



E-Bike Systems

E-Bike Drive System ***DirectPower***



**Operating
Instructions**

Contents

1	Preliminary remarks on safety instructions	1
1.1	Symbols used	1
2	Safety instructions	2
2.1	Intended use	4
2.2	Hazards for special groups of persons	4
2.3	Driving license, vehicle registration, insurance	5
3	Components of the drive system <i>DirectPower</i>	6
4	Battery	8
4.1	Lithium-ion battery	8
4.2	Battery charging	10
4.3	Mounting the battery on the luggage carrier and connecting it	13
5	Normal operation	14
5.1	Instructions for riding	14
5.2	Before every journey	16
5.3	Display and operation	17
5.3.1	Switching on	18
5.3.2	Switching off	18
5.3.3	Assisted pull-away	19
5.3.4	Setting the assistance level or energetic recovery level	19

5.3.5	Charge status indicator	21
5.3.6	Functions	22
5.3.7	Resetting counters	24
5.3.8	Switching the display brightness	25
5.3.9	Switching on the bicycle lighting	26
5.3.10	Setting a PIN	27
6	Maintenance, cleaning and repair	29
6.1	Maintenance	29
6.2	Cleaning	30
6.3	Repair work	31
7	Disposal	32
8	Carrying by car	32
9	Warranty and limitations of liability	33
10	Technical data	35

Congratulations! You have chosen a bicycle with the *DirectPower* electric drive system. We are pleased that you have selected this HEINZMANN product! It has been carefully conceived and designed, and combines great performance with ease of operation and maintenance and reliability. We wish you much pleasure and lots of fun riding your electrically assisted bicycle, and thank you for the confidence placed in our product.

Please read these instructions carefully all the way through to ensure that you enjoy all of the benefits which the product offers.

The manufacturer reserves the right to make changes to the design or construction of the product for its technical improvement.

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1 Preliminary remarks on safety instructions

1.1 Symbols used

Important information for your safety is marked by special symbols. Please follow this information to avoid injury and damage to the product.

**WARNING****WARNING:**

This symbol warns of hazards to your health and points to potential risks of injury.

NOTE**NOTE:**

Indicates possible material damage.

**CAUTION:**

Provides general instructions for safe function and special technical features or regulations.

**Info:**

This symbol indicates tips and special information.

2 Safety instructions

Carefully read through all of these instructions before using the product!

Keep these instructions in a safe place! If the product is passed on to a third party, the instructions must be passed on with it.

Failure to follow these instructions may result in injury or damage to the components. The manufacturer can accept no liability for losses arising as a result of failure to follow these instructions.



Danger of bearing parts breaking

A damaged motor can cause bearing parts to break!

This could result in a fall.

- Stop riding the bicycle immediately and replace the damaged motor right away.

An incorrectly mounted drive wheel can cause the drive wheel or the frame to brake!

This could result in a fall!

- When mounting the drive wheel, always tighten the wheel nuts with the specified torque.

An incorrectly mounted or overloaded luggage carrier can lead to breakage!

This could result in a fall!

- The maximum load limit for the carriers is **30 kg!**



▲ WARNING

Risk of operational faults or fires

Damaged electrical assemblies and cables can lead to short circuits.

This could result in operational faults and, in the worst case, fire.

- Damaged electrical assemblies and cables must be replaced.



▲ WARNING

Danger due to unintentional motor activity and rotating parts

The motor can move unintentionally if the drive system remains switched on when work is being carried out on the electric bicycle. Clothing could be pulled into the rotating parts of the drive. This could result in injury.

- Always disconnect the battery from the bicycle before carrying out work on the electric bicycle.
- When re-commissioning for the first time after installation or repair, set up the bicycle so that the drive wheel can turn freely. Only then should the battery be inserted again and the drive checked for correct function.



CAUTION:

You may be required to wear a helmet when riding a bicycle with electric auxiliary drive, depending on the type and model. Whether or not it is required by law, it is always advisable to wear a suitable bicycle helmet when riding an electric bicycle!

