## CONTENTS

### Chapter I INSTRUCTION
- 1 Composition of Electric Motorcycle ................................................................. 1
- 2 Specifications ....................................................................................................... 1
- 3 Construction ....................................................................................................... 2

### Chapter II USE AND MAINTENANCE
- 1 Proper Use of Electric Motorcycle ..................................................................... 5
- 2 Maintenance of Electric Motorcycle .................................................................... 8

### Chapter III STRUCTURE AND MAINTENANCE OF ELECTRIC CONTROL PARTS
- 1 Driving Motor ................................................................................................... 14
- 2 Controller .......................................................................................................... 20
- 3 Lithium Battery .................................................................................................. 26
- 4 Charger .............................................................................................................. 31
- 5 Meter ................................................................................................................ 34
- 6 Lighting and Signals .......................................................................................... 39

### Chapter IV TROUBLESHOOTING OF ELECTRIC MOTORCYCLE
- 1 Normal Meter Display & Motor Breakdown ..................................................... 41
- 2 Intermittent Operation of Driving Motor ........................................................... 42
- 3 No Display in Meter & Motor Breakdown ......................................................... 43
- 4 Slow Motor Speed ............................................................................................. 43
- 5 Jogging Motor .................................................................................................... 44
- 6 Noisy Driving Motor ........................................................................................ 45
- 7 Runaway Motorcycle ........................................................................................ 45
- 8 No Power Display in Meter & Normal Motor Operation ............................... 46
- 9 Normal Power/Electric Current Display & Abnormal Speed/Mileage/Gear Display & Normal Motor Operation .................................................. 46
- 10 Horn Breakdown .............................................................................................. 47
- 11 Failure of Headlight ........................................................................................ 47
- 12 Failure of Winkers .......................................................................................... 48
- 13 Continuous Burn-out of Fuse ......................................................................... 48
Chapter V STRUCTURE AND MAINTENANCE OF WHOLE VEHICLE

14 Insufficient Endurance Mileage with the Full Charging Lithium Battery ................................................................. 49
15 Diagnostic Diagram of CAN-bus Communication .......................................................................................... 49
16 Flow Diagram of Fault Diagnosis ........................................................................................................ 52
17 DTC of Electric Motorcycle .................................................................................................................. 53
18 Electric Diagram .................................................................................................................................. 55

1 Frame ......................................................................................................................................................... 56
2 Vehicle Body ........................................................................................................................................ 56
3 Construction and Troubleshooting of Wheels ......................................................................................... 62
CHAPTER I INSTRUCTION

1 Composition of Electric Motorcycle

Electric motorcycle is mainly consisted of five systems, power, transmission, traveling, brake-operating and electric instrument. Each of them functions as follows:

1.1 Power System

The system is usually made up of lithium battery pack, which is the power source of electric motorcycle, and its performance directly influences the power and economy.

1.2 Transmission System

The system is used to transmit the output power from the power system to the driving motor that running the electric motorcycle. It is composed of a controller and a driving motor, which enables the electric motorcycle to obtain the driving force and speed needed for driving, and keeps the stable starting and stopping.

1.3 Traveling System

The system is the role of the electric motorcycle to form a whole and support the total weight. It will transmit the torque from the transmission system into the driving force for the electric motorcycle, absorb and pass the road reaction force acting on the wheel at the same time, to ensure the normal and safe running. It is mainly composed of frame, steering stem comp., front shock absorber, rear shock absorber, front/rear tyre and seat etc.

1.4 Brake-operating System

The system is used to directly control the driving direction, speed, braking performance and so on, so as to ensure the safe running. It is mainly composed of steering handlebar, braking device and speed regulating handle etc.

1.5 Electric Instrument System

The system is the main unit to ensure the safe running of vehicle. It can supply the rider correct and timely control of the vehicle effectively, which is composed of data display device, charger and lamp etc.

2 Specifications
### Electric Motorcycle Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overall dim.</strong> (L×W×H)</td>
<td>1680mm×750mm×1090mm</td>
<td><strong>Lithium battery</strong></td>
<td><strong>Capacity</strong> 24Ah</td>
</tr>
<tr>
<td>Wheelbase</td>
<td>1200mm</td>
<td><strong>Nominal voltage</strong></td>
<td>60V</td>
</tr>
<tr>
<td>Ground clearance</td>
<td>130mm</td>
<td><strong>Input voltage</strong></td>
<td>(180–240)V</td>
</tr>
<tr>
<td>Kerb weight</td>
<td>76kg</td>
<td><strong>Frequency</strong></td>
<td>50 Hz</td>
</tr>
<tr>
<td>Max, laden weight</td>
<td>150 kg</td>
<td><strong>Type</strong></td>
<td>DC brushless</td>
</tr>
<tr>
<td>Max. speed</td>
<td>≥50km/h</td>
<td><strong>No-load parameter</strong></td>
<td>&lt;2A</td>
</tr>
<tr>
<td>Grade ability</td>
<td>≥12°</td>
<td><strong>Rated power</strong></td>
<td>1200W</td>
</tr>
<tr>
<td><strong>Brake</strong></td>
<td></td>
<td><strong>Efficiency</strong></td>
<td>≥80%</td>
</tr>
<tr>
<td>Front wheel</td>
<td>Disc</td>
<td><strong>Rated speed</strong></td>
<td>650 ± 20 (r/min)</td>
</tr>
<tr>
<td>Rear wheel</td>
<td>Drum/Disc</td>
<td><strong>Rated output torque</strong></td>
<td>17N·m</td>
</tr>
<tr>
<td><strong>Brake type</strong></td>
<td></td>
<td><strong>Controller</strong></td>
<td></td>
</tr>
<tr>
<td>Front</td>
<td>Operated by hand</td>
<td><strong>Type</strong></td>
<td>Electronic</td>
</tr>
<tr>
<td>Rear</td>
<td>Operated by hand</td>
<td><strong>OCP</strong></td>
<td>≤(35 ± 0.5)A</td>
</tr>
<tr>
<td><strong>Shock absorber</strong></td>
<td></td>
<td><strong>UVP</strong></td>
<td>(48 ± 0.5)V</td>
</tr>
<tr>
<td>Front</td>
<td>Hydraulic spring damping</td>
<td><strong>Instrument</strong></td>
<td>LED</td>
</tr>
<tr>
<td>Rear</td>
<td>Hydraulic spring damping</td>
<td><strong>Electric elements</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Rim type</strong></td>
<td></td>
<td><strong>Rear-view mirror</strong></td>
<td>Round, convex</td>
</tr>
<tr>
<td>Front</td>
<td>Alloy</td>
<td><strong>Headlight</strong></td>
<td>12V4W/8W</td>
</tr>
<tr>
<td>Rear</td>
<td>Integral hub motor</td>
<td><strong>Winker</strong></td>
<td>12V1.8W X4</td>
</tr>
<tr>
<td><strong>Tyre type</strong></td>
<td></td>
<td><strong>Brake/tail light</strong></td>
<td>12V0.5W3W</td>
</tr>
<tr>
<td>Front</td>
<td>3.0 - 10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rear</td>
<td>100/80 - 10</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Tyre pressure</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Front</td>
<td>≥200kPa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rear</td>
<td>≥225kPa</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 3 Construction

Electric motorcycle is one kind of motorcycle, with the lithium battery as the power source. It travels on the basis of driving the motor under the input of external signal. The power drive and control system consist of an electric motor, a controller, a lithium battery pack and a charger. The relationship between these devices is:
the electric energy is stored in the lithium battery pack, when the electric motor (controlled by the controller) is turning, the vehicle will move on. The charger is used to supplement the electric energy of lithium battery, so that the charging and discharging cycle can be sustained. Above four components ensure the electric function of electric motorcycle, and become the most important components of green transportation of the human and electromechanical integration to distinguish from the motorcycle fed by fuel.

3.1 Vehicle Body

It is mainly composed of frame, front fork, aluminum wheel, steering bar pipe, rear fork, seat and so on.

3.2 Electric Motor

A motor is a component that converts the electric energy of vehicle-mounted lithium battery into mechanical energy to drive the electric motorcycle.

3.3 Lithium Battery Pack

The lithium battery pack is an energy carrier used by electric motorcycles for motor rotating, and is one of the key components that determine the mileage.

3.4 Controlling Parts
The controlling parts of an electric motorcycle include the controller, steering handle, brake handle, meter and switch comp., lighting and indicating lamps (e.g. headlight), etc.

3.4.1 Controller

Electric motorcycle controller is used to control the working state of motor, is the core part of electric equipments and functions in low voltage, current limiting and over-current protection. The intelligent controller with the FOC magnetic positioning technology is adopted to keep the self-check, constant speed and energy recovery.

3.4.2 Acceleration handle

It is used to control the running speed of electric motorcycle. Turning the direction of acceleration handle, the electric signal output to the controller will vary. According to this signal, the controller can adjust the speed of electric motor.

