “e-bike”.

This operating manual only describes how to use the ZF Bike Eco System from ZF Micro Mobility GmbH with your pedelec. It combines the description of the CentriX motor, Core Controller, remote, color display, cable set, battery terminal M, battery, and associated BC 200 charger in one document.

This operating manual for the ZF Bike Eco System doesn’t represent complete operating instructions[1] for the use, service, repair, and maintenance of the drive system. Part of this can only be done by your dealer. Please contact your dealer. They can also provide you with further information on use and maintenance.

Therefore, also observe and read the operating instructions of the pedelec manufacturer for the entire vehicle and the instructions for additional and special equipment. Read the Safety Instructions and keep all documentation.

[1] In wider sense original operating instructions for a pedelec constitute the complete documentation for the entire life cycle of the product until it is decommissioned. These operating manual forms part of it and contain all the necessary information for the intended use by the user.

1.2 Imprint

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Responsible for technical content:

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1.3 Available languages

These overall operating instructions are available in the following languages:

DE, EN, FR

1.4 Intended use of the ZF Bike Eco System

The ZF Bike Eco System is intended for use in pedelecs (in accordance with EN 15194:2017+A1:2023). The ZF Bike Eco System with all its components may only be used in the pedelec intended for this purpose in the combination provided. Only then can a safe use of the ZF Bike Eco System be guaranteed.

Exceptions hereof are expansion options that have been tested by the manufacturer (e.g., retrofitting of lights by the authorized dealer).

A compatible smartphone with the ZF Ride app is required to access additional operating options. This app can be used to establish a Bluetooth® connection between the smartphone and Core Controller. In this way, use of further functions is enabled.

NOTE: All retrofitted consumers, especially lights, will change the energy consumption of the drive system. The safety retainer for continued operation of the lights (ZF Bike Eco System light reserve, or LRA), for the case that motor drive is already excluded due to low battery charge, must be readjusted by an authorized dealer using the dealer software. If the two-hour light duration required by the German Road Vehicle Registration Regulation cannot be achieved, the vehicle is no longer compliant!

1.5 Foreseeable misuse

The manufacturer is not responsible for any other use of the ZF Bike Eco System, e.g., when taken from the pedelec and/or in other combinations or with modifications.

Functional safety of drive system can only be warranted with original components of ZF Bike Eco System. Only original spare parts shall be used for repair or maintenance.

Unauthorized modifications also include “pedelec tuning”. The respective offers promise a higher maximum support speed. Read the tip.

- Modifications on speed sensor and related tonewheel are prohibited.
- Opening the components is prohibited.
- Don’t use the system if components are damaged.

Furthermore:

- Don’t clean the drive system with high-pressure cleaners or associated cleaning agents.

All guarantees and warranty claims on the vehicle and drive system are void if the above is not observed.

TIP: Be aware that, if you modify or change combinations of ZF Bike Eco System components, you yourself become the manufacturer of a (new) vehicle that has no certificates and no approval. You are responsible for any damage caused to you or others using the modified drive or vehicle. The insurance coverage expires. In addition, fines may be imposed if such a situation is discovered, even if no damage has been caused.

1.6 Responsibilities of the Operator

Pedelecs with the ZF Bike Eco System have the same status as bicycles in Germany, which means that children can theoretically also ride them. Even a mentally impaired person could ride it.

Although children from the age of 10 should no longer ride on the sidewalk, the general recommendation is still from the age of 14.

10-year-old children have usually already attended a traffic school and could therefore ride a pedelec in traffic, but there is no guarantee that a child or a mentally impaired person has sufficient understanding of the vehicle and its operation.

This means that “unauthorized access” occurs if a child or a mentally impaired person uses the pedelec unsupervised and without permission because it is parked in an accessible location and is neither locked nor has the drive permanently switched off.

Be aware that you are jointly responsible if this unauthorized use results in an accident. Assess your situation for the possibility of people with a lack of skills using the pedelec without authorization and lock or lock it as a precaution.

1.7 Residual risks

Even if you use the ZF Bike Eco System as intended, residual risks remain. The possibility of these residual risks cannot be excluded despite careful development by ZF Micro Mobility GmbH and the pedelec manufacturer.

These residual risks can be reduced, but not eliminated. They are unpredictable. Make yourself aware of them so that you can minimize them further through your behavior: They include the risk of injury due to unforeseeable behavior by other road users, unexpected deterioration of road conditions or hidden material defects that can impair functions.

A rechargeable battery, regardless of the technology, has a residual fire risk due to possible invisible damage inside. As electrochemical energy storage, the liquids it contains could escape and damage surfaces, for example.

Hot housing surfaces above 60 °C are avoided by power control. Up to 70°C can occur for short periods. Brief contact at 60-70°C could startle you. There is no risk of injury.

Prolonged exposure to sunlight on the display or on other surfaces of the pedelec can also cause them to exceed 60 °C.

Maintenance, i.e., through regular checks, including visual checks, is therefore of risk-reducing importance.

If malfunctions occur, remove the battery from the pedelec and disconnect the charger from the power supply. If possible, store the components outside your home and contact your dealer for the next steps.

1.8 Risk minimization through built-in safety functions

The ZF Bike Eco System is intended for pedelecs, which are defined in the EU by the EN 15194:2017+A1:2023 standard. The conformity of your pedelec with EN 15194 is verified in the EU-prescribed CE process. EN 15194:2017+A1:2023 is harmonized with Machinery Directive 2006/42/EC. As a result, their functional safety is the same as that of a “machine”.

Also, pedelecs are considered equivalent to bicycles under EU traffic laws. Their purely supportive drive may only be triggered by pedaling and may only provide maximum support up to 25 km/h with a maximum rated power of 250 W.

The EN 15194:2017+A1:2023 standard requires the presence of safety functions to enable a defined “safety performance”. This standard has been implemented in the ZF Bike Eco System. As a user, you can check that this has been fulfilled by means of the binding entry in the Declaration of Conformity of your pedelec.

Tip: As a normal user, you can support the mainly hidden and electronic security functions. Here, the “safety-related components”, e.g., the speed sensor or the entire area around the battery and its contacts, should be checked occasionally for possible damage or heavy soiling. In this way, you yourself help to maintain the safety functions and minimize the remaining risks mentioned! Please also read the Chapter Care and Maintenance!

2 Marking of Warning Notices

Failure to observe the warnings in this manual can lead to serious injury or death in certain situations.

In this manual, important information is conspicuously marked by the following symbols and different formatting:

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

A TIP provides key information to make procedures easier or clearer.

3 Safety notes

3.1 General Information

- Please read all safety instructions and information. Failure to observe the Safety Instructions and information may result in electric shock, fire and/or serious injury.
- Keep all Safety Instructions and information for future reference.
- Observe all national regulations on the registration and use of pedelecs.
- Read and observe the Safety Instructions and information contained in all instruction documents for the pedelec system and in the operating instructions for your pedelec.

3.2 Hazards during maintenance, service, and repair

The user must not perform any technical service, overhaul, or repair work on the ZF Bike Eco System. The components of the drive system may only be replaced by trained specialist personnel in your dealer's workshop.

Nevertheless, maintenance and care by the user are advisable in order to maintain functionality and detect defects quickly, usually by cleaning and occasionally regreasing exposed driving parts. For this purpose, the pedelec can remain on the ground or be suspended or placed on a platform.

Attention! During maintenance, switch off the pedelec drive system at the battery and remove the battery. Disconnect any connected chargers.

3.3 Hazards due to hot surfaces

The ZF Bike Eco System uses suitable controls to prevent temperatures above 60°C on touchable surfaces. However, slightly higher values may occur for a short time. Please note that a motor that has run hot, for example, will heat up adjacent frame parts and may startle you in case of contact. However, there is no risk of injury here.

Display and other surfaces may also exceed 60 °C during extended periods exposure to sun.

3.4 Hazards due to hot contacts

If you remove the battery after an intensive ride, the pin contacts remaining on the vehicle can reach temperatures above 60°C due to the high power. Do not touch them – allow the drive to rest and cool down.

3.5 Hazards at the start of a journey

If you set off quickly on your pedelec, the charger may still be connected to the battery. As a result, the charging plug could be torn out of the pedelec and pose a risk of open contacts.

After charging the battery, make sure to disconnect the charger from the vehicle before setting off. Unplugging the charger from the power supply is also advisable. Sometimes it's recommended to carry the charger with you. To do so, take care to disconnect it from the battery charging input.

3.6 Hazards due to the radio interface

The Core Controller is equipped with a Bluetooth® Low Energy wireless interface. Local operating restrictions, e.g., in airplanes or hospitals, must be observed.

Be careful! Using the Core Controller with built-in Bluetooth® may interfere with other devices, e.g., airplanes or medical devices such as pacemakers, hearing aids. Injury to people and animals in the immediate vicinity can also not be completely ruled out.

Do not use the Core Controller with Bluetooth® in the vicinity of medical devices, gas stations, chemical plants, areas with a risk of explosion or in blasting areas. Do not use the Core Controller with Bluetooth® in airplanes. Avoid operating the device close to your body for long periods of time.

The Bluetooth® word trademark and its logo are registered trademarks and the property of Bluetooth SIG, Inc. Any use of this word trademark/logo by ZF Micro Mobility GmbH is under license.

4 Used Technologies

4.1 Radio interface of Core Controller

The ZF Bike Eco System uses Bluetooth® technology to support maintenance, read out system data and adjust system settings.

4.2 SIMPLIFIED EU DECLARATION OF CONFORMITY

Hereby, ZF Staňkov s.r.o. declares that the radio equipment type Bluetooth® interface of Core Controller is in compliance with Directive 2014/53/EU. The full text of the EU declaration of conformity is available at the following internet address: www.zf.com/ebike/conformity .

4.3 Consumer information on data storage

The ZF Bike Eco System stores selected data to facilitate the diagnosis of malfunctions and for statistical and development purposes. Even if the sensors differ depending on system configuration, essentially drive performance data are recorded.

This data is only read out if the dealer diagnostic tool is connected. ZF Micro Mobility will never disclose this data to others, except in the cases listed below. ZF Micro Mobility can commission a contractual partner with data management. In the process, ZF Micro Mobility contractually guarantees that the data is managed in an appropriately secure manner. Disclosure takes place

- based on the user's and/or owner's consent
- if required by law
- for use by ZF Micro Mobility GmbH in a legal dispute
- for general ZF Micro Mobility surveys without personal reference

5 Function of the ZF Bike Eco System

5.1 Basic principle of drive support

The ZF Bike Eco System is an assisted drive system for pedelec. Depending on the user's pedaling force, it amplifies this force with the power of an electric motor, making it easier to ride than a conventional bicycle.

5.1.1 Application of drive system

In principle, ZF Bike Eco Systems can drive all electric pedal-assisted vehicles, mostly pedelecs. This refers to pedelecs, also known as EPACs (electrically power assisted cycles), but not to S-pedelecs, which must be type-approved.

5.1.2 Regulations for EPACs/pedelecs

According to EU standard 15194:2017+A1:2023, the pedelec or EPAC is considered similar to a bicycle and does not require a driver's license if it provides support up to 25 km/h with a rated continuous power of max. 250 W[2], and only if the user also provides his own force to propel it. A permissible exception is the push or starting assist, which provides support up to 6 km/h only using the electric motor without pedaling.

5.2 Explanation of functions

5.2.1 Control of support

In addition to pedaling force (rider torque), the level and character of the support also depends on other factors. In addition to the rider's own pedaling power, the current speed, selected support level and gear are processed during actuation within the selected support profile.

[2] The short period output of the electric motor may be significantly higher. This output is permitted.

5.2.2 Push assist

In addition, a pedelec equipped with ZF Bike Eco Systems is fitted with a push assist that allows purely electric driving up to 6 km/h at the touch of a button.