2.1 Intended use

The *DirectPower* drive system is used as a wheel hub drive for converting bicycles to electric bicycles. The drive system is also suitable for use in other products (e.g. lightweight vehicles, such as mopeds, rickshaws, wheelchair pulling aids, disabled person vehicles).

Where necessary, approval for the relevant use must be obtained from the drive manufacturer.



CAUTION:

The following are examples of improper use:

- Combination with unlicensed components
- Improper or unauthorized modifications to the components
- Overloading the motor, e.g. cycle racing or locking up the motor by force while it is running, e.g. running up against an obstacle

2.2 Hazards for special groups of persons

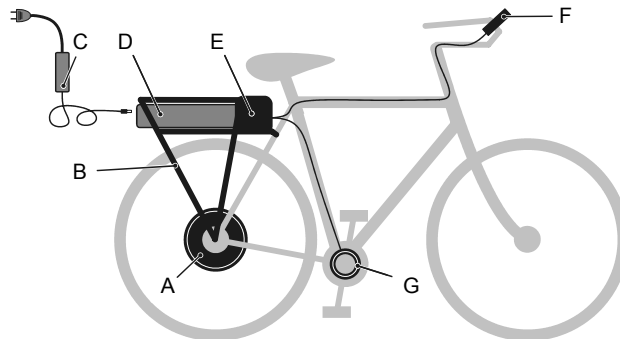
- The use of electric bicycles on public roads by children and young persons may not be permitted. Follow the laws of the country where the bicycle is used.
- The product must be stored where it cannot be accessed by children and persons who are unable to appreciate the attendant hazards.
- Electric bicycles are different to ride than bicycles without electric assistance. It is therefore advisable to practice handling the electric bicycle away from other traffic first of all.

2.3 Driving license, vehicle registration, insurance

When riding an electric bicycle, the laws, licensing and insurance regulations of the country where the bicycle is used apply.

It is the duty of the vehicle's keeper to find out about legal requirements, to apply them and comply with them.

3 Components of the drive system *DirectPower*



- | | |
|---|------------------------------|
| A | Motor |
| B | Luggage carrier |
| C | Charger |
| D | Battery |
| E | Control housing with control |
| F | Display and control unit |
| G | Pedalling sensor |

▪ Motor

The brushless electric motor is the power source of the *DirectPower* drive system. The design offers both powerful torque in continuous operation, as well as substantial peak torques (e.g. during start-up). Mechanical losses are negligible, as the motor is designed without a gearbox.

▪ Battery & charger

The lithium-ion battery is the power source for the *DirectPower* drive system. The high capacity of this type of battery offers maximum driving performance and range. These batteries have no memory effect and can be recharged at any time with no problems. A suitable charger for charging the battery from the electric grid is included with the system.

- Control housing and control

The electric control is like the brain of the *DirectPower* drive system. Its task is to evaluate all signals and activate the motor in accordance with the legal parameters so that it provides the relevant power. The plastic control housing protects the control reliably from wet and moisture, as well as impacts and similar influences.

- Display

The display and the control unit together make up the control centre of the *DirectPower* drive system. The user selects the degree of assistance or energetic recovery as desired and makes all other settings. The user also receives all necessary information on the operating state of the system with regard to the trip and range.

- Pedalling sensor

The pedalling sensor is combined with and built discreetly into the bottom bracket.

It passes on the pedal torque signals, pedal frequency and the pedalling direction of rotation to the control. The pedalling sensor is completely maintenance-free and does not require setting.

- Luggage carrier

The solid luggage carrier made from aluminium is designed to carry luggage or saddle bags, as well as hold the battery securely and safely. The control housing containing the system control is also mounted on it.

**Info:**

Note down the serial number of your drive system *DirectPower*. The serial number is a unique, individual number used to identify the motor. It can be used to identify the equipment uniquely (e.g. in case of queries with the dealer etc.).