3.4.3 Brake handlebar

Brake handle will lock and control the wheel turning by the electrical force from the wire cable and brake shoes; on the other hand, by the internal electronic circuit, signals are output to the controller which will cut off the power supply line, also realize the EBD function to increase the braking torque of motor and achieve the purpose of energy recovery in power-off brake.

3.4.4 Meter

The meter is used to display the working condition of electric motorcycle, that contains the on-off power supplies, battery, driving speed, fault code etc.. The intelligent controller can also tell the gear and constant speed state showing in the type of digital and light emitting diode generally.

3.4.5 Lighting and indicator lamp

Lighting is used to light and indicate, including the headlight, taillight, turn signal indicator and so on.
CHAPTER II  USE AND MAINTENANCE

1 Proper Use of Electric Motorcycle

1.1 Check before Starting-up

Read the Owner’s Manuel of 1200DT carefully before starting up the electric motorcycle. Check it in line with the instruction in order to reduce or avoid breakdown during driving. Generally check it as following:

(1) Check the connections of components for security to prevent accidents caused by loose, detachment or rapture of the parts.

(2) Check the electric quantity. Recharge the battery if it is out of power.

(3) Check the flexibility of controlling parts such as throttle, front hydraulic brake, rear brake cable (or rear hydraulic brake), etc.

(4) Check the flexibility of front/rear brake lever.

(5) Check the front/rear tyres and its pressure.

(6) Check the functions of electric device such as lighting, horn, indicators, etc.

(7) Raise the front/rear wheels above the ground. Check them for normal rotation and abnormal sound.

1.2 Starting-up

Key points for safe and correct starting-up the motorcycle are as follows:

(1) Check the whole motorcycle according to the instructions before driving. Make sure the motorcycle is in sound condition.

(2) Open the seat, move the OLP switch to position “ON”. Turn on the power lock and fold the side stand. Press the starter button for 3 seconds until the “READY” indicator in gear P lights up, then slowly turn up the throttle grip to start the vehicle.

(3) Shift the gear position according to the speed demand during the driving. Note: when gear position shifted from 2 to 3, users will have a strong feeling of acceleration.
1.3 Steer the Motorcycle According to the Dashboard Instructions

This electric motorcycle is equipped with a dashboard that displays the information of speed, electric quantity, mileage and electric current. Users can obtain the working conditions through it and steer the motorcycle in light of the data displayed on the dashboard during driving.

1.4 Restart during Driving

Unexpected situations always happen during the driving, so it is common to speed up, accelerate or stop the vehicle subsequently. The power-off in braking function of electric motorcycle ensures the driving safety of users. Whenever apply the front/rear brake, the power cut-off in braking function will take effect immediately.

1.5 Braking

On the premise of safety, reduce braking times as far as possible during driving to avoid frequent restart. If the motorcycle must be stopped in some unexpected situations, the following points should be heeded:

(1) According to the rule that “front brake for stopping, rear brake for deceleration”, apply both the front and rear brakes together when braking the motorcycle.

(2) When drive at high speed or in a downhill road, slow down the vehicle in advance. Snub the rear brake first. Don’t apply the front brake first which may cause accident due to center of gravity moving forward.

(3) In rainy or snowy days, the braking effect is poor due to the slippery road. When the loading weight is over 75kg, the inertia force gets large, thus the accident is more likely to happen. Be especially careful during the driving and make sure that the braking force of front and rear is the same in order to avoid side slipping.

1.6 Proper Use

A sound electric motorcycle is not only depending on good quality, but also on the regular maintenance and proper use. A good using habit and method play a crucial role in keeping the service life of lithium battery and motor. The motorcycle should be maintained and charged frequently.

1.6.1 Frequent maintenance

Keep the electric motorcycle clean. Prevent the motorcycle from rain and sunshine which will lead to the aging of electric components and corrosion of vehicle body or moving parts. When used in rainy season or passing through water, the water level cannot be higher than the center line of wheel axis to avoid damage to the motor. Tires should be inflated enough to reduce the friction resistance between the tire and the road. Pay attention to the braking performance of both front and rear brakes to ensure traffic safety. Used for about half a year (about 3000km), the wheel hubs should be maintained at the service center and adding lubricants as well.
1.6.2 Frequent charging

Keep a good charging habits. Recharge the battery after each use and keep it in half charge status. Because of the nature of lithium battery, do not deeply discharge it often. Especially when the battery is long time stored in a power-lack condition, the precipitated chemical from the inner will damage the battery irreversibly. Therefore, the battery must be recharged in every three month. Charge the battery through a matched charger in a cool and ventilated place. Keep the battery out of high temperature, moisture and water in order to prevent electric shock accident. When the battery temperature is higher than 45°C, it can be charged. Charge the battery later when its temperature drops below 45°C.

1.6.3 Notes

(1) Lithium battery performance will be affected by the ambient temperature. In general, when the temperature dropped to near 0 °C below, the lithium battery power may be significantly reduced. Therefore, in winter or cold areas, it is normal that the driving endurance decrease. when the temperature rises back to about 20 °C, the lithium battery function will recovery automatically.

(2) The driving endurance will be affected by a large power consumption in the following reasons, such as frequent braking or start the vehicle, driving on uphill road, muddy road or driving against the wind. In order to achieve the best endurance mileage, it is recommended to take the following ways:

① Minimize the frequent braking and start on the safety premise.

② When the lithium battery will not in use for a long time, make sure to full charge it before removing it to store. It is better to recharge it at intervals of 3-4 weeks.

③ All the battery will self-discharge. The lithium battery service life will be affected by long time stored in low power level.

(3) In rainy and snowy days, driving at low speed to avoid accidents caused by emergency braking.

(4) Please use the specified charger and other spare parts.

(5) Arbitrarily dismantle or refitting the motorcycle is forbidden. Contact your local dealer or authorized service center for help if any malfunction occurs.

(6) Because the circuit of electric motorcycle is controlled by a computer chip, when used in complex road conditions and interfered by electromagnetic, the system may crash. In this case, turn off the power, and restart it to recovery.
(7) The electric motorcycle should be well stored if it is not in use for a long time. Firstly, remove the full charged battery pack from the vehicle and turn off the power. Carry out maintenance and remove the dust. Inflate the tyres with enough air. Then store it in a cool, dry place with good ventilation. Recharge the battery again if stored more than three months. Keep the charger in a dry place and out of dust. The lithium battery pack should be stored indoors in winter.

(8) The max. loading of electric motorcycle is 150kg. Do not overload.

1.6.4 Safety instruction

(1) Reading this Service Manuel carefully and check all parts for good condition. Don’t drive the motorcycle before you know its functions. Don’t lend the motorcycle to the people who don’t know how to use.

(2) When driving in rainy and snowy days, apply brake in advance. Snub the brake first, then stop the vehicle.

(3) Arbitrarily dismantle the parts is not allowed. Replace the parts at the service center if needed.

(4) The voltage of lithium battery pack is 60V. Don’t touch the two electrodes with wet hands or connect them with metal, otherwise accident may occur due to the strong current caused by short-circuit.

(5) Obey the traffic rules and keep safe driving. The following people are forbidden to drive:

- a) Psychotic patient or people with psychotic history.
- b) Cardiopath
- c) Deaf-mute
- d) Disabled who is unable to drive
- e) Forbid the drunk driving

2 Maintenance of Electric Motorcycle

2.1 Regular Maintenance

For the parts and maintenance method, please refer to the following table.

<table>
<thead>
<tr>
<th>Parts</th>
<th>Maintenance method</th>
<th>Intervals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bearing of wheel</td>
<td>Remove the bearing of front wheel and adding lubricating grease; Check it for wear, replace it if it is worn or damaged.</td>
<td>Yearly</td>
</tr>
</tbody>
</table>
### Maintenance Schedule

<table>
<thead>
<tr>
<th>Component</th>
<th>Action Details</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axle of wheel</td>
<td>Remove the wheel axle. Check it for bending. Replace or straighten it if it is bent.</td>
<td>Every 6 months</td>
</tr>
<tr>
<td>Wheel</td>
<td>Check the deflection and runout of front/rear wheels. If the deflection or runout is serious, align or replace the wheels.</td>
<td>First time upon newly bought; every 2 years afterwards</td>
</tr>
<tr>
<td>Brake lever</td>
<td>Adjusting the free play of both front and rear brake levers to the specified value: 10~20 mm.</td>
<td>Every 3 months</td>
</tr>
<tr>
<td>Brake cable</td>
<td>Check the cable for dryness and wear. Replace the cable if it is seriously worn. Wash the cable and apply lubricating grease or oil.</td>
<td>Monthly; Every 3 months</td>
</tr>
<tr>
<td>Brake shoes</td>
<td>Check the brake shoes for wear. Replace the shoes if they are worn out of the repair limit.</td>
<td>Monthly</td>
</tr>
<tr>
<td>Seat</td>
<td>Check the leather cover and foam of seat for wear. Replace the seat if the leather cover and foam are worn out.</td>
<td>Casually</td>
</tr>
<tr>
<td>Electric quantity</td>
<td>Check the electric quantity of battery. Recharge it if necessary.</td>
<td>Daily; once in a month when long time stored</td>
</tr>
</tbody>
</table>

---

The regular maintenance content of electric motorcycle is as following:

1. Electric motorcycle should always be kept clean. Wipe away the dust and dirt with a clean cotton yarn or cotton cloth. Dry the electric motorcycle timely with a dry cloth when get wet in the rain to keep it from rust and short-circuit of electric components. Parts with baking finish are not suitable to cover with plastics because it is hard to dry up when get wet in water, thus the baking finish are easy to peel off. Don’t wipe the baking finish with oil as it will lose gloss. Electroplated parts should be frequently wiped with neutral oil to prevent rust.