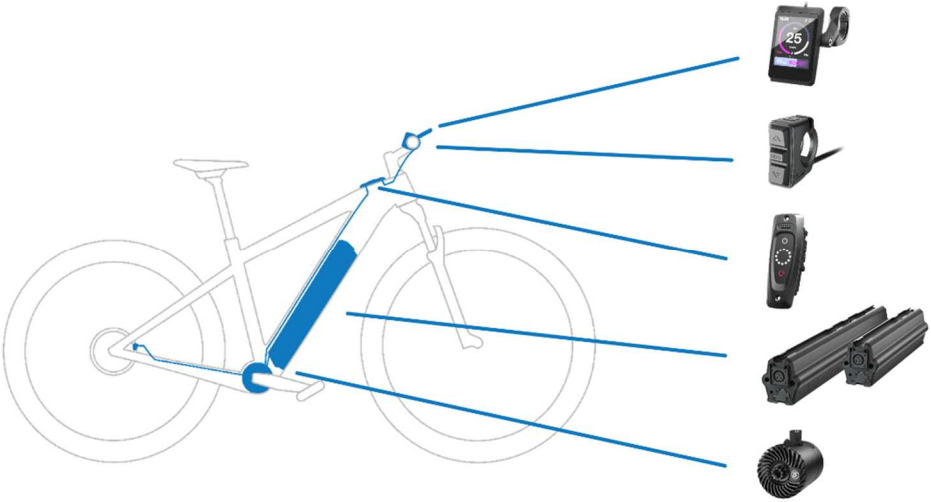
5.3 Reasons for lack of support

The ZF Bike Eco System does not support you

- if the ZF Bike Eco System is completely switched off at the Core Controller
- if the support level is set to OFF
- if you are not pedaling, but are too fast for the 6 km/h push assist
- if you are pedaling, but moving faster than 25 km/h
- if the battery does not have sufficient residual capacity for the drive
- if the ZF Bike Eco System automatically shuts down (switches off) the functions on a time-controlled basis
- if the (inserted) battery is currently being charged on the charger
- if the ZF Bike Eco System is connected to the service PC
- if you or the dealer make any changes to the default settings on the PC or display

6 Components of the ZF Bike Eco System

6.1 Overview and short description



The ZF Bike Eco System is a component kit that allows for various combinations to be used in your pedelec, depending on the requirements of the pedelec.

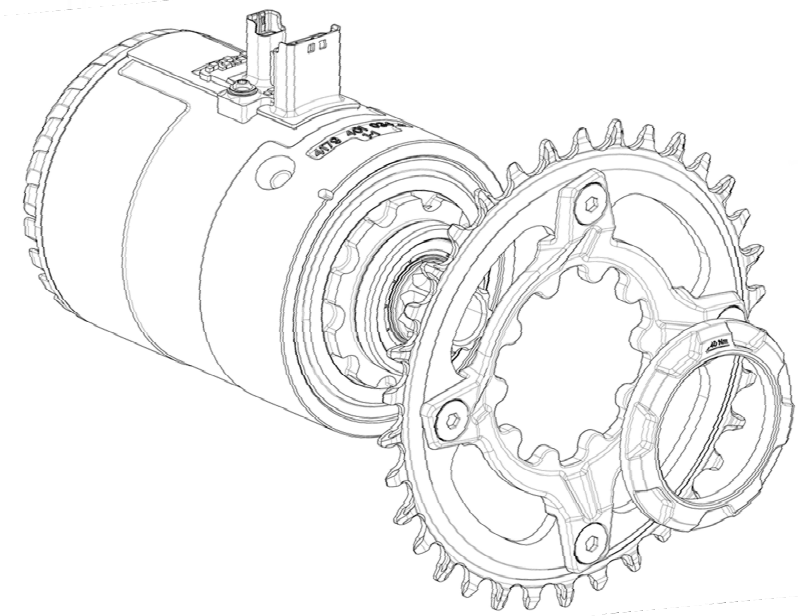
The following contains an overview of the existing components in the ZF Bike Eco System, but usually only one combination will be installed on your vehicle.

The pedelec manufacturer will determine whether the shown expansion elements such as displays can be retrofitted to your vehicle. Your dealer can request at the manufacturer.

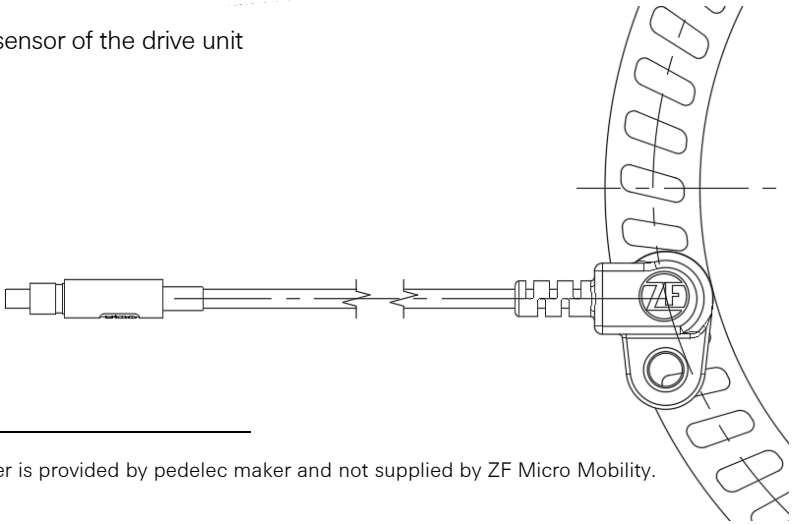
You will also find more detailed sections on the individual components in these overall operating instructions.

6.2 Drive unit and accessories

- ZF CentriX drive unit with chainring and spider[3]



- Speed sensor of the drive unit



[3] Shown spider is provided by pedelec maker and not supplied by ZF Micro Mobility.

6.2.1 Description

The supportive drive of the ZF Bike Eco System is provided by the CentriX drive unit. The drive unit is an integrated functional unit that contains the actual electric motor, a special shaft transmission, the freewheels and the electronic motor control with sensors for pedal torque[4], cadence and temperature monitoring. Another sensor at the rear wheel measures the vehicle speed.

The drive unit receives commands for the desired support mode from the Core Controller or remote on handlebar and implements them depending on the force applied to the pedals by the user.

6.2.2 Safety notes

The motor unit is normally permanently installed in the pedelec-frame by the manufacturer and is maintenance-free. Nevertheless, there is a risk of injury if you want to clean the area around the chainring or remove jammed parts such as the chain or dirt.

It is essential to de-energize the ZF Bike Eco System by removing the battery before carrying out maintenance in the chain or belt drive area.

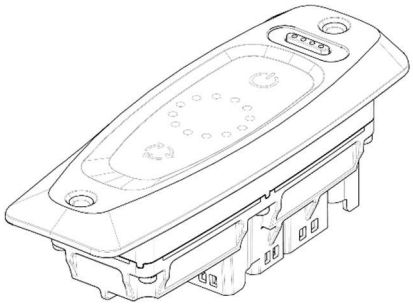
6.2.3 Warranty note

High-pressure cleaning is prohibited and will invalidate the warranty.

[4] Pedal torque is pedaling force (in newtons N) times the radius (in meters m) of the effect of this force. If the user presses the pedal with 100 N (approx. 10 kg), a radius of 0.17 m will result in a torque of 17 Nm.

6.3 Core Controller

The Core Controller is the integrated interface module of the ZF Bike Eco System. It is equipped with BLE, i.e., a Bluetooth® Low Energy wireless interface. Once activated, it offers extended functions in combination with a smartphone app.

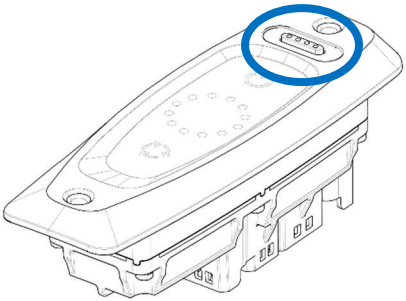


6.3.1 Description

The Core Controller is the central command unit of the ZF Bike Eco System. It combines operating functions with a wireless interface (Bluetooth) for pairing it to the ZFMM Ride app. On its top, the Core Controller features a Dataline plug connection supported by a holding magnet. This Dataline port can be used to charge smartphones, but also serves as a PC connection when using the dealer tool.

6.3.2 Dataline port

This Dataline port with holding magnet offers you as the user the option of charging your smartphone while it is attached to the pedelec. There are also connecting cables for the charging sockets of most current smartphones available. Charging is possible via USB-C and Apple Lightning, provided the ZF Bike Eco System is switched on.



Properties of the Dataline port

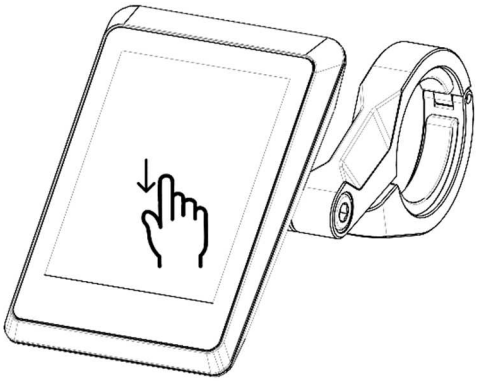
- The maximum charging power is 7.5 W. If the drive system enters light reserve mode with the battery pack almost empty, the Dataline connection is deactivated, and charging will no longer be possible.
- Recommended plugging sequence after accidental disconnection of the magnetic connection: First connect the Dataline port to the Dataline connecting cable, then plug in the smartphone.
- Before connecting ensure that the connection is clean and dry.
- Do not charge while cycling in the rain. The contacts could short-circuit. Electronic corrosion protection ensures that the Dataline connection is switched off. After standstill, dried-out contacts and system OFF/ON, charging will be possible again.

6.4 Handlebar operating elements

The remote is the handlebar operating element with function buttons.

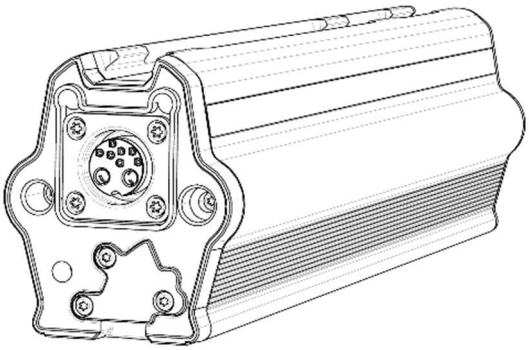
6.5 Display elements

The color display is the multifunctional handlebar display module with “touch” function

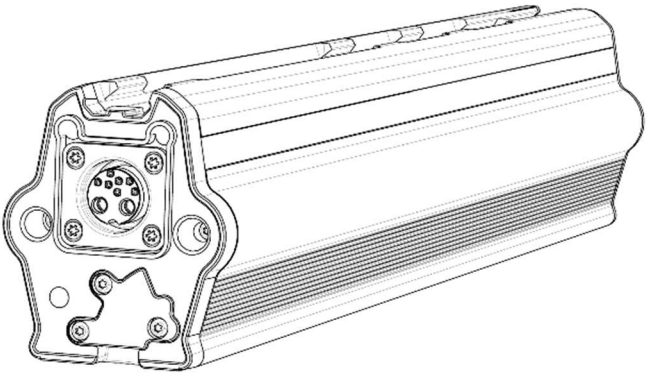


6.6 Batteries

There are currently two batteries with different capacities available for the ZF Bike Eco System, both of which fit into the same battery holder, battery terminal M.