4 Battery

4.1 Lithium-ion battery

This type of battery combines lightness in weight with a very high charge capacity. It is therefore very compact in design and will fit easily in an insert on the luggage carrier.

Lithium-ion batteries may only be charged using a special charging circuit! Charging the battery correctly and protecting it from deep discharge and overheating help to significantly extend the service life. A suitable charge regulator that takes all these requirements into account is therefore already built into the supplied charger. It guarantees optimal and safe function. Therefore, only this charger may be used for charging the battery.



Risk of fire

Charging the lithium-ion battery incorrectly can cause the battery or charger to heat up significantly. This could result in fire!

- Only use the charger supplied to charge the battery. The charger is designed for indoor use only.
- Before connecting the charger to the electric grid, always check whether the mains voltage corresponds to the connection voltage of the charger. The supply voltage of the charger is indicated on the nameplate on the back of the device.
- The lithium-ion battery may only be charged in a dry, non flammable environment.

Mechanical damage to the lithium-ion battery or charger can lead to functional faults and short circuits. This could result in fire!

- Any form of manipulation on the housing of the lithium-ion battery or charger is prohibited.
- Replace damaged batteries immediately and dispose of them safely.

**WARNING****Risk of electric shock**

A charger with a damaged plug or cable could result in electric shock!

- Never connect damaged plugs or cables to the electric grid.
- Damaged electrical assemblies and cables must be replaced immediately.
- Water and moisture must not be allowed to penetrate the charger under any circumstances. If water has entered the charger, disconnect it from the mains supply immediately and have it checked by a specialist dealer.
- Condensation water can develop on the charger if there is a sudden change in temperature from cold to hot. If this happens, wait until the device has come up to the temperature of the warm room before connecting it to the mains. The charger should be stored where it is used.
- The charger may only be used to charge the lithium-ion battery supplied. Other uses of the charger are not permitted.

4.2 Battery charging



Dust cap

The battery should be charged fully before the first use. Charging can be done either on the luggage carrier or off the bicycle with the battery removed.

To charge the battery, proceed as follows:

- Remove the dust cap from the charging socket on the battery housing
- Plug the charger into a mains socket outlet
- Connect the charging plug to the socket, the charge status indicator LEDs start to flash



CAUTION:

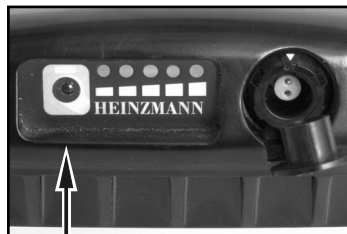
To guarantee correct polarity when charging, the charging socket has a slot. The corresponding spring of the charge plug must slide into this slot. Only then correct polarity is guaranteed.

Never try to insert the charging plug in a different position with force!



WARNING:

- When connecting the charger, note the routing of the cables and avoid trip hazards!



Button

Charge status display on the battery while charging:

LED status	Battery status
All five LEDs flash on one after the other and go out again at the same time	Battery is charged, number of LEDs lighting up represents the capacity already charged.
All LEDs permanently off	Charging is complete, battery is 100% charged,

The charge status can be seen at any time directly on the battery. Simply press the button to the left of the display LEDs. A number of LEDs lights up according to the relevant charge status.

Charge status display on the charger:

LED on the charger lit up red	Battery charging
LED on the charger lit up green	Charging complete, trickle charging active

Charging time:

Fully charging the discharged battery takes **approx. 6 hours**

When the end of the charging is complete, the charge regulator switches to trickle charging automatically. The battery can be left connected to the

charger indefinitely. The advantage of this is that the battery is always fully charged.

The battery can be used with the drive at any time, even if charging is not complete. However you will not achieve the same range that is possible with a fully charged battery.



Info:

Unlike other types of battery, the lithium-ion battery has no 'memory effect' of any kind. This means that it does not need to be fully discharged before it can be charged up again. It actually helps to prolong the battery's life if the charging cycles are flat, in other words if the battery is always charged up again immediately after use.