2. Check the tyre pressure often; make sure they are in good condition for use.

3. The main transmission parts of electric motorcycles, such as front wheel, rear wheel (rear wheel drives), front axle and front/rear brakes, as well as other frequently checked and adjusted parts, must keep in a good flexible condition and running without knocking sound or abnormal sound. The screws and nuts should always be checked and tightened to avoid wear of parts or greater damage due to loose parts.

4. The braking system should be always checked to keep it in good performance. Worn-out brake shoes will affect the braking effect. Replace them if necessary. When used in rainy days, clear away the dirt timely from the working surface of brake in order to keep the brakes in a sound condition.

5. Check the controlling parts and cables for flexibility. Make sure there is no sluggish and stick in these parts. Instill lubricating oil from one end of the hose and pull the cable at the same time till the moving of cable is smooth.
(6) Frequently apply a little bit lubricating oil to the moving parts of the motorcycle to reduce wear and keep the moving parts smooth, especially for the braking system and transmission system. For lubrication location and intervals, please refer to table 2-2.

<table>
<thead>
<tr>
<th>Lubrication location</th>
<th>Lubricant</th>
<th>Intervals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front/ rear wheel axle</td>
<td>Albany grease 3#</td>
<td>Every 6 month~1 year</td>
</tr>
<tr>
<td>Top/bottom bearings of steering stem</td>
<td>Albany grease 3#</td>
<td>Every 6 month</td>
</tr>
<tr>
<td>Moving parts such as axle, bush, etc./braking cable</td>
<td>Engine oil 30#</td>
<td>Every 30 days</td>
</tr>
<tr>
<td>Other rotating and moving parts</td>
<td>Engine oil 30#</td>
<td>Every 30 days</td>
</tr>
</tbody>
</table>

**Note:** The above schedule is for general reference only. The intervals may be shortened or extended as appropriate, depending on conditions such as the working environment, the frequency of use, the quality of electric motorcycle and the motorcycle condition.

(7) Store the electric motorcycle in a dry parking shed with good ventilation. Do not put it in a humid or high temperature place. When close to heat source, the rubbers are more likely to aging.

(8) The driving motor, controller, charger and lithium battery pack are not in the regular maintenance scope. Arbitrarily dismantle of these parts is not allowed. Take it to the service center for repair if needed.

**2.2 Check and Adjusting after 1000km’s Running**

Usually the break-in period for electric motorcycle is within 1000km. The so-called “break-in period” refers to the process that after riding for certain time, the parts of newly purchased electric motorcycle break in, so that the cooperation between the parts are more smooth and free. Different models and different delivery status will have different break-in mileage, but basically within 1000km.

After the break-in period, carry out an overall adjusting to the motorcycle to ensure a good performance in the future.

**2.3 Self-check in Maintenance**

(1) Check the tyres for proper pressure. The pressure for front/rear tyres is 225kpa (2.8-4.5kg f/c m²).
(2) Check the rear reflector.

(3) The locknut of front wheel axle should be always checked to prevent loosen.

(4) Tighten all the fasteners to right position, especially the stop plate mounted on the motor shaft can’t be loosen.

(5) Applying butter or lubricant to the brake cable to reduce friction resistance.

(6) Adjusting the free play of both front/rear brake lever to the specified value (10~20mm). At this distance, the wheels can be controlled effectively as well as running freely when release the brake lever. (Otherwise, the large driving resistance will consume a lot of power.)

(7) The newly purchased electric motorcycle is recommended to be checked and maintained at the authorized service center after riding for one month. Carry out maintenance at every 1000km as well.

(8) If the problems can’t be solved by owner in the daily use and maintenance, take the motorcycle to the authorized service center for help.

(9) Any damages and malfunctions caused by arbitrary dismantle of the parts is out of the warranty.

(10) The motor, controller and lithium battery pack are maintenance-free. If any problems occur during the warranty, please contact the local dealer to handle. Do not immerse the electric components such as motor, controller, etc. in water.

2.4 Key Points of Maintenance

2.4.1 Key points of battery maintenance

(1) Charge the lithium battery with the original charger.

(2) Battery working temperature: charging (0°C ~45°C), discharging (-20°C~55°C), relative humidity (45%~85%).

(3) Do not misplace the battery electrodes when put into charger. Don’t reverse charging the battery.

(4) Don’t make the battery short-circuit, or it will be damaged permanently.

(5) Don’t burn or destroy the battery, which may cause emission of poison gas or fire.
(6) Don’t put the battery in adverse environment, such as extreme temperature, deep cycle or frequent over charged and discharged.

(7) Please stop using the battery when problems such as abnormal voltage, abnormal temperature or expansion occurred.

(8) Keep the battery out of water, drinking and corrosive liquid.

(9) Don’t close the battery to heat source, open fire, inflammable and explosive gas or liquid.

(10) In order to keep the service life and good performance of battery, always keep the power between 20%~90%.

(11) Because of its special nature, the lithium battery capacity will have a different level of fading at low temperature.

(12) When stored over one year, the battery should be recharged and discharged to activate its capacity.

2.4.2 Tyre Maintenance

(1) The tyre pressure should be always checked and maintained at a normal level. Strongly press the tyre with fingers, if it is slightly dented, the pressure is suitable. Insufficient pressure or high pressure will affect the running of electric motorcycle.

(2) Remove the foreign matters in the tread grooves to avoid hard sharp object damaging the tyre and inner tube.

(3) Check the tyre for wear. Replace it if the value is 2.0mm greater than the wear limit.

(4) Check the tyre valve for deflection. Correct the valve if the deflection is serious.

(5) Don’t stain the tyre with engine oil. Wipe it clean if accidently stained to avoid tyre deformation.

2.4.3 Washing Instruction

(1) Slightly wipe the baking finish parts or surface of plastic parts with neutral detergent. Dry it with clean cloth.

(2) Apply antirust oil to the metal parts to prevent rust.

(3) It is forbidden to apply lubricant to the front/rear brake, aluminum wheel and tyre.
(4) Note: if the problems can’t be solved or located by yourself, mainly including motor, controller, charger, lithium battery, etc., please take the motorcycle to the authorized service center for repair. Do not arbitrarily repair the aforesaid parts, or our company will not perform warranty.

(5) Don’t arbitrarily disconnect or connect the electric components and plugs in order to prevent short-circuit.

(6) Maintain the lubrication location every 1~2 month. Engine oil 32# is recommended for lubrication.

**LUBRICATION LOCATION OF ELECTRIC MOTORCYCLE**
CHAPTER III  STRUCTURE AND MAINTENANCE OF ELECTRIC CONTROL PARTS

1 Driving Motor

1.1 Working Principle

Brushless motor can switch the coil power on/off through the electronic on-off switch. Hall elements will test and check the change of magnetic pole position and stator current. The stator of brushless motor is composed of three coils (also known as three-phase), wherein each phase consists two coils in relative place. The three-phase coil is evenly distributed in the stator, respectively at different angles to cut the rotor. When the current passing through the stator coil are switched, its magnetic field will revolve as the rotation direction of rotor (as called as “rotating magnetic field”), while driving a permanent magnet rotor.

1.1.1 Mechanical structure of electric motor

Brushless motor: the controller provides direct current with different direction to achieve the alternating changes of current direction in motor coil. There is no brush and commutator between the brushless motor rotor and stator.

1.1.2 Structure of brushless motor

The low speed brushless and gearless hub motor is adopted by the electric motorcycle, and belongs to an out rotor motor, which is composed of the electric motor rotor, stator, shaft, end cover, bearing, etc. The part is shown as follows:
1.2 Function of Coupler

1.3 Fault Diagnosis of Driving Motor

<table>
<thead>
<tr>
<th>Port No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5V-</td>
</tr>
<tr>
<td>2</td>
<td>/</td>
</tr>
<tr>
<td>3</td>
<td>5V+</td>
</tr>
<tr>
<td>4</td>
<td>Hall Blue</td>
</tr>
<tr>
<td>5</td>
<td>Hall Green</td>
</tr>
<tr>
<td>6</td>
<td>Hall Yellow</td>
</tr>
</tbody>
</table>
1.3.1 Hall elements

Brushless motor, in addition to the obvious appearance damage such as wheel crack deformation or cracking, lead wire breakage, head screw slip, the common faults are always damage to the sensor (Hall element). The following will introduce the damage judgment and replacement of sensor in detail.