- Battery SI 504 with 500 Wh

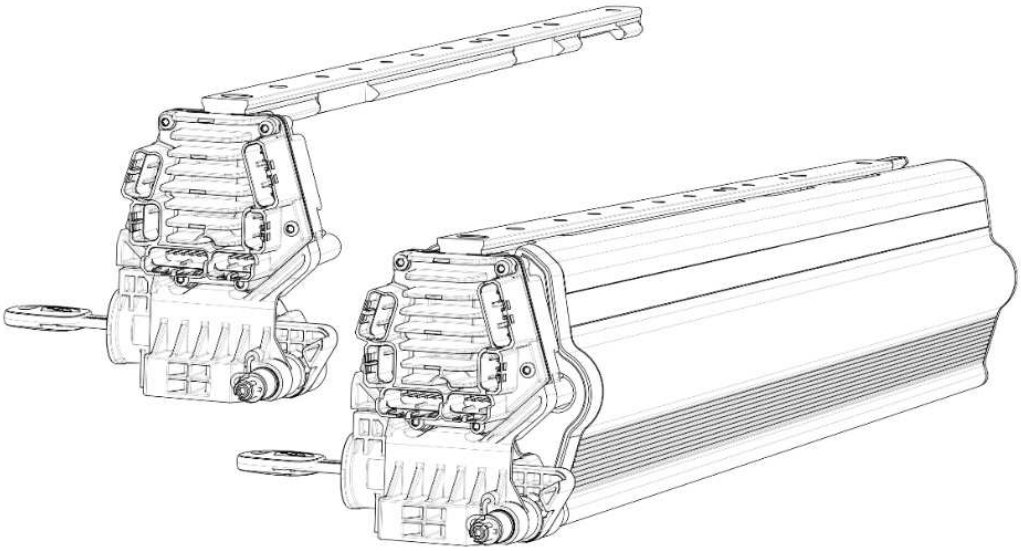


- Battery SI 756 with 750 Wh

6.7 Battery terminal

Battery terminal M contains the battery rail, the plug interface module with rear-light output and the lock mechanism.

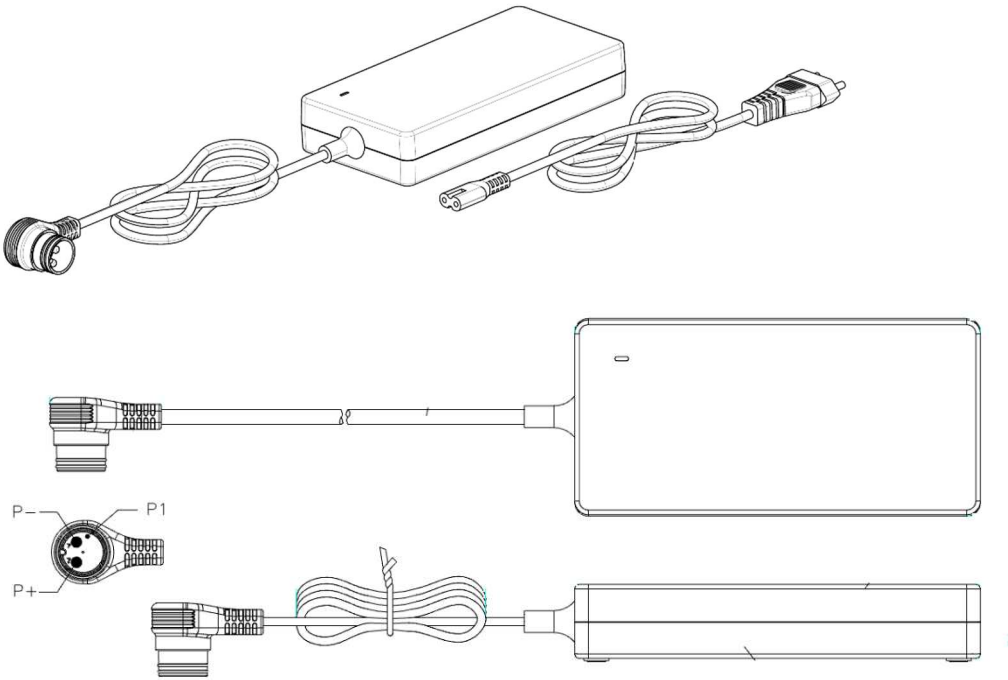
- BT-M for SI 504 and SI 756 batteries



6.8 Charger

BC 200 is the standard charger of the ZF Bike Eco System and delivers a charging power of 200 W.

- BC 200



Further technical data on the individual components can be found at the end of this manual in the chapter of the same name, “Technical Data”.

6.9 Wiring harness

Wiring harnesses are partly available in varying lengths

- Discharge cable for battery terminal / motor unit (battery variants)
- Frame charging input for wiring harness (length variants)
- Data bus cable between battery terminal and Core Controller
- Diagnostic cable with magnetic plug between Core Controller and service PC
- Charging cable with magnetic plug between Core Controller and mobile device (variants)

7 Batteries of the ZF Bike Eco System

These instructions give you an overview of the basic functions and Safety Instructions for handling the battery as part of the system, which you must strictly observe. For more detailed information on operation, please also read the operating instructions supplied with your pedelec. You can obtain these from the manufacturer of the vehicle.

The terms “battery” and “rechargeable battery” are synonymous. “Rechargeable battery” indicates that a battery can be recharged.

7.1 Designated use

The use of this rechargeable battery is exclusively intended for the power supply of compatible systems from ZF Micro Mobility GmbH and may not be used for other purposes. This battery is qualified for Pedelecs following EN 15194:2017+A1-2023. The battery is safe to operate when delivered.

ZF Bike Eco System contains SI 504 and SI 756 battery models.

7.2 Technical Data

Battery		SI 504	SI 756
Supply voltage	V	48	48
Nominal capacity	Ah	9,8	14,7
Energy	Wh	500	750
Operating temperature	°C	-10 … +40	-10 … +40
Storage temperature	°C	0 … +20	0 … +20
Charging temperature	°C	0 … +45	0 … +45
		IP 55	IP 55

7.3 Safety notes

Please read all Safety Instructions and information before using the rechargeable battery or charger. Non-compliance or omissions can cause serious injuries, electric shock and fires.

Please keep these instructions in a safe place for the duration of the useful life of the rechargeable battery.

This comprehensive list ensures that you can use the battery without any problems

- Always observe the following instructions to avoid burns or other injuries caused by leaking liquids, overheating, fire or explosions.
- Contact the point of sale or a bicycle dealer if you require further information on the use or assembly of the products that is not contained in the operating instructions.
- The following notices must be observed at all times to avoid personal injury and damage to devices and the environment.
- Only use the charger intended for this purpose to charge the rechargeable battery and follow the specified charging conditions. Failure to do so may result in overheating, swelling or ignition of the rechargeable battery.
- Do not clean the rechargeable battery with a high-pressure water jet.
- Do not connect the (+) and (-) pins or other contacts to metal objects. Do not transport or store the rechargeable battery together with metal objects such as necklaces, hairpins or metal shavings. Short circuit, overheating, burns or other injuries may result.

- The rechargeable battery and charger may not be deformed or opened. The application of soldering tin is prohibited.
- The rechargeable battery may not be subjected to mechanical shocks, as this can result in damage to the battery.
- Keep the rechargeable battery away from heat. Do not heat the rechargeable battery or throw it into a fire.
- Do not store the rechargeable battery near heat sources such as heaters, vehicles, or other dangerous places.
- Do not store the rechargeable battery in direct sunlight or in places with high temperatures where the battery can become excessively hot (e.g., in a car). Keep the rechargeable battery away from heat and open flames as these could cause the battery acid to leak.
- Do not store or charge the rechargeable battery near flammable materials. The heat generated during charging creates a fire hazard.
- Avoid exposing the rechargeable battery to large temperature fluctuations.
- To avoid electric shock, never unplug a wet plug and do not insert the plug if it is wet.
- If moisture gets into the plug, dry it before plugging it in.
- Do not immerse the battery in water and make sure that the battery contacts do not get wet. Failure to do so may result in overheating, swelling or ignition of the rechargeable battery.
- Do not charge the rechargeable battery in wet or very damp places or outdoors.

- Do not use the rechargeable battery if it is leaking, discolored, deformed, or has any other abnormalities.
- Do not use alcohol, solvents, or abrasive cleaning agents to clean the rechargeable battery or charger. Please only use a dry or slightly damp cloth for cleaning.
- The rechargeable battery may not be punctured, crushed, or damaged.
- Do not use the rechargeable battery if it is damaged on the outside.
- Observe the enclosed specific disposal instructions for the battery system.
- Use both hands to carry the battery to avoid injury and other hazards.
- If an error occurs during charging or discharging, stop using the rechargeable battery immediately and look up the error message in the pedelec operating instructions. If you are not sure, please contact the point of sale or a bicycle dealer.
- If the rechargeable battery does not start charging within one minute of connecting it to the charger, please unplug the charging cable and plug it in again. If this measure does not help, please contact the point of sale or a bicycle dealer.
- If the rechargeable battery swells or starts to smoke, please inform the fire department immediately, carefully remove other batteries if possible, and evacuate all persons from the danger zone.

- Keep the rechargeable battery away from children; playing with the rechargeable battery is strictly prohibited. Improper use can lead to serious injury or even death.
- This battery is not intended for use by persons (including children) with reduced physical, sensory, or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the system by a person responsible for their safety.

7.4 Behavior after contact with battery acid

- Battery acid can irritate your eyes and damage your body.
- If symptoms appear to have been caused by ingestion or inhalation of combustion gases or by contact with skin or eyes, seek medical attention.
- **After eye contact:** Rinse the eye carefully with plenty of water (for at least 15 minutes) and seek medical attention.
- **After ingestion:** Seek medical attention immediately; in addition, you can contact the poison control center.
- **After inhalation:** Leave the danger zone immediately and get some fresh air. Seek medical attention.
- **After skin contact:** Remove solid particles immediately, rinse affected areas with plenty of water (for at least 15 minutes). Remove contaminated clothing immediately and seek medical attention.

7.5 Battery use/operation

- Check the rechargeable battery for damage before charging or using it for the first time.

- Do not use the battery immediately upon receipt. Please charge the rechargeable battery before the first ride as it is not fully charged at the time of purchase. Charge it with the provided charger before using it for the first time. The battery can be used when the LEDs on the housing light up.
- Only use the BC 200 charger intended for this purpose to charge the rechargeable battery. Press the power button to switch on the battery. If no LED lights up, the rechargeable battery may be damaged. Do not use a defective rechargeable battery and please contact the point of sale or a bicycle dealer.
- Before removing or reinserting the battery, switch off the battery or the ZF Bike Eco System completely.

7.6 Battery LED Indicator

The rechargeable battery has three LEDs for indicating the battery's state of charge and error messages. All statuses can be found in the following table.

LED Legend
● LED on
● LED flashing at 1 Hz
○ LED off
◌ LED flashing at 2 Hz

Fehler	LED display
Battery failure	◌ ◌ ◌

Battery charge level	LED display
66 – 100 %	● ● ●
33 – 65 %	● ● ○
1 – 32 %	● ○ ○
0 %	◌ ○ ○

Battery charging at %	LED display
66 – 100 %	● ● ●
33 – 65 %	● ● ●
1 – 32 %	● ○ ○
0 %	◌ ○ ○

7.7 Operating temperature ranges

The operating temperature ranges for the battery are listed below. Please do not use the rechargeable battery at temperatures outside these temperature ranges. If the rechargeable battery is used at temperatures outside these ranges, injuries or fires may occur.

Only charge the rechargeable battery between **0°C and 45°C**

Only use the rechargeable battery between **–10°C and 40°C**

The rechargeable battery must be charged at ambient temperature, on a non-flammable and dry surface, away from heat sources, moisture, or flammable materials.