During the charging process, the ambient temperature should not lie below 10°C or above +35°C. Charging outside this temperature range reduces the available battery capacity and therefore the range. It is advisable to charge the battery in a heated room when outdoor temperatures are below zero. Direct sunlight and proximity to sources of heating such as radiators must be avoided.

Before long periods of inactivity, e.g. in winter, the battery should be fully charged up and stored in a dry, frost-free place. Charge the battery completely before using again.

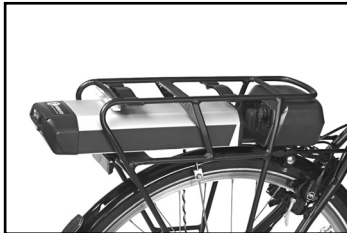
The battery delivers maximum performance at room temperature. When starting a journey, the temperature of the battery should therefore not lie below 10°C or higher than +25°C.

The battery can become quite hot on long journeys using a lot of motor power. Temperature monitoring inside the housing prevents charging in excessively high temperatures. The charger can be connected in this case. Charging will start automatically when the battery has cooled down sufficiently. The battery can easily take up to an hour to cool down following a long uphill ride.

The following ambient temperature ranges must be maintained to ensure that the battery works correctly:

Operating mode	Temperature range
Normal operation	-10 ... 45 °C
Charging	10 ... 35 °C
Storage	-10 ... 45 °C

4.3 Mounting the battery on the luggage carrier and connecting it



- Push the battery into the luggage carrier from behind on the carriage rail until it has audibly engaged in the lock.
- To disconnect and remove the battery, turn the key on the left side of the luggage carrier clockwise and hold. This releases the lock. Then release the battery from the connection by pulling hard on the rear handle and pull out of the luggage carrier to the back.

5 Normal operation

5.1 Instructions for riding



Danger due to hot surfaces

The battery can become quite hot on long journeys using a lot of power!

- Do not touch the motor after journeys under high load.



CAUTION:

The drive system can be damaged by increased feedback voltage from the motor if the bicycle is moving at excessively high speeds.

The following maximum speeds must not be exceeded depending on the rim size:

Rim size		Max. travel speed
20"	—	50 km/h
22"	—	55 km/h
24"	—	60 km/h
26"	—	65 km/h
28"	—	70 km/h

- The electric bicycle must be in a condition that is safe for use on the road at all times so as to guarantee your own safety and that of other road users.
- A rear-view mirror should be used to enhance your awareness of the traffic situation.
- The weight of the drive system and the extra motor power will have quite a significant impact on the performance of the electric bicycle. You must allow for longer stopping distances because of the increased weight. You should therefore practice the safe control of your electric bicycle off the public roads to start with.
- Before starting out on your journey, test for correct function with a trial application of the brakes.
- When braking, always apply both brakes together.
Never apply the brake of the driven wheel on its own or first.
- Always cycle carefully on surfaces that are wet, smooth or loose and avoid jerky movements.
- On fast bends and uneven or sloping surfaces, never place the pedal on the inside of the bend down so as to avoid ground contact and the attendant risk of a crash.
- Never ride hands-free.
- Use your cycle's lights in darkness and poor light so as to enhance your visibility for other road users.
- Wearing a cycle helmet is recommended for your own personal safety.
- Avoid continuous operation in saline environments and atmospheres as they encourage corrosion damage.