Judgment method I

(1) Connect the driving motor to the fine controller. Turn on the power. Do not turn the handlebar directly.

(2) Set the multimeter to 20V DC voltage, and connect the negative pole (black bar) to the black Hall wire, positive pole (red bar) to the red Hall wire. The voltage of sensor power is measured to be 5V usually, sometimes is 4.5V or 5.5V. As an example, it is 5V.

(3) Connect the black bar to the black wire, red bar to the yellow wire, slowly turn the motor to see the reading on the multimeter. The normal reading is changed from 0V to 5V sequentially. If there is a long-term high voltage 5V or low voltage 0V, the sensor to the yellow wire is damaged.

(4) Check the sensors to the green line and blue line respectively according to (3).

Judgment method II

(1) Unplug the controller connector from the driving motor, set the multimeter to check the diode. This method is preferred and accurate.

(2) Connect the red pen of multimeter to the black wire, the black pen to the yellow, Green and Blue Hall wire separately, the three resistance value should be basically the same. Exchange the connection of two pens to check, if the three values are different, the corresponding sensor may be damaged. This method may cause mistake in judgment.

1.3.2 Replacement

(1) Remove the end cover at both sides, then take the stator out.

(2) According to the test result with the above method, cut off the damaged sensor pin from one end near the circuit board, and be sure to not touch each other.

(3) Carefully remove the damaged sensor from the stator. Be sure to not damage the enameled wire. Clean the slot and fix the new sensor in the groove. Pay attention to confirm the positive and negative sides of sensor.

(4) The sensor pins are welded on the corresponding pads respectively and the excess pins are cut off.
(5) Secure the sensor and circuit board on the stator with wax wire.

(6) Place the stator into the wheel hub carefully, install the two ends covers and the driving motor.

1.3.3 Review

Install the driving motor on the rear wheel, check it again according to the above judgment method. Running the vehicle after the inspection.

If the motor insulation deterioration due to water in driving motor, the multimeter is should be placed in the 200MΩ to test the resistance between the motor phase line and shaft. The normal should be infinite, if the meter shows a value, to open and dry it with a hair dryer or in the sun. The resistance is measured to be normal. Also check the sensor again, if it is damaged, replace it as the procedure above.

1.4 Troubleshooting and Maintenance

1.4.1 Large no-load current

Set the multimeter to DC 20A, connect the red and black pens to the power input port in series. Switch on and note the max. current I₁ in the case of the motor does not rotate. Turn the handlebar to rotate the motor more than 10s at high speed without load, after the motor speed is stable, view and note the max. current I₂ at that time. The no-load current of motor= I₂ - I₁

When the above calculated value is greater than the limited value 3.5A, the motor must be out of order.

The reason of large no-load current is: the internal mechanical friction of driving motor is too large to cause a short circuit in partial coil and demagnetization of magnetic steel.

Check

Turn on the power and turn the handlebar to rotate the motor more than 10s at high speed without load. After the motor speed is stable, measure the max. speed n₁ at no-load with a handheld speed measuring instrument. In the standard test condition, driving for more than 200m to measure the max. speed n₂ at load.

When n₂/n₁>1.5, indicating the motor’s magnetic steel has been demagnetized seriously, it should be replaced as a set. In the actual maintenance, the entire driving motor should be replaced usually.

1.4.2 Hot driving motor
If the temperature of driving motor end cover is measured to be over than 25°C, the temperature of motor itself must be exceeded the normal range. Generally, the temperature should be kept lower than 20°C. Usually the too hot driving motor should be replaced in the actual maintenance.

1.4.3 The driving motor has mechanical collision or mechanical noise at the time of operation

The mechanical collision or discontinuous irregular noise can not be occurred in on-load running. Otherwise, usually the motor needs to lubricate and replace the bearing, bond the magnetic steel again, adjust the pad to reduce the axial movement or replace the motor core.

1.4.4 The vehicle mileage is shortened and the motor is weak

The reason that causes the shorten continuous mileage of electric motorcycle and weak of motor is very complex. If the above faults are excluded, the problem may be not caused by itself but relating with the battery capacity attenuation, charger dissatisfaction or controller parameter drift (the PWM signal does not reach 100 %) and so on.

1.4.5 Open phase of three-phase in the brushless driving motor

The open phase of three-phase in the brushless driving motor is commonly caused by the damage of Hall elements. By measuring the resistance of Hall elements output lead to the Hall ground wire and the Hall power lead, we can compare them to know which Hall element is faulty.

In order to ensure the accurate phase position of motor, we recommend to replace the three Hall elements at the same time. Before the replacement, you must clear of the drive motor angle is 120° or 60°. The three Hall elements with 60° is placed in parallel, but with 120° angle, one of them is placed turning over 180°.

1.4.6 The exchange of driving motor

The exchange principle of driving motor is:

Driving motor with low speed brushless can be changed with each other, likewise, the high speed brushless also can be done.

Low speed brushless and high speed brushless driving motor can not be directly interchangeable.

(1) Identification of motor power
The motor model, specification and motor manufacturing No. are included in the code as following:

①800W motor(DTX30200A1A00) : 10ZW6065317★6008★HA000000
②1200W motor(DTX30200A2A00) : 10ZW6065317★6012★HA000000
③1500W motor(DTX30200A0A00) : 10ZW6065317★6015★HA000000

2 Controller

2.1 Figure and Working Principle

The code is printed on the wheel rim of motor.
2.1.1 Figure

![Figure](image)

**Fault indicator**

2.1.2 Identification of controller model

![Label](image)

**1500W 1200W 800W**

2.1.3 Working principle
2.2 Feature and Function Pin of Controller

2.2.1 Function of controller

(1) Speed adjustment: the controller can adjust the speed of driving motor.

(2) OCP: the controller has a device to limit the output current automatically when running in heavy load, brake or circuit is faulty.

(3) Cut-off in braking: the controller is enable to cut off the power supply of driving motor when braking.

(4) Undervoltage protection: when controller voltage decrease to the protection limited value (48±1)V, the power supply of motor will be cut off.

(5) OTP: when the temperature of MOS is higher than 110°, the power supply of motor will be cut off automatically.

2.2.2 Function pin of controller
<table>
<thead>
<tr>
<th>Port No.</th>
<th>Description (default)</th>
<th>Port No.</th>
<th>Description (default)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reverse</td>
<td>2</td>
<td>Low gear</td>
</tr>
<tr>
<td>3</td>
<td>High gear</td>
<td>4</td>
<td>\</td>
</tr>
<tr>
<td>5</td>
<td>CANL</td>
<td>6</td>
<td>Ground</td>
</tr>
<tr>
<td>7</td>
<td>Burglar alarm power (-)</td>
<td>8</td>
<td>\</td>
</tr>
<tr>
<td>9</td>
<td>\</td>
<td>10</td>
<td>Electronic lock</td>
</tr>
<tr>
<td>11</td>
<td>High level brake</td>
<td>12</td>
<td>Charge protection</td>
</tr>
<tr>
<td>13</td>
<td>\</td>
<td>14</td>
<td>Anti-theft</td>
</tr>
<tr>
<td>15</td>
<td>CANH</td>
<td>16</td>
<td>Ground</td>
</tr>
<tr>
<td>17</td>
<td>\</td>
<td>18</td>
<td>Side stand switch</td>
</tr>
<tr>
<td>19</td>
<td>Signal from the burglar alarm phase wire</td>
<td>20</td>
<td>Electronic lock of burglar alarm</td>
</tr>
<tr>
<td>21</td>
<td>Low level brake</td>
<td>22</td>
<td>\</td>
</tr>
<tr>
<td>23</td>
<td>\</td>
<td>24</td>
<td>Parking, cruising and one-key repair</td>
</tr>
<tr>
<td>25</td>
<td>Limited speed</td>
<td>26</td>
<td>Handle to ground</td>
</tr>
<tr>
<td>27</td>
<td>Handle signal</td>
<td>28</td>
<td>Handle, 5V</td>
</tr>
<tr>
<td>29</td>
<td>\</td>
<td>30</td>
<td>Burglar alarm power (+)</td>
</tr>
</tbody>
</table>

2.3 Indicator Lamp of Controller Protection

<table>
<thead>
<tr>
<th>System protection characteristic</th>
<th>Frequency (LED blink)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overload protection</td>
<td>Battery voltage is higher than the system set-point.</td>
</tr>
<tr>
<td>Undervoltage protection</td>
<td>Battery voltage is lower than the system set-point.</td>
</tr>
<tr>
<td>Overflow current protection</td>
<td>The phase wire of motor has short circuited.</td>
</tr>
<tr>
<td>Blocking protection</td>
<td>The blocking time of motor is longer than the system design value.</td>
</tr>
<tr>
<td>Hall protection</td>
<td>The Hall input is abnormal.</td>
</tr>
<tr>
<td>Power tube protection</td>
<td>Self-test of power tube is abnormal.</td>
</tr>
<tr>
<td>Phase lacking protection</td>
<td>One phase wire of motor is in open circuit.</td>
</tr>
<tr>
<td>Braking status</td>
<td>Controller is under the braking status.</td>
</tr>
<tr>
<td>Self-test error protection</td>
<td>Abnormal problems occur when the external system is circuited to self-test.</td>
</tr>
<tr>
<td>Controller OTP</td>
<td>Temperature of controller is higher than the system set-point.</td>
</tr>
<tr>
<td>Handle protection</td>
<td>Handle of controller is faulty.</td>
</tr>
<tr>
<td>Anti-theft status</td>
<td>Controller is under the security status.</td>
</tr>
</tbody>
</table>
2.4 Troubleshooting and Maintenance

2.4.1 Failure reason of controller: failures are mainly shown in following ways.

(1) Damage to power devices, that may be caused by:
   a) motor;
   b) poor quality of controller;
   c) loose mounting or vibration;
   d) overload of motor;
   e) broken driving circuit of controller and unreasonable design parameter.