If the rechargeable battery has been charged in an environment with low temperatures, the maximum cycling distance per full charge is reduced. As soon as the battery is fully charged at room temperature, it has reached its normal battery capacity again.

The battery will not charge at temperatures below **0°C** and above **45°C**.

7.8 Safety Instructions for charging

- Only use the charger intended for this purpose for charging, otherwise any guaranteed rights will become void.
- Make sure that the charging port and the plugs are always dry and clean before connecting the charger.
- If you do not need the charging port on the bicycle, please cover it with the dust cover to prevent dirt from getting into the contacts.
- Check the cable and the power plug for damage before plugging them in. If you notice any damage, please replace the power cable.

- To avoid electric shock, only touch the charger with dry and clean hands. Also ensure that the charger is not exposed to moisture.
- Please do not cover the rechargeable battery and charger during charging.
- The rechargeable battery may not be charged while unattended.
- Take care not to charge the rechargeable battery in direct sunlight.
- If a lightning storm is imminent, disconnect the charger from the power source and stay away from the charger and other metal parts.
- It is recommended to wait one hour after the last ride to charge the rechargeable battery. The temperature of the rechargeable battery could be increased due to the ride.
- Do not charge the bicycle outdoors or in an environment with high humidity and do not expose it to wind or rain.
- To avoid damaging the cable, do not pull on the cable, but use the plug to plug it in and unplug it. When carrying the charger, make sure that you do not pull on the cable and avoid crushing the cable, e.g., by wrapping the cable around the charger.
- It is recommended to charge the rechargeable battery in a room with a smoke detector system.
- Continuous charging is not recommended for the service life of the battery cells.

7.9 Notes on storage

Keep the rechargeable battery in a clean, safe place. Keep the rechargeable battery out of the reach of children and pets. Avoid storing the rechargeable battery at elevated temperatures; storage at elevated temperatures can lead to fires and injuries. Ensure that the storage location of the rechargeable battery is well ventilated.

Recommended storage temperature: **0°C to 20°C.** Store the rechargeable battery or the bicycle with the built-in rechargeable battery in a cool place where it is not exposed to direct sunlight or rain. If the storage temperature is too low or too high, the performance of the rechargeable battery will be reduced, and its operating time shortened. Please note that the temperature inside the bicycle frame may be higher than the ambient temperature.

Avoid temperatures below **-10°C** and above **+45°C**.

If you want to use the rechargeable battery after a long storage period, you must charge it before use. If you do not plan to ride the bicycle for a longer period, store it with the rechargeable battery showing a battery capacity between approx. 30%-70% (2-3 LEDs on the battery indicator). In addition, charge the rechargeable battery every three months to make sure that it is not fully discharged.

7.10 Notes on disposal

The rechargeable battery must not be disposed of with household waste. Take the battery to be recycled back to the point of sale or to a bicycle dealer. Lithium-ion batteries are recyclable, valuable resources. In accordance with Directives 2012/19/EU and 2023/1542, rechargeable batteries that are no longer usable must be collected separately and recycled in an environmentally friendly manner.

Rechargeable batteries, accessories and packaging should be sorted for environmentally friendly recycling. If you are not sure, contact the point of sale or a bicycle dealer.

7.11 Guarantee conditions

Please charge the rechargeable battery to approx. 70% capacity at least every three months, even if the bicycle is not in use. If the rechargeable battery is completely discharged, recharge it as quickly as possible to ensure that battery capacity is maintained. If the battery is not recharged immediately, its battery capacity can deteriorate and, in the worst case, become unusable.

The products are not protected against natural wear and tear and deterioration due to normal use and aging.

The service life of the rechargeable battery depends on factors such as the manner of storage, the environment, the conditions of use and the individual battery characteristics.

Do not open the rechargeable battery or remove any associated parts, including the label, as these actions will invalidate the guarantee.

For return information, please contact the point of sale or a bicycle dealer.

The battery comes with a two-year warranty. During this period, any defects that are demonstrably due to material defects or manufacturing defects will be remedied by replacing or repairing the defective parts. ZF Staňkov s.r.o. reserves the right to choose the method of remedying defects.

7.12 Inserting the battery

Please don't use the rechargeable battery immediately after shipping. Only use the rechargeable battery after it has been charged using the charger provided.

Insert the rechargeable battery into the down tube with the contact side facing the motor. The rechargeable battery must be inserted into the rail provided for this purpose (see Figure 1). After insertion, the rechargeable battery must be guided parallel to the rail in the direction of the contacts.

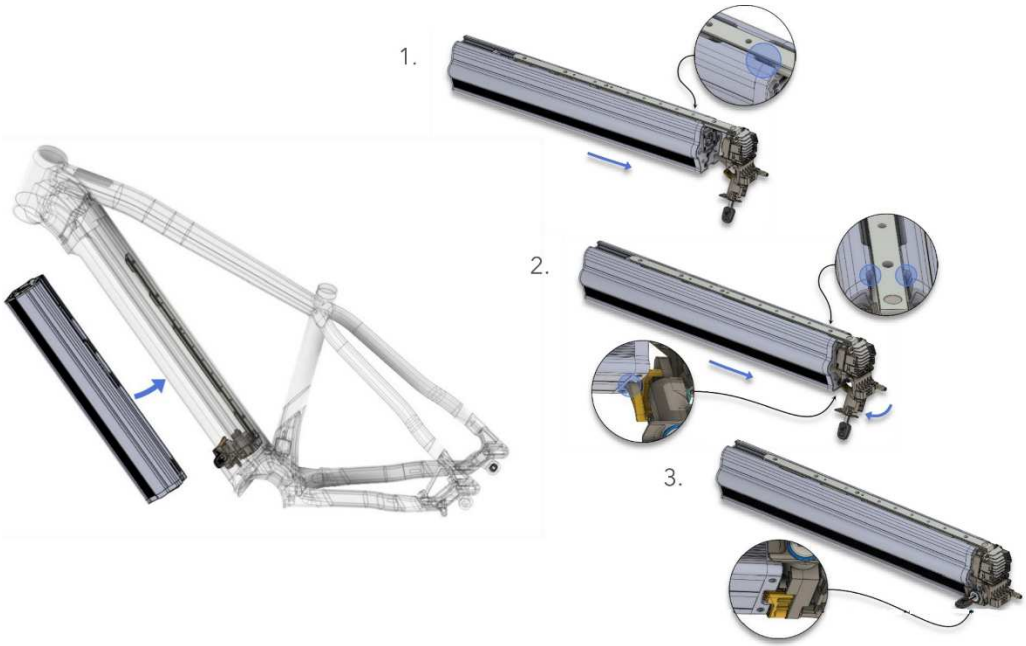


Figure 1: Inserting the rechargeable battery

SI 504 and SI 756: Then latch the locking system in using the release lever and lock it with the key.

Safety instructions:

There is a risk of pinching your fingers when inserting or removing the battery. Perform the movement carefully. The risk increases if there is dirt on the battery or battery holder. Keep them clean.

7.13 Removing the rechargeable battery

The system must be switched off before removing the battery.

SI 504 and SI 756: To remove the rechargeable battery, first remove the cover and then open the battery lock. Grip the battery with one hand and open the release lever with the other hand by pushing it downward. Make sure to only hold the rechargeable battery in the grooved area, otherwise there is a risk of crushing your fingers. As soon as the lock is open, the rechargeable battery can be pushed upward. When removing the rechargeable battery, take care to grip it firmly so that it does not fall out of the frame.

7.14 Updates

Please note that the battery can be updated to the latest software version via the app or by your bicycle dealer.

7.15 Transportation

Rechargeable batteries that are not defective can be transported privately without any further restrictions.

If the rechargeable battery is transported commercially by forwarding agent or airplane, the packaging must be labeled accordingly. Further national regulations may have to be observed.

Only send fully functional rechargeable batteries. Damaged rechargeable batteries must be transported separately; consult a dangerous goods expert or contact the point of sale. Tape the contacts for transportation and pack the rechargeable battery securely in the original packaging.

If you have any further questions about transportation, please contact the point of sale or a bicycle dealer.

7.16 Declaration of conformity

The declaration of conformity of batteries SI 501 and SI 756 batteries can be viewed on the following page: https://www.zfmicromobility.com

CE

8 State of Charge and Range

To use the drive support provided by the ZF Bike Eco System, the battery must be sufficiently charged.

Frequent charging is generally not a problem with lithium-ion batteries, but it is not recommended to leave the charger connected to the battery for long periods of time. Observe the charging process!

When it is advisable to disconnect the charger after a few hours, for example, is explained in more detail in the chapter “charger”.

8.1 Charging options

ZF Bike Eco System batteries can be charged separately or while inserted in the vehicle.

Your ZF Bike Eco System powered pedelec comes with the corresponding BC 200 charger. This charger can be used to charge the battery directly while removed or via a charging port on the frame while inserted.

Only use this BC 200 charger, otherwise the battery may be damaged. If the charger appears defective or its function appears to be impaired, stop using it immediately and contact your dealer for further steps to obtain an original replacement charger. It is imperative that you stay safe!

8.2 Charging strategy

When using a new battery or a new ZF Bike Eco System powered pedelec for the first time, fully charge the battery once.

Observe whether the charging process runs smoothly and contact your dealer if anything is unclear. There is electric energy involved.

The indicators on the BC 200 charger and battery show when the battery is fully charged.

In most cases, it is also advisable to charge the battery to 100% after each use, e.g., if you frequently make journeys of more than 15 km. For frequent short trips < 5 km, it is important to consider whether recharging is necessary each time. For the best service life, a lithium-ion battery prefers a state of charge of 90% rather than being kept at 100% permanently.

You can run the battery flat, i.e., until only the lights can be switched on. No damage arises. Please recharge before prolonged non-use.

You will quickly get to know the average range for your personal use case and may alternatively be able to use up the battery capacity, i.e., the stored energy, spread over a few days of use.

8.3 Evaluating the existing battery capacity

The available battery capacity, i.e., the amount of energy currently remaining for the possible riding distance with it (remaining range) must be estimated depending on your individual use.

The consumption per kilometer depends on several factors. Just as with motor vehicles, it can easily rise to four times of the lower value, for example, if you are riding up a steep hill.

8.4 Remaining capacity for the pedelec lighting system

At the end of the discharge, the remaining capacity can no longer be used for the motor but can be used for a standard pedelec lighting system. According to the standard, at least 2 hours must be ensured for the safe journey home.

This is called the light reserve area (LRA)

8.5 Your influence on the range

The level of support selected by the ZF Bike Eco System has a direct influence on the achievable range with the given battery capacity and its state of charge (available amount of energy). The support provided by the electric motor can be used more or less economic.

8.5.1 Cases in which range will decrease noticeably

- If you switch to the higher support level more frequently than usual
- If you are riding fast for the most part (up to 25 km/h)
- If the total weight of the rider or luggage is higher than usual
- When riding with children on a pedelec or in a child trailer
- When the road surface is poor and rough
- If many starts and stops are required on the route.
- If frequent acceleration is required
- If there are steep climbs on the route
- When riding with support in a strong headwind.
- When riding in cold weather
- If the battery is aged to a certain degree
- When riding with a probably strong front light switched on
- If the tire pressure is too low
- If the chain runs poorly, i.e., not smoothly.
- If the brake is not well adjusted and, for example, is constantly dragging and thus having a constant braking effect.

8.6 Influence of optional consumers

Your pedelec with the ZF Bike Eco System can optionally be equipped with additional consumers that will draw increased power from the battery. E.g. front light consumption varies widely. Take this consumption into account when evaluating the remaining range shown on the display and use your own experience.

Tip: When using a powerful front light with high beam function, you can switch off the high beam manually at the end of the battery discharge as a precaution.