5.2 Before every journey

Before every journey, check the following and ensure that:

- the motor (spokes, spindle nuts) and electrical connections are fitted securely
- the battery is firmly seated on the luggage carrier
- all cables are free from damage and ensure they are securely attached to the bicycle frame
- all screws and nuts are firmly seated
- brakes are working safely, brake pads must not rub against wheel rims
- the tyres have sufficient pressure (max. pressure is marked on the relevant tyres)
- all bearings run freely (bottom bracket, wheels, steering) and wheels run quietly



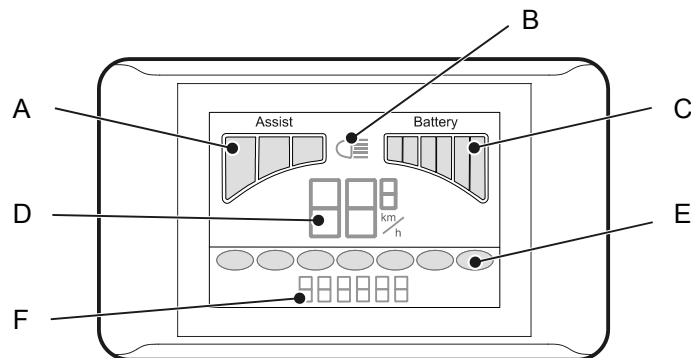
CAUTION:

The electric bicycle should also be taken for inspection by a specialist dealer every 1,000 km and at least once a year. Always have faults repaired by a specialist dealer!

5.3 Display and operation

The display contains all display elements:

A	Assistance level
B	Bicycle lighting
C	Battery charge status
D	Current travel speed
E	Function display
F	Display line



The handlebar holds the control unit with the three buttons **MODE**, **Up arrow** and **Down arrow**.

All settings are made using these buttons. There are no other setting options.

5.3.1 Switching on



Press and hold the **MODE** button for at least 3 seconds until the display is active. Then release the button again. The need to press and hold the button is a safety measure to prevent accidental switching on. The system is now ready for travel.



CAUTION:

No load must be placed on the pedals while switching on to ensure that the drive is not activated by mistake!

- Mount the bicycle and place both feet on the ground
- Switch on the drive system
- Set off

5.3.2 Switching off



Press and hold the **MODE** button for at least 3 seconds until the display goes out. Then release the button again. The drive system is now switched off.



Info:

The system switches off automatically after approx. 10 minutes of inactivity.

The **MODE** button on the control unit must then be switched on again before the bicycle can be used again.

5.3.3 Assisted pull-away



Assisted pull-away is an optional function of the drive system. It provides electrically-powered assistance during pull-away without having to pedal up to a maximum speed of 6 km/h.

To activate this feature, press and hold the *Up arrow* button.

The motor assistance activates after approx. one second.

To end the assistance, release the *Up arrow* button.

5.3.4 Setting the assistance level or energetic recovery level

The drive system offers three different assistance levels for normal operation.

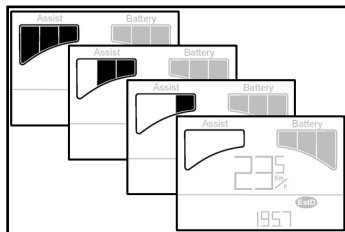
Assistance	Level I	Level II	Level III
Motor	~ 30-35 %	~ 65 %	100 %
Pull-away	● ○ ○	● ● ○	● ● ●
Range	● ● ●	● ● ○	● ○ ○



To select a higher assistance level, briefly press the *Up arrow* button.



To select a lower assistance level, briefly press the *Down arrow* button.



The assistance levels are shown as display segments under "Assist" at the top left of the display.



Info:

In the assistance level "0", the drive system is active, but provides no assistance. If the optional function "regenerative braking" is installed, it continues to work.

The system can also be used in energy recovery mode. In this case, the motor is operated as a generator and feeds electrical energy back into the battery. This can be useful as additional braking during long periods of down-hill travel. Here too, there are three different energy recovery levels available.

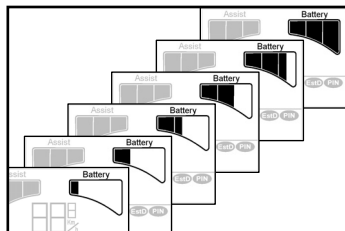


The energy recovery mode is accessed by pressing the *Down arrow* button briefly in assistance level "0".