(2) Damage to power supply of external controller, that may be caused by:
   a) short-circuit in the controller;
   b) short-circuit of the external control parts;
   c) short-circuit of external lead wire;

(3) Discontinuous working of controller may be caused by:
   a) parameter drift of electric elements at high or low temperature condition;
   b) some electric elements will come to the protection status when its partial temperature is too high due to the large design power of overall controller.
   c) poor connection.

(4) Reasons for loss of control signal are as follows:
a) the connecting wire is wear and the connectors do not work or fall off.

b) wire selection is unreasonable.

c) protection of the wire is not complete.

d) type selection of connector is not correct.

e) poor connection of wireless and connectors.

2.4.2 Common troubleshooting of controller

Where the controller is faulty can be determined by measuring the power or signal voltage of parts and lead wire connecting to the controller. The following fault diagnosis and maintenance method can be referenced for the controller.

(1) Without the output signal of brushless controller

a) Set the multimeter to 20V(DC) to measure the output signal of handlebar. If the voltage is greater than 4V when operate the handlebar, the fault of it can be excluded.

b) Set the multimeter to 200V(DC) to check that whether the 6 MOS gate voltage is in correspondence with the rotation angle. If it is not, PWM circuit of MOS drive circuit is indicated to be damaged. Refer to the phase check chart of brushless controller to measure the voltage of chip input/output pin and check the corresponding relationship with the rotation angle of handlebar, and the fault chip can be determined. Otherwise, you can replace the chips with the same model.

(2) Runaway break-down

The runaway failure is usually caused by MOS tube break-down. Set the multimeter to a diode gear to measure the three pins of MOS tube, if the MOS tube is good, there should be no short-circuit phenomenon. Otherwise, you can replace it with the same model.

3 Lithium Battery

3.1 Structure
The lithium battery is composed of three parts: a cell, a BMS protection board and a battery case, of which the BMS protection board functions as:

1) to collect the battery temperature, voltage, electricity, CAN information of current;
2) to set the protection of high/low temperature, overload/underload in charging and discharging;
3) to limit the maximum working current.

3.2 Description of BMS Board Wiring
### 3.3 BMS Required Parameter

<table>
<thead>
<tr>
<th>No.</th>
<th>Test Item</th>
<th>Typical Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>High voltage protection</td>
<td>70.5-71.4V</td>
</tr>
<tr>
<td>2</td>
<td>Low voltage protection</td>
<td>52±1V</td>
</tr>
<tr>
<td>3</td>
<td>High temperature protection</td>
<td>70°C</td>
</tr>
<tr>
<td>4</td>
<td>Low temperature protection</td>
<td>-20°C</td>
</tr>
<tr>
<td>5</td>
<td>High temperature protection in charging</td>
<td>55°C</td>
</tr>
<tr>
<td>6</td>
<td>Wire disconnection</td>
<td>Without charging &amp; discharging</td>
</tr>
<tr>
<td>7</td>
<td>Power in sleep mode</td>
<td>≤300uA</td>
</tr>
</tbody>
</table>
3.4 Common Faults and Exclusion

Because the failure of single battery, BMS, wiring or connecting parts, abnormal status may occur to the lithium battery system in use. In that case, please refer to this manual and service it by a professional technician. If you have any objection, please contact us in time, we will supply the technical support for you.

3.4.1 Stop using the battery and store it separately if it is damaged or deformed.

3.4.2 Tighten or clean the battery if the connections appear rust or loose; replace the connecting wire if it is damaged; or weld and seal off the connections immediately if the solder joint is loosen.

3.4.3 Stop using and bury the battery in sand if smokes come from it.

3.4.4 If the battery has been discharged, firstly repair and charge it with the current below 0.1C; after each battery rise to more than 3.20V, recharge it in ordinary condition; at the same time, check to see whether the BMS is normal.

3.4.5 Stop using and put aside the battery when its temperature is over 70°C and the fault code “49” is shown, if the temperature continues to rise, bury it in the sand.

3.4.6 Check the battery for enough capacity or large resistance if the vehicle is lack of power, or has short running mileage and so on.

3.4.7 Please check the fuse in the battery box for proper working, the connections in are solid and the plugs are tightly connected if the battery breaks down or the vehicle cannot start.

3.4.8 If the battery has a large pressure difference, please check with the multimeter to see if the capacity of the BMS board battery is insufficient, the discharge is serious, replace the battery if it is necessary.

3.4.9 If the CAN communication has the problem of no current and display, faulty temperature measurement, etc., please do as follows:

Unfold the battery box, remove the positive/negative connectors of cell and the CAN output connector orderly, then insert the two connectors reverse to the removal. Test on the vehicle again, if problems of CAN communication still exist, replace the lithium battery.
4 Charger

4.1 Structure

Charger is one of the four core components of electric motorcycle. The quality of it will directly affect the service life of lithium battery.
4.1.1 Technical requirement of charging

1) Lithium battery charger: 4A

This charger has a role of trickle action, charging time is generally no more than 20h, or the service life of charger will be affected. Before charging, keep the lithium battery away from the fire source to avoid the occurrence of fire, then connect the charger to power. When the temperature of lithium battery cell is above 70℃, the charging should be stopped. After that, firstly cut off the power, then pull off the output plug from the battery box socket.

Not in the case of emergency, you can use the slow charging. When time and condition are satisfactory, you are better to charge it for 5h~10h before using which will longer the service life.

2) Normal charging

Tightly connect the output plug of charger to the socket of battery box, and insert the plug of charger in the another end to the socket of common power supply. Then switch on the power on the charger, and the red indicator light will go on, that shows the output charging of power is in normal working. The indicator light will turn to green 8h~10h later and the lithium battery is fully charged.

3) You can still float charge the battery for 1h~2h.
4.2 Troubleshooting

4.2.1 The output voltage is normal, but charging current is too small.

In this case, you should check the electric elements relating to the voltage for poor contact or damage, otherwise replace the charger.

4.2.2 The charger is very hot, even the shell is burnt to deform.

The question may be caused by some users always carry the charger on the vehicle, which may result in part of electronic elements to be loose. It mainly shows as follows: abnormal working voltage, deformed charger shell or burnt circuit board. At this time, you can weld the parts again. Otherwise check the electronic elements for open circuit.

1) The charging indicator is in green when charging.

Separately check the power input plug of charger and charging plug of battery box for tight connection; then the voltage of positive/negative pole of battery box, if it is unavailable, check the battery fuse for open circuit or fuse seat for poor connection.

Set the multimeter to 200V and measure the unloaded output voltage of charger, the value shown should be 20~40V; if it is not, disassemble the charger and replace a output wire.

Note: Do not connect the positive/negative pole adversely when replacement of charger output wire.

2) The charging indicator is not bright when charging.

Insert the input plug of power to the normal power socket to check the connection, if above indicator is still not bright, you should open the charger shell to view the fuse connection internally, and check it for broken circuit. If the problem is excluded, check the input wire of power, then the electric elements near the high pressure area on the circuit board for cold solder joint. In addition, the open circuit will cause the same fault, if the charger fuse is broken.

4.2.3 The charger release a lot of heat and is accompanied by an abnormal sound, even can not work.

The fault may be due to damage to the shock reduction and resistance-capacitance of output pole, or the open circuit and cold solder joint of electric elements.

4.2.4 The copper foil of output part is burn out.
The fault is usually caused by the reverse connection of battery, which may result in the damage of electric elements. If the charger fuse is not burnt, replace the broken electric elements and connect the broken copper foil, the charger will restore to work. Otherwise, you should check the electric elements one by one and replace the damaged parts to solve the serious problem.

4.2.5 Some abnormal noises come from the charger in working, also the charging indicator is dim and blinking.

The fault is caused by the damaged electric elements, at this case, replace them and make sure the charger output voltage in the normal operating range.