8.7 Accuracy of the remaining range

There is no fixed correlation between the remaining battery capacity and the kilometers that can be traveled with support. Why?

As with heavier vehicles (cars), the consumption per unit of distance can vary greatly. For electric vehicles and pedelecs, the comparable figure to *liters per 100 km* is *watt-hours per kilometer*. While the best values for electric cars with a total weight of over one ton are around 140 Wh/km and can easily rise to four times this value, values between 7 and 25 Wh/km are typical for pedelecs, according to the abovementioned dependencies. (Riding with support).

The battery in the ZF Bike Eco System knows your current consumption based on the kilometer last ridden (in Wh/km). Together with the remaining battery capacity, the remaining range can thus be determined. To avoid unnecessarily fluctuating figures on the display, long-term consumption values are also considered here.

The result is the best possible estimate based on your individual cycling behavior.

9 BC 200 charger

9.1 Introduction

The ZF Bike Eco System uses batteries with lithium-ion cell technology. The nominal voltage of the system is 48 V.

9.1.1 Nominal voltage and actual battery voltage

Nominal voltage is a classification. The (approx. average) cell nominal voltage of a lithium-ion cell is 3.6 V. For the ZF Bike Eco System, 14 cell groups are connected in series. The result is a total cell nominal voltage of 14 x 3.6 V = 50.4 V, which is slightly higher than the system's nominal voltage of 48 V.

The electrical voltage increases or decreases during charging and discharging. With lithium-ion, this value typically lies between 2.8 and 4.2 V per cell. Therefore, a discharged ZF Bike Eco System battery has approx. 39 V while it has approx. 59 V when fully charged.

Lithium-ion cells may not be overcharged, deep-discharged or overheated, which is ensured by the battery's integrated battery management system (BMS) and the matching lithium-ion charger.

9.1.2 CC-CV charging technology for Lithium-ion battery

The original ZF Bike Eco System Li-Ion charger takes the lithium-ion cell characteristics into account by applying the so-called CC-CV charging procedure.

CC-CV stands for Constant Current – Constant Voltage. It starts with a constant current, the voltage of the battery slowly increases up to a set upper value, which is 58.8 V in the ZF Bike Eco System. The voltage is then kept constant and the current drops to a minimum value where the cell can no longer absorb any more energy. The loader then switches off.

9.2 Intended Use

The BC 200 charger is intended exclusively for the use with ZF compatible systems and must not be used for any other purpose. Other areas of use or applications are not intended and neither suitability nor technical conformity is declared for these.

The charger is designed and manufactured using the state-of-the-art technology. The charger is safe to operate when delivered. The ZF product can be dangerous if it is used improperly or not as intended by unauthorized and untrained persons.

9.3 Safety Instructions

Please read all safety information and instructions. Ignoring them can lead to property damage or injuries. Please keep these instructions in a safe place as long as you own this charger. Contact the dealer if you need information on the use and installation of the products that is not contained in this short instruction.

The following instructions must be always followed to avoid personal injuries and damage to equipment and the environment.

- The charger is designed for indoor use. Protect it from moisture and don't use it in a wet environment.
- Keep the charger and e-bike charging socket clean and use the cover after charging.
- **Warning**: Explosive gases may develop during charging. Avoid flames and sparks. Ensure adequate ventilation during the charging process. Please note that the vapors can be hazardous to health.

- Use the charger only for systems of the ZF Bike Eco System, otherwise there is a risk of explosion and fire.
- To avoid the risk of an electric shock, do not unplug a wet plug from the bike. If the charger plug is already wet inside or outside before charging, do not connect the charger to the bike. Dry the plug and connections before usage. Do not connect the charger if the charge port on the bike is wet. Dry the bike charge port before charging.
- If the charger, the cable, or the plug is damaged, it must no longer be used. The charger must not be opened. Please contact your dealer.
- Do not charge the e-bike or the battery on a flammable surface, as there is a risk of fire.
- Please do not touch the charger during the charging process, as the charger may heat up during charging.
- The cables must not be squeezed or exposed to tension.
- Do not charge the battery or the e-bike while unattended.
- The charger is not intended to be used by persons (including children) with reduced physical, sensory, or mental capabilities, or lack of experience and knowledge, unless they are supervised or instructed in the use of the system by a person responsible for their safety.
- Children must not play with the charger. Keep the charger out of the reach of children.
- The charger must only be used up to a maximum ambient temperature of 40 °C.

- The charger must be placed on a solid surface during the charging process, as it may get damaged if it is dropped.
- If the charger is not to be used for a longer period, please disconnect it from the power supply to prevent damage caused by overvoltage.
- Do not use an extension cable. Connect the charger directly to a power source.

9.4 Technical Data

Battery charger BC 200

Input voltage	V	200-240
Frequency	Hz	50-60
Charging current (max.)	A	4
Output voltage	V	58.8
Operating temperature	°C	0…+40
Storage temperature	°C	+10…+40
Protection class *(when plugged)*		IP20

9.5 Operation

Check the battery for any damage before charging or using it. Please charge the battery before your first ride, as the battery is not fully charged at the time of purchase.

If the charge process is not started after charger connection, the battery may be damaged. Do not use a defective battery; instead, contact your dealer. Battery may use LEDs to visualize errors. Please check the battery manual for more information.

9.6 Start-up

To use the charger, first insert the device connector of the power cable into the device socket of the charger. Now connect the charger to the wall socket. If the charger shows a green LED, you can connect the e-bike / battery to the charger.

9.7 Errors

If the battery is placed in the e-bike during the charging process, you can view any error messages in the ZF Ride app. Additional the charger has an LED that displays the device status.

LED color	Description
Green	Power supply connected (if no battery is connected) Battery is fully charged (if battery is connected)
Red	Battery is charging
Red, flashing	Battery error

9.8 Conformity

Hereby, ZF Staňkov s.r.o. declares that the component battery charger BC 200 complies with Directive 2014/30/EU and Directive 2014/35/EU. The Declaration of Conformity can be found on the following page: www.zf.com/ebike/conformity.

9.9 Battery safety

Do not charge overheated batteries. Stop the charging process if the battery becomes too hot (over 55°C). The battery must have cooled down to ambient temperature before further charging.

If there is an odor or smoke or if the battery is too hot to touch, interrupt the charging process immediately and contact the customer service for the vehicle or battery manufacturer or ZF Micro Mobility. If possible, carry the battery or charger outside, e.g., under a roof, until it has been cleared.

9.10 Disposal

In accordance with European Directive 2012/19/EU, all electrical and electronic devices must be disposed of via local collection centers. Contact your dealer if you have any further questions about the disposal.

Subject to change without notice.

9.11 Scope of Supply

The packaging contains the charger, a power supply connection cable and operating instructions.

9.12 Troubleshooting

Fault pattern	Check	Measure
The charging process does not start. No LED signal appears on the battery and charger	Check the function of the wall socket using another device. Check the cables and housing of charger and battery for damage.	If there is damage, do not attempt a repair, but contact your dealer. The dealer might have to collect the damaged battery (for safety reasons).
The charging process does not start. No LED signal appears on the battery and charger	If no damage is visible, insert all connectors once more to check whether one of the connections is faulty.	If this is unsuccessful, please contact your dealer.
However, the charging process starts and ends immediately when the LEDs start flashing.	Check whether the charger and the battery heat up.	Allow them to cool down to room temperature.

10 Quick Start for Normal Use

10.1 Switching the ZF Bike Eco System on and off

The ZF Bike Eco System is switched on and off at the Core Controller. The Core Controller is often located in the top tube, below the handlebars.

The power button on the Core Controller serves as the main switch for the ZF Bike Eco System.

- Switching on: Briefly press the power button for <1 s and release it again.
- Switching off: Press the power button for approx. 3 seconds and release it again.

Your pedelec may also have a remote fitted to the handlebars. This is used to operate the system but cannot be used to switch it on and off.

After switching on, the first feedback from the Core Controller will be the LED lighting up at the 6 o'clock position. An animation of the LED ring follows.

This animation signals that the software is starting up.

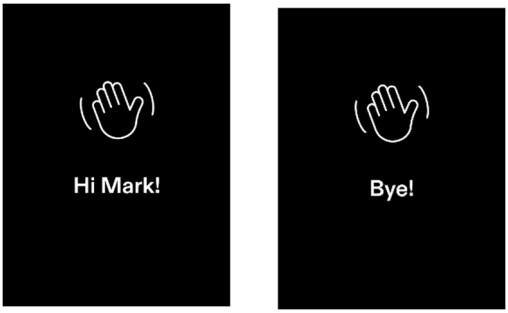
The details given below

During this time, the color display will show a logo. For example, the ZF logo.

At the end of the start-up animation of the LED ring on the Core Controller, the LEDs change to indicate the battery's current state of charge.

The battery's charge indicator shows the state of charge of the pedelec battery. The state of charge of the pedelec battery can also be read off the battery itself. On the display, each point of the LED ring corresponds to 1/12 of the total capacity.

The logo or – if set – a personalized welcome message continues to appear on the color display. The system shuts down in a similar way:



When the ZF Bike Eco System is fully operational, the handlebar display shows the standard display (ride screen) with the current speed, range and selected support level.

By default, the ZF Bike Eco System starts with the last support level you selected so that you can set off immediately.

Note: If a lock icon appears unexpectedly, please refer to Chapter “Troubleshooting”.

10.2 Selecting the support level

You can choose between four support modes and riding without support: ECO – ACTIVE – SPORT – BOOST – OFF. All other ZF Bike Eco System functions are available to you even without drive support.

The desired support mode can be selected on the Core Controller and on the remote. Briefly press the lower button on the Core Controller repeatedly to set the desired support level.

Press the up or down button on the handlebar control element to switch.

The standard display appears on the color display with OFF – ECO – ACTIVE – SPORT – BOOST and OFF again. WALK is only shown when the push assist is activated.

Depending on the control element, the support level can be changed in both forward and reverse direction (on the remote), or the menu can be cycled through in forward direction only (on the Core Controller).

10.3 Character of Support Modes

Adaptiveness of support:

Until recently a special feature of a pedelec, dynamic adaptation to the rider's request for assistance (adaptivity) is now integral to the control of all support levels. With the ZF Bike Eco System, adaptivity is particularly important in ACTIVE and SPORT mode, as it energetically releases the power when required and yet the range does not suffer greatly.

ECO:	Gentle support for relaxed cruising. Perfect for flat stretches and easy rolling.
ACTIVE:	The all-rounder for everyday use and touring. Offers balanced support, ideal for moderate terrain and a good balance between battery consumption and performance.
TRAIL:	Reacts adaptively to the pedal load. Provides exactly the support that is needed - whether on demanding trails or steep passages.
BOOST:	Maximum power for extreme climbs and technical challenges.
OFF:	This mode deactivates the drive assistance, but not the other functions of the ZF Bike ECO System, such as odometer, light, connectivity, and navigation aid.

11 General operation

11.1 Core Controller, remote and color display

In addition to the simplified operation using the two buttons on the Core Controller, the combination of remote and color display is the most convenient way to control the ZF Bike Eco System and maintain an overview of all functions at all times.

[Color display with ride screen]

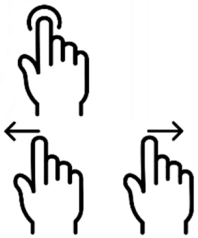
[Remote]

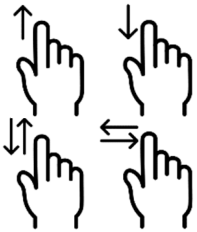
The color display is the information center of the ZF Bike Eco System.

Its surface is touch-sensitive, which makes it possible to operate the system using swipe and tap gestures. These gestures are explained below.