Here too, there are three different energy recovery levels available. The energy recovery levels are shown as display segments under "Assist" at the top left of the display. To set it apart from the assistance mode, the segments flash in energy recovery mode.

5.3.5 Charge status indicator

The charge status of the battery is always shown at the top right of the display under "Battery". Up to six display segments light up depending on the charge status.



Number of segments in the display	Status of the battery
6	Battery fully charged
1 (flashing)	Battery almost empty
No display	Battery exhausted , drive system will switch off soon

If the battery is almost empty, the last remaining segment starts to flash. The battery then only has limited reserve capacity. Once this is used up, the drive system switches off automatically. This is to prevent the battery from deep-discharging.

After this type of automatic shut-down, the drive system no longer provides any assistance. Commands issued by pressing the buttons are also no longer accepted.

The drive system is only ready for operation once the battery has been charged or a pre-charged battery is inserted.

5.3.6 Functions

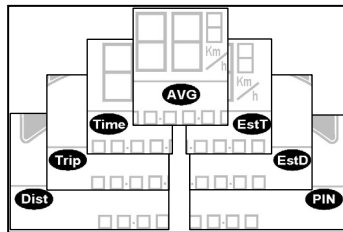
The drive system offers a range of different functions during operation
 These functions are:

- Odometer (Dist)
- Trip counter (Trip)
- Time counter (Time)
- Average trip speed (AVG)
- Estimated time remaining for the assistance (EstT)
- Estimated distance remaining (EstD)
- PIN (PIN)
- Bicycle lighting (optional function)



The desired function is selected by pressing the *MODE* button the relevant number of times.

The relevant active function is shown by an oval symbol above the display line.



- Dist - Odometer
Total sum of all kilometres travelled.

- Trip - Trip counter
Sum of all kilometres travelled since the trip counter was last reset. For instructions on how to reset this counter, see Ch. 5.3.7.

- Time - Travelled trip time
Total time travelled since the time counter was last reset. The time is shown in hours and minutes. For instructions on how to reset this counter, see Ch. 5.3.7.

- **AVG - Average trip speed**

The average speed since the counter was last reset is shown in kilometres per hour. For instructions on how to reset this counter, see Ch. 5.3.7.

- **EstT - Estimated time remaining for the assistance (EstT)**

The estimated time remaining for the drive system to assist the driver is shown. The value is determined by the control from the operating values gathered since the battery was last charged. The counter cannot be reset by the user.

- **EstD - Estimated distance remaining (EstD)**

The estimated remaining distance which can be travelled with the remaining battery charge capacity is shown. The value is determined by the control from the operating values gathered since the battery was last charged. The counter cannot be reset by the user.

- **PIN**

Edit menu for setting a PIN. See Ch. 5.3.10

- **Bicycle lighting**

Optional function for activating the front and rear bicycle lighting. A lamp symbol on the display shows when the bicycle lighting is switched on.

5.3.7 Resetting counters

The following counters on the display can be reset by the user:

- Trip counter (Trip)
- Time counter (Time)
- Average trip speed (AVG)

The counters can only be reset together at the same time.



To access the settings mode, press the *Up arrow* and *Down arrow* buttons at the same time with the drive system switched on. A PIN entry window appears on the display first of all.



To reset the counters, press and hold the *Up arrow* button for at least 3 seconds until the word **CLEAR** appears in the display line. The counters are now reset to zero.



Press the **MODE** button to return to the operating mode.

5.3.8 Switching the display brightness

The display lights up after being switched on. The brightness can be changed to adapt to the ambient conditions.

To access the settings mode, press the *Up arrow* and *Down arrow* buttons at the same time with the drive system switched on. A PIN entry window appears on the display first of all.



Press the *Down arrow* button to access the brightness setting. A choice of seven different brightness levels is available. Press the *Down arrow* button repeatedly to move through the values in sequence. The relevant level is shown in the display line.