4.2.6 The output voltage is too high.

The high output voltage (>70V) may be caused by short circuit or open circuit of some components, you can measure the pin voltage of integrated circuit for detailed analysis.

Note: After the replacement, you should measure the charger output voltage with a multimeter once again, the required value must be 20~44V. Adjust the electric elements if the value is different to keep the normal condition of charger output voltage.

5 Meter

5.1 Structure

Meter is used to supply illumination and display the working condition of electric control parts in the electric motorcycle. It shows as follows:
5.2 Meter Display

- **Meter display category**
  - **Meter**
  - **Controller (CAN)**
  - **Lithium battery (CAN)**

  - **Turn signal indic., LH**
  - **Turn signal indic., LH**
  - **Hi-beam**
  - **Cruise control light**
  - **Gear indic.**
  - **Speed**
  - **Mileage**
  - **Fault code**
  - **READY light**
  - **Parking light**
  - **Electricity quantity**
  - **Current**
  - **Percent**
  - **Charging indic.**
5.3 Removal, Installation and Maintenance

Switch on the power supply to see if the signal indicator is light.
Diagnosis Procedure of Meter

1. Power on
   - If readings on the meter:
     - If output voltage of DC is 12V
     - If fuse is damaged
     - If the overload protector is open
   - If readings are full displayed:
     - If CAN of controller is output
     - If CAN of lithium battery is output
   - If handle switch is in normal operation
     - No
     - Yes
6. Lighting and Signals

6.1 Switch on the power supply, then turn on the light switch to check the headlight.

6.2 Turn on the turning switch to check the winkers and turn signal indicators.
6.3 Check the lithium battery connector if it is loose.

6.4 Fuse Box, Over-load Protector and DC Converter

The fuse box is connected to the 60V power line. The over-load protector is installed in the positive pole of battery output. The DC converter can transmit the voltage from 60V to 12V to suit to the lighting system of vehicle.
CHAPTER IV  TROUBLESHOOTING OF ELECTRIC MOTORCYCLE

1 Normal Meter Display & Motor Breakdown

1.1 Fault Diagnosis

(1) Check the brake switch for short-circuit or burn-out;

(2) Check the throttle grip for short-circuit or burn-out;

(3) Check the driving motor for short-circuit or burn-out;

(4) Check the controller for short-circuit or burn-out.

1.2 Repair

(1) Remove the socket of brake switch and check it. If the motor runs normally, the brake switch is faulty, replace it as a result.

The normal voltage for throttle grip is 5V. Check the signal voltage of throttle grip, it should range between 0.8–4.2V from low to high. If the voltage is lower than 1V without change, the fault must come from the throttle grip or it has a short-circuit problem. The meter displays DTC as 27. If the voltage is higher than 1V with normal change, then check the Hall Signal of motor (yellow/green/blue wire). If all the three phase Hall Signal voltage is 5V with good connection, then the Hall of motor burns out. The motor or Hall element of motor should be replaced as a result.

(2) Check the Hall signal wire of motor respectively. Turn the motor slowly by hand, the voltage of each phase should range between 0-5V. If the voltage is unchanged, then the Hall of motor is damaged. Replace the motor or hall element as a result. If the voltage normally changed with a normal power supply, then the controller is damaged. Replace the controller as a result.

(3) Test the input voltage of controller with a multimeter. The voltage should be higher than 54V. Check the input line if there is no voltage. Check the voltage of controller to throttle grip (connecting to the red/black wire of throttle grip). The normal voltage should be between 4–5 V. Unplug the socket of throttle grip if there is no voltage. If the voltage recovered, then the throttle grip is damaged (short-circuit). If still there is no 5V voltage when unplug the throttle grip, then disconnect the coupler of motor hall. If the voltage recovers to 5V, then maybe there is short-circuit in the hall element. If still there is no 5V, then the fault is located in controller. Replace the controller as a result.
(4) Firstly check for short-circuit of throttle grip and hall switch of motor. The connection is more likely to get short-circuit when damped by rain. Keep the connection from water. Before replace the damaged controller, check for short-circuit of throttle grip and switch of motor hall at first, otherwise it will cause a continuous damage to the controller.

(5) If the motor is out of work, focus on inspection of motor hall switch and throttle grip signal. If the housing of controller gets very hot when energized, normally it is caused by short circuit of inner power tube of controller. Cut power off immediately in this case.

2 Intermittent Operation of Driving Motor

2.1 Fault Diagnosis

(1) The lithium battery is in critical state of undervoltage.

(2) Poor connection of lithium battery connector.

(3) Lead line of throttle grip is seriously worn.

(4) Brake switch or power switch is damaged.

(5) Power lock is damaged or poorly connected.

(6) Couplers of circuit is poorly connected.

(7) Internal elements of controller is poorly connected.

(8) The wire-wound of motor wire is false soldered.

2.2 Repair

(1) Check the lithium battery; recharge the battery.

(2) Adjust or replace the connector.

(3) Replace the lead line of throttle grip.
(4) Adjust or replace the braking switch in power cut-off.

(5) Replace the power lock.

(6) Reconnect the circuit couplers.

(7) Replace the controller.

(8) Replace the motor.

3 No Display in Meter & Motor Breakdown

3.1 Fault Diagnosis

(1) Burn-out of fuse

(2) Damaged battery

(3) No output voltage of lithium battery

(4) Damaged power lock

(5) Damaged connector or poor connection of lithium battery

(6) Damaged DC converter

3.2 Repair

Check the output voltage of lithium battery with a multimeter. The battery is damaged if there is no voltage. If the output voltage is normal, check the input voltage of DC converter. If there is no input voltage of DC converter, then check the fuse for burn-out. If the fuse is in good condition, then the battery socket is poorly contacted or the wire is broken. If the aforesaid are all in good condition, then check the power lock for proper function.

4 Slow Motor Speed
4.1 Fault Diagnosis

(1) Damaged throttle grip

(2) Insufficient battery capacity or the battery cannot be recharged

(3) Faulty controller

(4) Faulty driving motor

4.2 Repair

Check the voltage of signal line (green) of speed governing. When the throttle grip is at its maximum rotating angle, the voltage should be 4.2V. The motor speed will decrease if the voltage is lower than 4.2V. Replace the throttle grip at this case and recharge the battery as well.

Replace the controller or driving motor.

5 Joggling Motor

5.1 Fault Diagnosis

(1) Faulty hall element of driving motor

(2) Poor contact of throttle grip

(3) Interfered signal line of speed

5.2 Repair

(1) Reconnect the hall element of driving motor

(2) Reconnect the throttle grip

(3) Try to replace the controller and meter
(4) Normally the vibration of motorcycle is caused by poor connection of motor hall or throttle grip. Focus on couplers, especially the couplers of motor hall.

6 Noisy Driving Motor

6.1 Fault Diagnosis

(1) Large bearing clearance of motor

(2) The rotor scraping stator

(3) Unfastened or detached motor

(4) Axial play of motor inner

6.2 Repair

(1) Replace the bearing

(2) Repair the stator and rotor

(3) Re-bond the magnetic steel

(4) put more proper washer at axial direction

7 Runaway Motorcycle

7.1 Fault Diagnosis

(1) Damaged throttle grip, short-circuit of earth wire (black) or poor connection

(2) Faulty controller

7.2 Repair
(1) Disconnect the throttle grip, if the motorcycle recovers to normal, indicating the controller is in good condition, then the throttle grip and negative wire should be checked; if the wheels can’t stop, then the controller is damaged. Replace the controller as a result.

(2) The wheels rotate rapidly as soon as the motorcycle is energized. This phenomenon is called “runaway motorcycle”. In most case, it is caused by the poor connection of negative wire of throttle grip. Focus on the inspection of negative wire of throttle grip.

8 No Power Display in Meter & Normal Motor Operation

8.1 Fault Diagnosis

(1) No voltage between the positive/negative outlines of meter

(2) Damaged meter

(3) The short-circuit protection function of DC converter is on

8.2 Repair

Test the positive/negative voltage of meter with a multimeter (in 50V DC). If the voltage is normal, then the meter is damaged. If there is no voltage, then the wire or coupler is short-circuiting. Check the wire and coupler as a result.

9 Normal Power/Electric Current Display & Abnormal Speed/Mileage/Gear Display & Normal Motor Operation

9.1 Fault Diagnosis

(1) Damaged Meter

(2) Damaged Controller

(3) Damaged Gearshift switch

9.2 Repair
Test the voltage between CAN signal lines (henna, brown blue) and black line of controller. The normal value should be 1.5~3V. If there is no voltage, then the controller is damaged; if there is voltage, then the meter is damaged.

10 Horn Breakdown

10.1 Fault Diagnosis

(1) Damaged Horn

(2) Damaged horn switch

(3) Short circuit of connection wire or coupler

10.2 Repair

Test the voltage between the connection wires of horn after pressing the horn button. If the voltage is normal, then the horn is damaged; if there is no voltage, then the horn switch is damaged or connection wire is short circuiting. The problem can be quickly located by short connecting the wires of horn switch.