General view

11.2 Touch control of the color display – gestures and tapping





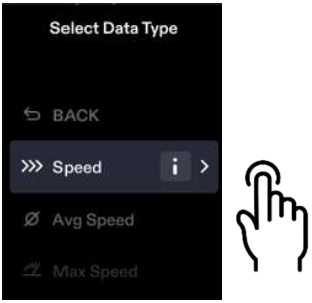
11.2.1 Functions of the touch gestures

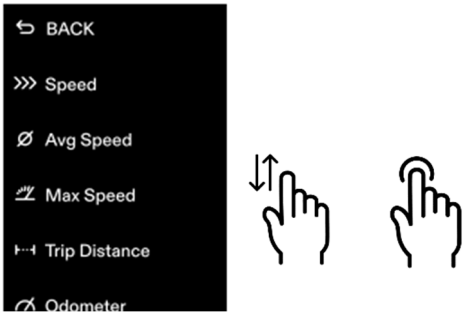
Tap: Briefly tap an object on the screen with your finger. For example, tap a menu item to open it.

Swipe: Swipe a finger quickly in one direction across the display and then lift it up. For example, you can swipe to the left on the color display to see other menus.

Scrolling: Slide a finger across the screen without lifting it. Example: In the Settings menu, you can scroll up and down a list to display additional items.

Example views of the color display: Opening a submenu by tapping, scrolling the list up or down, confirming the selection by tapping again.





11.3 Riding screens – displays during the ride

During normal use of supported riding, the color display will show you all the information you need on the riding screens.

The display is subdivided into the following:

- Header with status for lights, connectivity, and time
- Central display area, e.g., speed, navigation, etc.
- Dot bar, i.e., a row of dots for orientation regarding the position of other displays
- Footer with remaining range, support level, battery state of charge

The color display offers three basic riding screens while riding:

- Ride screen – default screen during use
- Data screen – simultaneous detailed display
- Navigation screen – when a mobile app is paired for navigation

Swipe left/right with your finger to switch between the views.

In addition, the Walk mode screen will appear after push assist is activated.

11.3.1 Ride screen

With its central number display, the ride screen is the default screen of the color display in the ZF Bike Eco System.

In addition to speed, the large number in the middle can be personalized to show one of a selection of current values. There are currently 20 types of data available that can be permanently called up here via the settings.

The two semi-circular bar displays “Bike” for motor power and “Me” for rider power are always visible.

In addition to the time and the status light in the header, the Bluetooth icon here shows at all times whether a mobile app is currently connected or not. If there is no pairing, the symbol is grayed out.

11.3.2 Data screen

In addition to the header and footer, you can place four other current data types on info tiles in the data screen display. You can create a personalized compilation from the large selection of available information.

If a tile shows a gray corner at the top right, personalization is possible. To do so, tap the tile to access the personalization menu. There you can select the desired information and place it in the info tile.

For more information on this, please also read the chapter on personalizing the data screens/pages.

Part of the information that can be displayed is provided by the paired mobile phone. If the connection to the mobile app is interrupted, a message will appear showing a crossed-out mobile phone icon. Example illustration on bottom right.

11.3.3 Walk mode screen

Walk mode is the push assist function of the ZF Bike Eco System. For your safety, it is activated in two stages.

1. If the Walk button on the remote is pressed, the Walk mode display will appear. You will be prompted to release the Walk button now.

2. A ring display counting down indicates the 5 seconds within which the button must be released, otherwise the sequence must be restarted.

3. Then press the up button on the remote within 3 seconds. This is again indicated by a countdown on the ring display.

If the Walk button is pressed again during this time, the display will again prompt you to release it.

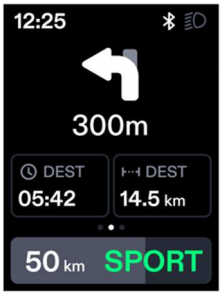
4. While you hold down the up button on the remote and push assist is powered by the motor, the current speed will be displayed.

5. To exit Walk mode, release the up button on the remote or press any other button. For 1 second, a quick reactivation of Walk mode will be offered:

If push assist does not work, this may indicate a malfunction of the wheel speed sensor. Therefore, check the sensor installed on the left side of the rear wheel hub and the tone wheel (sensor disk). Check whether the window and the sensor are dirty or whether visible parts of the cable are damaged. However, if the error persists, please contact your dealer.

11.3.4 Navigation screen

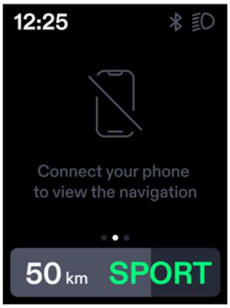
Using a smartphone paired with the ZFMM Ride app, the color display can show the route navigation of the smartphone as a sequence of events. There are three tiles in the central area that display the following information:

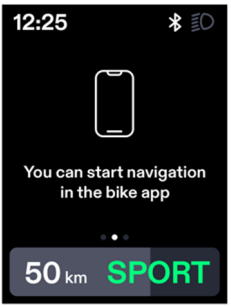


The sign for the next turn event (turn event icon) is shown at the top center, usually as an arrow sign indicating the next change of direction. The decreasing distance to the next turning point is also listed here (distance to turn event).

Below that are two basic information tiles showing the remaining time and distance to destination.

If dashes appear in the fields instead of the above display, this information is missing, and you must pair the smartphone for the first time or pair it again. You may also be notified to start navigation in the ZFMM Ride app now.

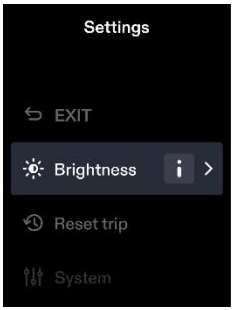




11.4 Settings screens – settings of the ZF Bike Eco System

A long press on the info button “i” on the remote or a downward swipe on the color display will take you to the Settings screens of the ZF Bike Eco System.

You can navigate to the following menu items using the up and down buttons or by swiping up and down on the color display:

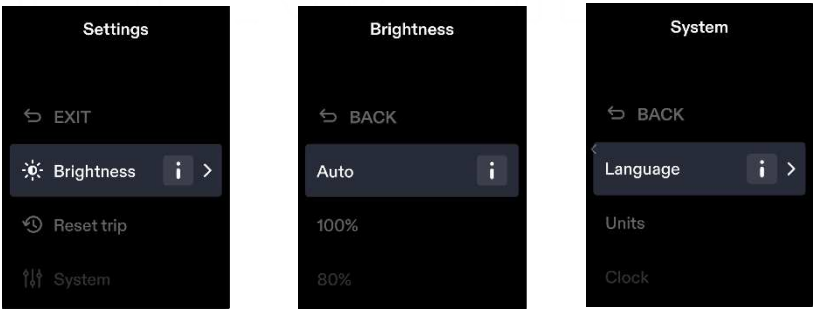


- (Exit)
- Brightness
- Reset Trip
- System
- Reset Display
- Data Page
- Bike Status
- information
- Display Orientation
- (Exit)

11.4.1 Navigating within the Settings menu

The settings screens show a heading at the top center to indicate where you currently are in the menu. You will see “Settings” as the heading in the main selection list.

Swipe across the color display to scroll through the list and select a submenu. Alternatively, press the up or down buttons on the remote.



Tap the color display or alternatively press the “i” button on the remote to select a submenu for further settings.

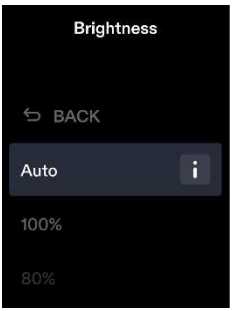
For example, if you select “Brightness” by scrolling and tapping, you will be taken to the corresponding submenu and the heading will now read “Brightness”. Set the desired value there.

The top list item “Back” will take you back to the next higher level.

By scrolling to “EXIT” at the top of the list and tapping to confirm, you can exit the settings screens and get back to your last selected view, usually the home screen.

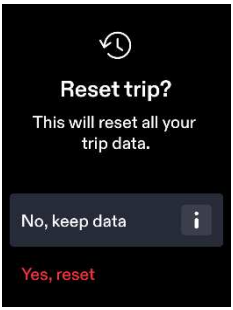
11.4.2 Brightness

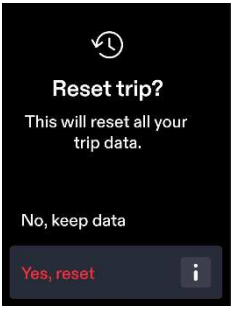
Scroll up or down the color display and select the desired setting by tapping on it. The display brightness can either be set automatically using the built-in brightness sensor or adjusted in 20% increments from 20% to 100%. The option “Auto” is only available if a brightness sensor is installed as, for example, in the remote.



11.4.3 Reset Trip

Here you can set the tour data under “Trip” to zero. This reset has no influence on the total mileage of your ZF Bike Eco System.





11.4.4 System

The language, distance measurement units and time can be personalized in the system settings.

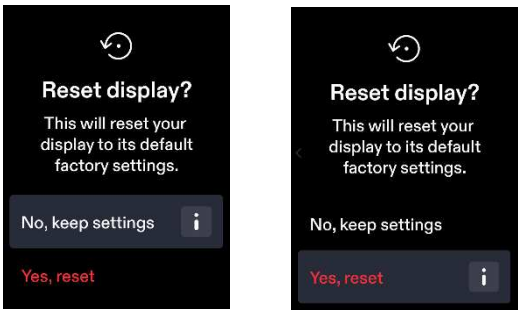
There are currently three languages available: German, English and French.

For units of measurement, you can choose between the metric system (meters and kilometers) and the imperial system (yards, feet, miles).

You can also choose between 12 h and 24 h display for the time.

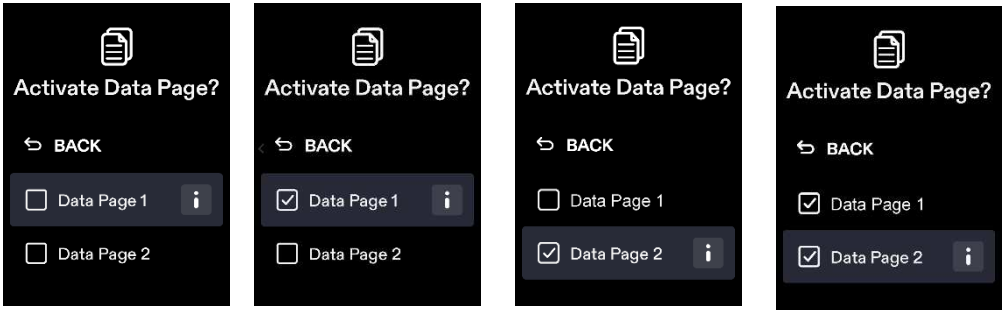
11.4.5 Display Factory Reset – factory settings

Here you have the option of resetting all color display settings, especially if the overview has been lost. However, Trip will also be reset.



11.4.6 Data screen

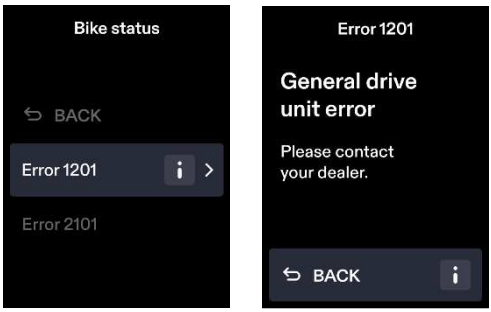
By tapping, you can set or remove check marks and thus decide whether one or two data screens are to be displayed within the riding screens.



To personalize the data screens, also refer to Chapter “Personalization menu”.