Level	Display	Brightness	
1	BL - off	No lighting	
2	BL-AT1	low	Display lights up after the system is switched on or if one of the buttons is pressed for approx 4 seconds.
3	BL-AT2	medium	
4	BL-AT3	bright	
5	BL-on-1	low	Permanent lighting
6	BL-on-2	medium	
7	BL-on-3	bright	



Press the **MODE** button to return to the operating mode.

5.3.9 Switching on the bicycle lighting



This optional function enables the bicycle lighting to be operated with the drive system battery.

To activate this function, press and hold the *Down arrow* button.

The bicycle lighting is switched on after approx. one second.

The function is indicated with a lamp symbol on the display between the assistance level display and the charge status display.

To switch off the light, press and hold the *Down arrow* button. The bicycle lighting is switched off again after approx. one second.

5.3.10 Setting a PIN

If a PIN has been defined by the user, the drive system asks for this PIN after the system is switched on. The system is only ready for operation once this PIN has been entered completely and correctly.

**Info:**

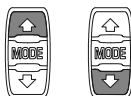
The system is supplied without a PIN and is ready for use immediately after it is switched on.



To access the settings mode, press the *Up arrow* and *Down arrow* buttons at the same time with the drive system switched on. A PIN entry window appears on the display first of all.



Press the *MODE* button to return to the entry mode. Four digit spaces are shown, with the first one flashing.



Press the *Up arrow* or *Down arrow* button to increase or decrease the relevant number by one. Confirm the desired number by pressing the *MODE* button and the next digit space starts to flash.

When all the numbers have been entered, press and hold the **MODE** button for at least 3 seconds. The system is switched off and the set PIN is saved.

Each time the drive system is switched on, it now asks for the PIN.



Info:

If 0000 is selected as the PIN, the PIN function is practically disabled. In this case, the system does not request a PIN when it is switched on.

The PIN can be changed at any time when the system is switched on.

6 Maintenance, cleaning and repair

6.1 Maintenance



Risk of incorrect functions if maintenance is carried out incorrectly

Incorrect maintenance work on an electric bicycle could result in damage to key components!

This could result in a fall.

- Maintenance work may only be carried out by a specialist dealer.



Danger due to unintentional motor activity

The motor can move unintentionally if the drive system remains switched on when work is being carried out on the electric bicycle.

- Always disconnect the battery from the bicycle before carrying out work on the electric bicycle.
- When re-commissioning for the first time after installation or repair, set up the bicycle so that the drive wheel can turn freely. Only then should the battery be inserted again and the drive checked for correct function.

The electric drive is maintenance free provided it is used properly and with care.

A safety inspection should be carried out by a specialist dealer every 1000 kilometres.

The following items should be checked:

- Secure attachment of all cables and components
- Operation of the complete electrical system
- Operational safety of the battery

6.2 Cleaning



▲ WARNING

Danger due to rotating parts

The motor can move unintentionally if the drive system remains switched on when cleaning work or similar manipulations are being carried out on the electric bicycle.

- Remove the battery before carrying out any cleaning or assembly work on the electric bicycle.

The parts of the retrofit kit can be cleaned using a damp - but not wet - soft cloth and normal commercial cleaners or soapy water.

To clean the bicycle, follow the directions given in the bicycle's operating instructions.

NOTE



Never use a high-pressure cleaner

The use of a steam jetter, high-pressure cleaner or water jet for cleaning is not permitted. Components can be destroyed if water is allowed to enter the electrical system or motor.

6.3 Repair work

Users carry out repair work, which is not related to the electric drive, at their own risk and at their own discretion!



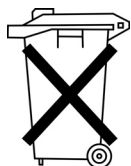
Info:

When re-installing the drive wheel, e.g. after changing a tyre, the wheel nuts must be tightened with a torque of **45 Nm ± 5 Nm!**

The torque support must be completely surrounded by the dropout. The reserve in the assembly groove for the wheel axle in the dropout must be **at least 5 mm!**

The recess of the torque support must point to the open side of the dropout!