11 Failure of Headlight

11.1 Fault Diagnosis

(1) LED beads burn-out

(2) Damaged headlight switch

(3) Short circuit of wire or coupler

11.2 Repair

(1) Test the voltage between the connection wires of lamp after press the headlight switch. If the voltage is normal (12V), then the LED bead of headlight is damaged; if there is no voltage, then the headlight switch is damaged or connection wire is short circuiting.
If the positive/negative wires of headlight switch are inversely connected, the headlight will be out of work.

### 12 Failure of Winkers

#### 12.1 Fault Diagnosis

1. Damaged flasher
2. Damaged turn signal switch
3. Short circuit of winker wires or coupler
4. Damaged LED beads of winker

#### 12.2 Repair

If the left and right winkers fail at the same time, mostly the flasher is damaged. If only one side of the winker is out of work, then the flasher is in good condition. The turn signal switch and LED beads should be checked then.

### 13 Continuous Burn-out of Fuse

#### 13.1 Fault Diagnosis

1. Damaged controller
2. Damaged DC converter
3. Inversely connected of positive/negative wires of battery
4. Short-circuit caused by broken insulation of wires

#### 13.2 Repair
Unplug the lithium battery, turn on the power switch and turn off all the lighting switches. Test the resistance of battery plug, if the resistance is very small, nearly equals to the level of “OFF”, indicating that the wire is short circuited. Then use the open circuit method to test; if unplug the controller, the power display recovers to normal, indicating that the controller is damaged; if still the power display is abnormal, then unplug the DC converter to test. The test can be done in the same manner.

14 Insufficient Endurance Mileage with the Full Charging Lithium Battery

Endurance mileage refers to distance on the conditions that the electric motorcycle runs on a secondary road at the speed of 20km/h powered by a full charged new battery, with a standard driver weight of 75kg and temperature of (25±5) °C and wind speed no more than 3m/s. When the battery power is used up, the total travelled distance of motorcycle is called endurance mileage.

There are many factors that affect the endurance mileage. For instance, a brand new lithium battery, its actual "endurance mileage" may be more than 50km while after used for a certain time, its "endurance mileage" will decline. This is mainly due to the lithium battery capacity has declined after used for a certain time. In addition, the actual load weight, the road condition, wind speed, wind direction, numbers of braking and restarting during the driving, the tire condition, charging method, operation temperature and other factors will affect the actual "endurance mileage " as well.

14.1 Repair

(1) Inflate the tyres if the pressure is insufficient
(2) Recharge the battery if necessary
(3) Adjusting the free play of front/rear brake
(4) Adjusting the bearing play of front/rear wheel axle

15 Diagnostic Diagram of CAN-bus Communication

15.1 The output device of CAN-bus communication are controller and lithium battery. The meter has the function of display.
15.2 The faults can be primarily located from the meter display. When the lithium battery or controller breaks down, the displays on the meter are as following:
16 Flow Diagram of Fault Diagnosis

Press the self-test switch of battery

- Yes

Install the lithium battery

- Yes

All battery lights are illuminated

- Yes

Check fuse and output voltage of DC converter

- Yes

Replace the fuse

- No

Fuse is damaged

- No

Replace the DC converter

- No

No output of 12V voltage

- No

Replace the motor

- No

Check the controller for operation

- No

Controller operation

- Yes

Motor operation

- Yes

Turn the throttle grip

- Yes

READY indicator glows

- Yes

P indicator glows

- Yes

Fold the side stand

- Yes

Side stand switch damaged

- Yes

Replace side stand switch

- Yes

Motor is damaged

- Yes

Loaded

- Yes

OK

- No

Replace the side stand or check the mounting of side stand switch

- No

Side stand switch damaged

- No

Replace the side stand switch or check the mounting of side stand switch

- Yes

Turn on the air switch

- Yes

Install the lithium battery

- Yes

No

- No

Press the starting button for 3s

- No

Replace the fuse

- No

Fuse is damaged

- No

Replace the DC converter

- No

Check fuse and output voltage of DC converter

- No

Controller operation

- No

Motor operation

- No

Turn the throttle grip

- No

READY indicator glows

- No

P indicator glows

- No

Fold the side stand

- No

Side stand switch damaged

- No

Replace side stand switch

- No

Motor is damaged

- No

Loaded

- No

OK

- No

Replace the motor

- No

Check the controller for operation

- No

Controller operation

- No

Motor operation

- No

Turn the throttle grip

- No

READY indicator glows

- No

P indicator glows

- No

Fold the side stand

- No

Side stand switch damaged

- No

Replace side stand switch

- No

Motor is damaged

- No

Loaded

- No

OK

- No

Replace the motor

- No

Check the controller for operation

- No

Controller operation

- No

Motor operation

- No

Turn the throttle grip

- No

READY indicator glows

- No

P indicator glows

- No

Fold the side stand

- No

Side stand switch damaged

- No

Replace side stand switch

- No

Motor is damaged

- No

Loaded

- No

OK
<table>
<thead>
<tr>
<th>Number</th>
<th>Parts</th>
<th>DTC</th>
<th>Name of fault</th>
<th>Cause</th>
<th>Repair</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Motor</td>
<td>00</td>
<td>Motor failure</td>
<td>Comprehensive failure. Check details in APP</td>
<td>Repair it according to the detailed specification</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Motor</td>
<td>01</td>
<td>Motor failure</td>
<td>Phase-deficient</td>
<td>Contact the after-sales service center</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Motor</td>
<td>02</td>
<td>Motor failure</td>
<td>Hall of motor damaged</td>
<td>Contact the after-sales service center</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Motor</td>
<td>03</td>
<td>Motor failure</td>
<td>Overheated motor</td>
<td>Contact the after-sales service center</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Motor</td>
<td>04</td>
<td>Motor failure</td>
<td>Motor stalling</td>
<td>Contact the after-sales service center</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Controller</td>
<td>20</td>
<td>Controller failure</td>
<td>Comprehensive failure. Check details in APP</td>
<td>Contact the after-sales service center</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Controller</td>
<td>21</td>
<td>Controller out of work</td>
<td>MOSFET damaged</td>
<td>Contact the after-sales service center</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Controller</td>
<td>22</td>
<td>Controller out of work</td>
<td>Drive failure</td>
<td>Contact the after-sales service center</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Controller</td>
<td>23</td>
<td>Controller out of work</td>
<td>Over current</td>
<td>Contact the after-sales service center</td>
<td>36A</td>
</tr>
<tr>
<td>10</td>
<td>Controller</td>
<td>24</td>
<td>Controller out of work</td>
<td>Over voltage</td>
<td>Contact the after-sales service center</td>
<td>75V</td>
</tr>
<tr>
<td>11</td>
<td>Controller</td>
<td>25</td>
<td>Controller out of work</td>
<td>Over heat</td>
<td>Contact the after-sales service center</td>
<td>110℃</td>
</tr>
<tr>
<td>12</td>
<td>Controller</td>
<td>26</td>
<td>Controller failure</td>
<td>Undervoltage</td>
<td>Contact the after-sales service center</td>
<td>48V</td>
</tr>
<tr>
<td>13</td>
<td>Controller</td>
<td>27</td>
<td>Throttle grip failure</td>
<td>Throttle grip failure</td>
<td></td>
<td>Without hall signal or higher than 3.8V</td>
</tr>
<tr>
<td>14</td>
<td>Lithium battery</td>
<td>40</td>
<td>Lithium battery failure</td>
<td>Comprehensive failure. Check details in APP</td>
<td>Repair it according to the detailed specification</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>BMS</td>
<td>41</td>
<td>Lithium battery warning</td>
<td>Over charging protection</td>
<td>Disconnect charger and stop charging</td>
<td>71.4V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>42</td>
<td>Lithium battery warning</td>
<td>Under voltage protection</td>
<td>Recharging timely</td>
<td>51V</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>43</td>
<td>Lithium battery warning</td>
<td>Over current protection in charging</td>
<td>Disconnect charger and stop charging</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>44</td>
<td>Lithium battery warning</td>
<td>Over current protection in discharging</td>
<td>Contact after-sales service center</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>45</td>
<td>Lithium battery warning</td>
<td>Over heat protection in discharging</td>
<td>Remove the battery and put it in a shady and cool place</td>
<td>&gt; 70°C</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>46</td>
<td>Lithium battery warning</td>
<td>Low temperature protection in discharging</td>
<td></td>
<td>&lt; -20°C</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>47</td>
<td>Lithium battery warning</td>
<td>Open circuit of battery pack</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>48</td>
<td>Lithium battery warning</td>
<td>Short-circuit protection in discharging</td>
<td>Contact after-sales service center</td>
<td>&gt; 70°C</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>49</td>
<td>Lithium battery warning</td>
<td>Over heat protection in charging</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>50</td>
<td>Lithium battery warning</td>
<td>Low temperature protection in charging</td>
<td></td>
<td>&lt; -20°C</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>51</td>
<td>Lithium battery warning</td>
<td>Over heat protection of MOS of circuit board</td>
<td></td>
<td>120°C</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>52</td>
<td>Lithium battery failure</td>
<td>Temperature sensor failure (short-circuit/open circuit)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>60</td>
<td>DMU failure</td>
<td>Comprehensive failure. Check details in APP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>61</td>
<td>Communication module failure</td>
<td>Identification failure of SIM card</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>62</td>
<td>Communication module failure</td>
<td>Arrearage of SIM card (displaying for 2S)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>DMU</td>
<td>Communication module failure</td>
<td>GPS failure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>64</td>
<td>Communication module failure</td>
<td>Short-circuit of GPS antenna</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>65</td>
<td>Communication module failure</td>
<td>Open circuit of GPS antenna</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>66</td>
<td>Communication module</td>
<td>Unwritten SN of motorcycle</td>
<td>Unwritten the SN of central</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1 Frame
1.1 Structure