11.4.7 Bike Status

Here you will find system messages (info codes) and a brief explanation for each.



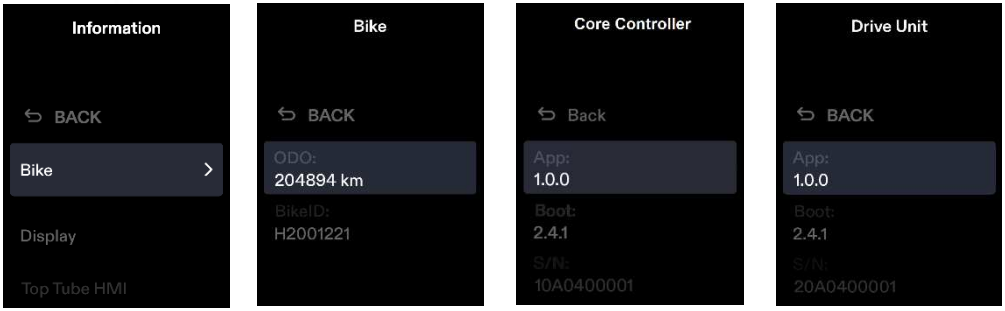
Most system messages are not permanently displayed on the riding screens. They can be acknowledged and are listed in this submenu. For example, depending on the message, you can find out whether your dealer should be contacted.

11.4.8 Information

Basic information on your ZF Bike Eco System can be called up here.

Divided into components, the respective status is displayed, e.g., the serial number of the motor unit, its total mileage, current software (bootloader version; firmware version).

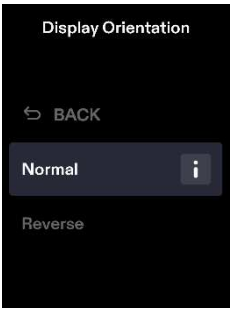
Menu items: Bike, Display, Core Controller, Drive Unit, Battery and Remote.



Example for submenu selection

11.4.9 Display Orientation

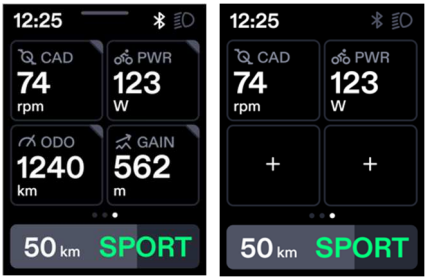
The color display can be mounted rotated by 180° as required. For this case, the submenu offers the possibility to also rotate the screen display by 180°. These orientations are called “normal” and “reverse”, respectively.



11.5 Personalization menu

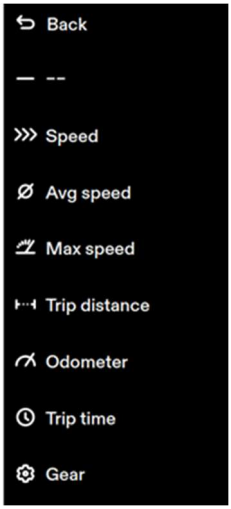
One or two data screens can be displayed within the riding screens, each with four info tiles, which display up to eight types of data from a selection.

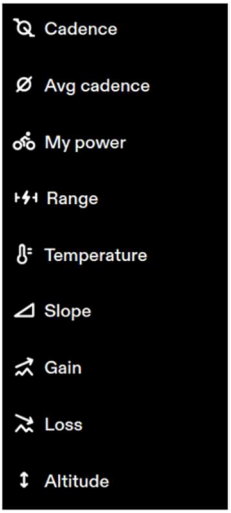
By tapping the tile, data from a selection can be filled or later changed to other data types. Each info tile that can be personalized is displayed with a gray corner. If the info tile is not yet linked, a + sign is displayed.

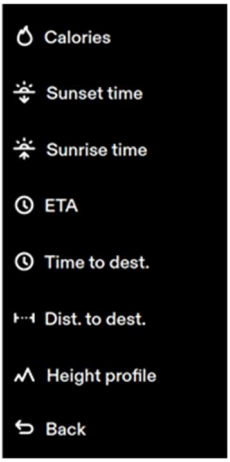


The following data selection is available:

("Slope" function = slope angle in preparation)





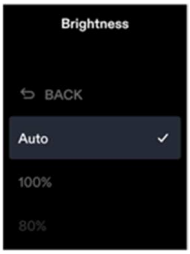


11.6 Switching on the lights

If connected to the ZF Bike Eco System, you can control the lights via the Core Controller or, if available, via the app.

Press the Mode button on the Core Controller for at least 3 seconds and the cycling lights (low beam) are switched on. Pressing it again for 3 seconds will switch them off again. The light symbol in the top left-hand corner of the display changes color from gray to white. It is grayed out again when switched off.

In addition, an auto mode for the lights can be activated in the ZF Ride app. The lights are then controlled by a brightness sensor. “Auto” can only be selected if a brightness sensor is present.

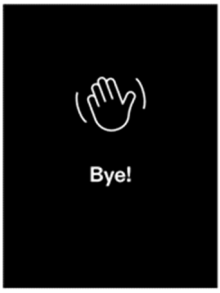


If there is no brightness sensor in the system, the ZF Bike Eco System will use a date- and time-controlled auto mode for the lights, which, however, works less precisely.

11.7 Switching off the ZF Bike Eco System

Press the power button on the Core Controller for 1 second to switch off the ZF Bike Eco System.

Depending on whether you have personalized the system with your name or not, the display will show “Bye” or “Bye, your name”.



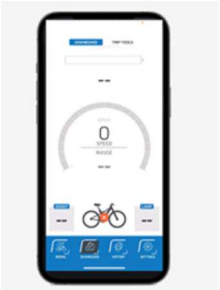
The LED ring on the Core Controller will

now switch off its 12 LEDs one after the other.

[Insert newer image of the Core Controller]

The app will now show a red cross

to indicate that the pedelec is no longer connected.



11.8 Automatic switch-off

The ZF Bike Eco System switches off automatically after 10 minutes of inactivity, e.g., when the pedelec is stationary without the switch being pressed. The display, the LEDs on the Core Controller and the app look the same as during manual switch-off.

During the charging process, the system will switch off automatically 2 minutes after the battery has been fully charged.

11.9 Forced switch-off

If you recognize the rare partial failure of a component, you can force a complete shut-down of the ZF Bike Eco System by pressing and holding the power button (>10 seconds).

Subsequent reactivation enables the ZF Bike Eco System to be started up in an orderly manner.

If the partial failure occurs again here, contact your dealer for more detailed troubleshooting.

11.10 Display during charging

The battery of the ZF Bike Eco System can be charged while inserted in the pedelec or separately.

During the charging process inside the Pedelec, the color display remains switched off and the Core Controller provides information on the battery's state of charge via its LEDs, which flash in 8% increments.

Once the battery is fully charged, the ZF Bike Eco System will switch off automatically.

During the direct charging process from the charger to the battery outside the pedelec, the three LEDs on the battery provide simplified information on the state of charge. The first LED flashes up to 32%, after which it lights up continuously. After that, the second LED flashes up to 65% until it also changes to continuous light. The third LED then follows with flashing until 100% charge is indicated by its continuous light.

11.11 Charging a mobile device

The dataline port on the Core Controller can be used for slow charging of mobile devices with a USB connection. The maximum output here is 7 W.

Please ensure that the magnetic plug connection is kept dry during charging to prevent contact corrosion.

11.12 Error, warning, and info displays

Note any system codes shown on the color display, which can make the initial analysis much easier when contacting the dealer by telephone.

Please also refer to Chapters 17 and 18.

12 ZF Ride App

12.1 Download of the app

With the ZF Ride app, we offer you a comprehensive companion to your ZF Bike Eco System e-bike for navigation, route planning and riding statistics. The app is available on the Apple App Store and Google Play Store.

12.2 Set-Up App

12.2.1 Welcome Screen & Account Creation

After you have successfully downloaded and installed the ZF Ride app on your smartphone, a registration process will be initiated.

12.2.2 Pairing Process

The e-bike must first be connected to your smartphone to be able to use all the functions of the app to their full extent:

- Make sure Bluetooth is turned on and visible on your smartphone and make sure your e-bike system is turned on. Now start the ZF Ride app.
- By clicking on the "Add new bike" button, the app will start to search for your e-bike. Click on the available bike ID (= Bluetooth name such as ZF_XXXXXXXX).
- Please enter your details, such as name, email address and password, for registration. Please confirm your email address.
- First, you must exit the app and open your email client on your smartphone. Confirm your email address now.
- After confirming your email address, you will need to open the ZF Ride app again.

- Click on "repeat". Now you can enter your personal data, such as your birthday date, height, and weight.
- Enable location permission for use.
- Download the desired country map.
- A connection is established to your e-bike. The app can now be used.

If several e-bikes have been connected, you can select the desired e-bike when you start the app. You can see whether your smartphone is connected to your e-bike by the blue tick, or the indication "Connected".

12.2.3 Map Download

For using the navigation function, you need to download the offline map for your desired country. You also have the option to download multiple maps.

12.3 Functions & Screens

The ZF Ride app offers you various functions and features for more comfort and riding pleasure.

12.3.1 Navigation

You have the option of using the built-in navigation function:

- **Basic navigation:** To start navigation, search for your desired address using the search field. By clicking on "Select" you can start navigation.
- **Draw & Plan:** For individual route planning, use the Draw & Plan function (button on top, on the left-hand side), simply draw the desired route on the map with your finger. The app calculates a route based on the (bike) paths.

- **Range display:** Depending on the charge level and the selected route option, the maximum achievable range is displayed for your route.
- **Recording option:** The circle symbol on the left-hand side tells you whether the route is being recorded or not. The recording function can be manually paused or stopped.
- **Other Functions:** You can rotate the map in the north direction or in the view direction. After moving the map, you can return to your current position.

12.3.2 Dashboard

The dashboard screens are similar to the functions of a bicycle computer. You also have the option to switch between two different tabs:

- **Overview:** This dashboard is the main display for the most important driving functions. You can see the current speed, as well as selected assistance levels (ECO, ACTIVE, SPORT, BOOST), the battery level, as well as the light indicator. In order to individualize the screen, the individual tiles can be changed by clicking for a longer press.
- **Trip Data:** Under travel data you will find several additional information relevant for your driving experience. For example, average speed, distance to the destination and altitude covered can be displayed. The tiles/computers can be customized by clicking for a long press.

12.3.3 Trips

Trips gives you an overview of ridden, recorded, and imported routes. By clicking on one of the recorded routes, you will receive additional data about your journey and a visualization of the route you have taken. By clicking on the "Imported" tab, the de-sired route can be imported.

12.4 Settings

The Settings menu allows you to access essential settings in the app and provides you information about the connected bike.

- **My bikes:** Information about the e-bike, bike status (incl. error messages) and bike pass, as well as an overview of the connected bikes
- **System:** Display of selected language of the app, as well as the possibility to change the language, and setting the units of measurement
- **Navigation:** Customizable settings and navigation language
- **Maps:** Possibility to download additional maps (worldwide)
- **Account:** User's personal information such as weight, height, date of birth and gender
- **Info:** General information about the app and privacy policy

12.5 Other

Display Integration

If your bike is equipped with a display, selected information from the connected app can also be displayed on the display, such as ride information and simplified navigation commands. For more information, see the chapter on the description of the display.

Error Messages

If a system error occurs, you will receive a pop-up notification in the app. Please contact your bicycle dealer for critical issues. An overview of error messages that have occurred can be found in the settings.

13 Care and Maintenance

13.1 Hazards due to pressure jet cleaning

The components of the ZF Bike Eco System are protected against all weather conditions. The entire system is rated IP 55.