7 Disposal



Electrical and electronic devices and batteries must not be disposed of together with household waste. The end user is required by law to return electrical and electronic devices at the end of their life to the public collection points provided for this purpose, or to the specialist dealer. Details depend on the laws in the country where the bicycle is used. You will make a significant contribution to protecting our environment by re-using or properly recycling old appliances.



The components must be disposed of in accordance with the valid environmental regulations in the country where the usage takes place. You can contact your local authority or specialist stockist for advice about recycling.

8 Carrying by car

Aggressive road dirt, rainwater or a saline atmosphere will shorten the life of an electric bicycle. It should therefore always be protected with a tarpaulin when carried on a car. Remove the battery for transportation and transport in a cool place in the vehicle.

9 Warranty and limitations of liability

We, HEINZMANN GmbH & Co. KG (manufacturer), shall in the event of a defect that occurs in our product provide the following services to the immediate purchaser of our product as part of our statutory warranty obligation:

1. Rectification of defects that occur as a result of material or manufacturing deficiencies, by repair or replacement of the affected part according to the statutory warranty regulations within a period of 24 months from the date of manufacture to the immediate purchaser. Wearing parts are excluded. The date of manufacture is shown on the nameplate.
2. If repair or replacement is unsuccessful, the immediate purchaser may at his discretion demand a reduction of the price (abatement) or revocation of the contract (withdrawal). Minor defects shall not confer a right of withdrawal.
3. Claims for defect shall not exist if they are causally related to the fact
 - that these operating instructions are not followed
 - that modifications are made to our product or our product is used improperly
 - that our product is unsuitable for the application owing to unusually high mechanical or thermal stress or is otherwise overloaded, according to Chapter 3
 - that our product is unsuitable for installation in the vehicle owing to unusual installation conditions
 - that natural wear and tear or wear through improper use has occurred
 - that our product has sustained corrosion or oxidation due to environmental influences
4. If the immediate purchaser claims damages as a result of defects occurring to the product, then the following limitations of liability apply.

5. Claims for defects expire as outlined in point 1.
In case of injuries to life, body or health, injuries caused by intentional or negligent violation of duties on our part, as well as in the case of fraudulent concealment of a defect, the statutory periods of limitation apply.
The statutory periods of limitation also apply for recourse actions in accordance with § 479 Section 1 of the Civil Code.

Limitations of liability

- We accept no liability on any legal grounds for damage not sustained by the supplied product itself.
- However this disclaimer does not apply in the event of premeditation or gross negligence, culpable injury of life, body or health, defects that have been maliciously concealed, the acceptance of a guarantee or a procurement risk, the breach of essential contract obligations or in the event of defects of the supplied object, in so far as we are liable under the product liability law for personal injury or damage to privately used objects.
- In the event of a culpable breach of essential contract obligations, the claim for damages in the event of slight negligence is limited to the reasonably foreseeable losses typical for this type of contract.
- The above provisions relating to limitation of liability apply analogously in the event of a breach of ancillary contract obligations such as for example duties to inform and advise.

10 Technical data

Control unit		
Operating voltage		36 V
Current max.		depending on version & usage 10 .. 33 A
Motor		
Type		PRA 180-25
Motor nominal voltage		22.8 VAC
Output		250 W (DIN EN 60034-1)
Speed when riding on the level		depending on version & wheel diameter approx. 60 ... 330 ¹ / _{min}
Nominal torque		11.4 Nm
Impulse torque		up to 60 Nm
Thermal overload protection		Type KTY84-130
Motor diameter		Ø 220 mm
Weight		Front wheel motor approx. 4.5 kg Rear wheel motor approx. 4.7 kg
Degree of protection		IP54
Battery		
Type		Lithium-ion battery
Nominal voltage		36 V
Capacity		11 Ah / 400 Wh
Charging time		approx. 6 h with charging current 2 A
Temperature ranges	Normal operation	-10 ... 45 °C
	Charging	10 ... 35 °C
	Storage	-10 ... 45 °C



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