Nevertheless, water and accompanying dirt can get into the housing if strong jets of water with increased pressure, such as those from a high-pressure cleaner, are aimed at the seals. This water, if pressed into the interior of the components, will damage the mechanical, electrical, and electronic components.

This issue particularly affects the high-pressure cleaners that are widely used both privately and at car wash centers, whose jet nozzles apply water at such high pressure to the seals, e.g., of the bottom bracket bearing shafts of the motor or the housing parts of the battery, that it will penetrate them despite the design measures. This stress on the seals never occurs naturally, not even in heaviest rain. Do not underestimate this fact.

The entire ZF Bike Eco System must therefore not be cleaned with high-pressure cleaners. Failure to do so will invalidate the guarantee.

Avoid temperature differences cleaning water to ZF Bike Eco System. Don't use harsh, i.e. aggressive cleaning agents. Wash off dust and dirt with a soft sponge and lukewarm water to preserve the surfaces as much as possible. Do not use alcohol, solvents, or abrasive cleaners to clean the battery or charger. Only use a dry or slightly damp cloth for cleaning.

Do not tackle icing by chipping, scraping, or using an open flame. Look for areas of buildings with temperatures above 0 °C to free iced-up functions by simply defrosting.

13.2 Firmware update via the ZF Bike Eco System app

Via the Core Controller's Bluetooth interface together with the ZF Bike Eco System app on your smartphone, the ZF Bike Eco System is in principle able to receive new firmware for individual components (OTA update) and then import it centrally (also called a flash process).

If you have started the update process via the app, the pedelec may not be moved and the battery may not be removed until the flash process is complete.

Make sure that the battery is sufficiently charged. The firmware update via the ZF Bike Eco System app will not start if the state of charge is below 15%.

It is recommended that you seek the support of your dealer when updating the software of system components as your dealer can provide immediate support and resolve any irregularities.

14 Storage

14.1 Suitable state of charge of the battery

Lithium-ion batteries are known to self-discharge only minimally during months of storage. The suitable battery state of charge, for example, when storing your ZF Bike Eco System for four months over the winter, is between 50% and 80%.

Aiming for a 100% state of charge does not create an expected increase in storage time.

15 Transportation

The ZF Bike Eco System is designed for use in damp and dusty environments, i.e., for everyday use in the city or outdoors. However, the following must be observed when transporting it on bicycle racks, especially on vehicles such as buses, trains or your own car. In addition to water and dust, extreme temperature conditions can also arise during transportation. This primarily concerns the handling of the ZF Bike Eco System's battery.

15.1 Protective measures in case of rain, dust, and extreme temperatures

Transporting the bicycle on a bicycle rack in the rain creates stresses comparable to pressure washing. Due to higher speeds than those typical when riding a pedelec, rain can be pressed into the cavities of the components by the headwinds alone.

This water usually dries off without any problems on a de-energized pedelec but will endanger the battery. Remove the ZF Bike Eco System battery from the pedelec and transport it inside the vehicle.

For transportation in very dusty environments, a suitable cover on the carrier will ensure the lowest possible level of fine dust on the ZF Bike Eco System. Waterproof covers offer a solution, but they must be lashed down very tightly.

If the pedelec is unprotected and exposed to prolonged periods of either constant sunshine at high ambient temperatures > +45°C or very extreme cold, e.g., < -25°C, ensure that the battery is carried separately in a place with a moderate climate, i.e., usually inside the vehicle. These temperatures will not cause any immediate damage but will put unnecessary strain on the battery.

15.2 Transport to vacation destinations

Find out about the conditions of carriage for pedelecs from your travel company or the planned public carrier in good time before starting your journey. Bus, train, ferry, forwarding agent.

Today's pedelecs are subject to restrictions, as lithium-ion batteries are generally considered dangerous goods[5] internationally. Above a certain battery capacity (energy content), there are special regulations for air traffic, ships, and roads.

Find out about special regional regulations if you are planning to travel abroad. In other EU countries, a pedelec in accordance with the EN 15194:2017-A1:2023 standard should be equally usable everywhere, unless the authorities generally prohibit the use of battery-powered vehicles, e.g., in a nature park or an environmental zone.

Although the pedelec is known and supported worldwide, different traffic regulations outside the EU can make it difficult to use EU pedelecs there.

[5] The term “dangerous goods” does not indicate immediate danger in everyday use. It is about the behavior of the lithium-ion cells in the event of damage or accidents.

16 Disposal Instructions (EU)

Like all electrical or electronic products and batteries made available on the market in the European Union, the components of the ZF Bike Eco System must be returned to the material cycle at the end of their service life or when they have been replaced due to a defect.

The manufacturer has a responsibility here and finances the take-back system.[6]

ZF Bike Eco System components are registered in the waste electrical equipment register and can be returned free of charge either to municipal recycling centers or via retailers.

In slight contrast, the lithium-ion batteries belonging to the ZF Bike Eco System are subject to the regulation concerning the return of batteries and are taken back by retailers on behalf of the manufacturer.

As a rule, however, your local recycling center will also accept them. Particular attention is paid to the safety of defective lithium-ion batteries. They must be transported back to a disposal company in special containers to prevent major damage in the event of a fire.

[6] "Manufacturer" here refers to the manufacturer of the entire pedelec.

17 System Messages

The ZF Bike Eco System offers various options for detecting the cause of a malfunction or lack of function. You can do a lot of troubleshooting yourself.

In addition to instructions on various general error patterns, the ZF Bike Eco System uses system event messages to give you and your dealer much more information.

The following table printed here will become incomplete over time and only shows the basic error patterns.

18 Troubleshooting

In addition to serious damage, there are some simple causes that may impair function. If you see the following event messages (info codes) in the display or app, you can first try to rectify these errors yourself by checking them and taking some simple steps. For all others, please contact your dealer or ZFMM Service.

Colors are used to indicate the importance of the message:

Red=Error Orange=Warning Yellow=Info

Display line 1	Display line 2	Description	Measure
Info 3051	Service due	Note on maintenance intervals	Please arrange a service appointment.
Error 1001, 1101, 1201	Please contact your dealer.	General component error	Do not take any steps yourself. Please contact your dealer.
Error 1103, 1503, 1603	Buttons	Error at operating buttons; possibly they are blocked.	Please check whether the buttons are blocked.
Error 1110, 1210, 1310, 1410, 1510	Please contact your dealer.	Electronics malfunction	Please contact your dealer.
Error 1011, 1311	Power supply	Power supply	Please contact your dealer.
Error 1013, 1413	Wiring	Loose contacts	Please check the insulated cables or contact the dealer.
Error 1215, 1415, Warning 2315	Out of temperature range	Component too cold or too hot	Please operate the battery at ≥ 0°C and/or allow the motor or display to cool down.
Error 1120, 1220, 1320, 1420, 1520, 1620, 1021, 1121, 1221, 1321, 1421, 1521, 1621	Incorrect software	Non-compatible software detected.	Please update the software again or contact the dealer.
Error 1022, 1122, 1222	Configuration	Software configuration error	Please contact your dealer.
Error 1124, 1224, 1524	Reboot system	Software safety has detected an error.	Reboot the system. If the error persists, please contact the dealer.
Error 1030, 1130, 1230, 1330, 1430, 1530, 1630	Communication	Communication error detected.	Please contact your dealer.

Continued next page

Display line 1	Display line 2	Description	Measure
Error 1034 Error 1234	Authentication	Authentication error detected.	Please contact your dealer.
Error 1160	Bluetooth	Bluetooth error	Please contact your dealer.
Error 1161	Mobile phone charging port	Smartphone charging port error	Please check the connection or contact the dealer.
Error 1271	Please contact your dealer	Torque sensor faulty	Please contact your dealer.
Error 1272	Speed sensor	Speed sensor error	Please check the sensor, the sensor disk and the plug connection.
Error 2273	Speed sensor manipulation	Speed signal not plausible	Please check the sensor components and remove any manipulating influence.
Error 1380 Warning 2380	Please charge	Cell voltages deviate too much	Please charge the battery so that the cell voltages are equalized.
Error 2381	Battery empty	Battery is almost empty; motor support is no longer possible.	Please charge.
Error 15A0	Temperature sensor	Temperature sensor malfunction detected	Please contact your dealer.
Error 15A1	Light sensor	Light sensor malfunction detected.	Contact your dealer or use the manual brightness setting.

Key: Each second digit indicates 0=System, 1=Core Controller, 2=Motor, 3=Battery, 4=Display, 5=Remote.

19 Technical Data

The atmospheric humidity limit values are broadly defined, as the drive is intended for use in European transitional climates or warm continental climates (coasts).

The entire system is rated as protection class IP 55 against ingress of dust and water. Individual components achieve even higher protection classes, as listed below.

19.1 ZF CentriX mid-mounted motor

19.1.1 Electrical connected loads

Nominal voltage input	48 V
Nominal continuous power	250 W

19.1.2 Mechanical Data

Housing diameter	88 mm
Width of bottom bracket bearing shaft	153 mm
Q factor (outside flank dimension of crank arms)	175 mm (depending on crank)
Weight	< 2600 g
Torque (at motor output shaft)	up to 90 Nm
Protection degree (protection against ingress)	IP 5k5

19.1.3 Environmental conditions

Operating temperature	-5°C to +40°C
Storage temperature	+ 10°C to + 40°C
Humidity, use and storage	5% - 100% relative humidity (RH)

19.2 Core Controller

Supply voltage	12 V DC
Operating temperature	-5°C to +40°C
Storage temperature	+ 10°C to + 40°C
Humidity, use and storage	5% - 100% relative humidity (RH)
Degree of Protection	IP 55

Radio Interface	Bluetooth© Low Energy 4.2
Frequency Range	2402-2480 MHz
Maximum transmitting power	3 mW

19.3 Remote

Supply voltage	12 V DC
Operating temperature	-5°C to +40°C
Storage temperature	10°C to 40°C
Humidity, use and storage	5% - 100% relative humidity (RH)
Degree of Protection	IP 55

19.4 Color display

Supply voltage	12 V DC
Operating temperature	-5°C to +40°C
Storage temperature	10°C to +40°C
Humidity, use and storage	5% - 100% relative humidity (RH)
Degree of Protection	IP 55

19.5 Battery SI 504

Nominal voltage input	48 V
Nominal capacity:	9,8 Ah
Energy content	500 Wh
Operation temperature discharge	-10°C to +40°C
Operation temperature charge	0°C to 45°C
Storage temperature	0°C to 20°C
Protection degree (protection against ingress)	IP 55 when connected

19.6 Battery SI 756

Nominal voltage input	48 V
Nominal capacity:	14,7 Ah
Energy content	750 Wh
Operation temperature discharge	-10°C to +40°C
Operation temperature charge	0°C to 45°C
Storage temperature	0°C to 20°C
Protection degree (protection against ingress)	IP 55 when connected

19.7 Battery Terminal M

Case Color	Black
Supply voltage	48 V
Operating temperature	-5°C to +40°C
Storage temperature	10°C to 40°C
Humidity, use and storage	5% - 100% relative humidity (RH)
Degree of Protection	IP 55

19.8 BC 200 charger

Supply voltage	180 – 264 V AC / 47-63 Hz
Operating temperature	0°C to 40°C
Storage temperature	20°C to 60°C
Humidity, use and storage	10% - 90% relative humidity (RH)
Degree of Protection	IP 20

20 Conformity

The ZF Bike Eco System doesn't constitute a pedelec in accordance with EN 15194:2017+A1:2023, but rather its drive system.

As such, it fulfills the EC Declaration of Incorporation (DoI) in accordance with Annex II-B of the Machinery Directive.

This Declaration of Incorporation can be found via following weblink www.zf.com/ebike/conformity .

You will find the EC Declaration of Conformity for the entire pedelec at the manufacturer of the pedelec.