Frame is the main supporting part of electric moped. Because the electric mode is subject to strong road shock and vibration in running, as well as for the convenience of driving, the material and structure are required to have high strength and stiffness, also the weight should be lighter. The U shaped frame adopted by the electric moped has the characteristics of high strength, good rigidity and applicability, it is mainly made of steering bar pipe, front oblique tube, rear main pipe (LH & RH) and rear connecting tube, welded together. See the structure of frame in Fig. 5-1.

It is used to prop up the battery, steering system, transmission, travel system, control system, brake system and so on, also supply the supporting points for the installation of other devices.

2 Vehicle Body

2.1 Structure of Front Shock Absorber

Front shock absorber is the elastic connecting parts between the front wheel and frame, while rear shock absorber is manly used to bear the radial force from the rear wheel. They can work together to support the vehicle body, reduce the shock and vibration from front/rear wheels to driver and passenger effectively and rapidly to buffer the stress of all spare parts, also prolong the service life and improve the riding comfort, handling performance and stability.

2.1.1 Front shock absorber
The electric motorcycle is equipped with a front shock absorber of hydraulic spring, compound type, which consist of front shock absorber spring, seal ring, dust cover, piston ring, front shock absorber lower cylinder, piston rod, buffer spring, one-way valve spring and seat, one-way valve, one-way valve seat, fork tube comp., etc.. The construction of front/rear shock absorber are shown in Fig. 5-12.

When the front wheel of electric motorcycle is subject to the shock and vibration from the road surface, the front shock absorber cylinder will be upward, damping oil in it will flow up through the small hole on the one-way valve and the piston rod, the damping force is not large at this time. As the cylinder continues to travel upward, the clearance between the one-way valve seat and the cone surface of piston rod seat becomes smaller gradually, so that the increased damping will prevent the cylinder from impacting with the front shock absorber. When the shock absorber cylinder is down due to the restoring force of spring, the one-way valve will be closed, and damping oil flows out from the small hole of piston rod, the large damping can effectively reduce the vibration of the front shock absorber spring.

2.1.2 Rear shock absorber

The electric motorcycle is equipped with the rear shock absorber of hydraulic spring, compound type, which consist of upper connector, buffer boot, bush, rear shock absorber spring, rear shock absorber rod, damper, lower connector and so on.

It mainly bears the radial force of rear wheel. When the rear wheel is subject to the shock and vibration from the road surface, the rear shock absorber will be compressed and stretched, the hydraulic oil in the damper is forced to flow through the damping hole to reduce the vibration of rear shock absorber effectively.
2.2 Removal, Installation and Maintenance of Rear Shock Absorber

1) Unscrew and remove the covering parts and battery box.

2) Remove the upper connecting bolt from the rear shock absorber, check the bush for wear or damage.

3) Remove the lower connecting bolt from the rear shock absorber, check the bush for wear or damage.

4) Check the rear shock absorber spring for elasticity and rear damper for leakage. Replace the rear shock absorber if necessary.
5) The maintenance of rear suspension is shown in Table 5-3.

### Table 5-3 Maintenance of Rear Suspension

<table>
<thead>
<tr>
<th>Parts</th>
<th>Damage Form</th>
<th>Failure Description (Part)</th>
<th>Failure Description (Vehicle)</th>
<th>Repair</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rear shock absorber</td>
<td>The spring of rear shock absorber is broken or lack of elasticity.</td>
<td>The spring of rear shock absorber is broken or lack of elasticity.</td>
<td>The rear shock absorber is too soft or too hard.</td>
<td>Replace the rear shock absorber Assy.</td>
</tr>
<tr>
<td>Assy.</td>
<td>Oil is leaking from the rear damper.</td>
<td>Oil is leaking from the rear damper</td>
<td>The rear shock absorber is leaking or is too soft.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The piston rod on the rear damper is bent to deform or broken.</td>
<td>The piston rod on the rear damper is bent to deform or broken.</td>
<td>The rear shock absorber is too hard.</td>
<td></td>
</tr>
</tbody>
</table>

### 2.3 Structure and Maintenance of Steering mechanism

Steering mechanism is mainly composed of steering bar Assy. and front fork Assy.. the steering stem and steering bar pipe are connected to the upper bridge with the steering bar clip and steering stem connecting seat. As the frame tube to be the center, insert the steering stem and turn the core screw into a cone or wedge to tighten the core nut, as a result, the front fork Assy. and steering bar Assy. will be connected closely as a whole. The front fork Assy. mainly controls the front wheel, and keeps the electric motorcycle running in a certain direction. Turning the steering handle to left or right, the steering stem will control the front wheel and driving direction of vehicle. The construction of steering stem and steering handle are shown in Fig. 5-3.

![Fig. 5-3 Construction of Steering stem and steering handle](image)
2.3.1 Steering handle

The speed regulating handle and front brake handle that used to control the speed of the driving motor are mounted on the right, while the rubber boot and rear brake grip are on the left. Each of sides has a rear-view mirror and switch comp.

2.3.2 Front fork Assy.

It is an important part of electric motorcycle’s steering mechanism. The lower bridge is made of forging. The steering stem is put in the frame tube. Front fork Assy. consists of steering stem, steering bearing, bearing retainer and so on. Impact force generated from the road surface to the front wheel will transmit to the steering stem by the front shock absorber, then to the vehicle body. Therefore, the steering stem must be not only bear a larger impact, but make sure the flexible rotation in running.

2.4 Structure and Maintenance of Brake Cable

Brake cable consists of steel rope, drawing head, plastic hose of metal spring, etc. The steel rope should be soft with strong endurance and large force. It is made of a plurality of thin steel wires, which ensures the strength and becomes softer. Drawing head and steel rope are connected by soldering, riveting and Zn alloy die casting. The outer layer of metal spring plastic hose is made of plastic, and the inner is made of steel wires and wounded to be a spring shaped flexible tube, which is suitable for multi-direction bending and can stand the axial pressure. A layer of nylon tube is added to the brake label between the metal spring plastic hose and steel rope to avoid the direction friction of them.

In order to ensure the reliable work of brake cable, so as to prolong the service life, regular cleaning and lubrication is essential. After a first 1000km or every 2000km running, the steel rope need to clean and lubricate. There are two methods of lubrication: soak lubrication and drip lubrication.
2.4.1 Soak lubrication

1) Soak the whole steel rope in the kerosene for 5 ~10min, with pulling it back and forth to remove impurities in the hose.

2) Soak the whole steel rope in the mixed oil (proportion of kerosene and lubricating oil is 1:1) for 5 ~10min, with pulling it back and forth to let mixed oil into the hose.

3) Take out the steep rope and clean the excessive oil.

2.4.2 Drip lubrication

1) Wound the end of metal spring plastic hose with a transparent tape and form a tubular shape.

2) Raise above end and pull the drawing head out.

3) Slowly fill the lubricating oil into the hose with a oiler until drops come out the other end.

2.5 Structure and Maintenance of Rear Fork

2.5.1 Structure

Rear fork is used to connect the rear wheel and frame, by the rear shock absorber, the rear wheel can move up and down in certain range based on a anchor point of frame, so as to buffer the shock and vibration of rear wheel.

2.5.2 Maintenance

Support the main stand and check to see if the rear wheel swings too much from left to right. Check the rear fork weldment for falling off and rear fork for bending or deformation, adjust, weld or replace it if necessary. Also check the lubrication grease in the inner of cushion collar, apply it if necessary. Check of rear fork is shown in Fig. 5-6; adjustment of rear fork is shown in Fig. 5-7.
3. Construction and Troubleshooting of Wheels

The wheel is the driving part of electric motorcycle. It supports the whole weight of vehicle and to ensure a reliable adhesion force to the road without slipping. The wheels can ease and absorb the shock and vibration caused by the road. The front wheel is engaged with the steering parts to determine the running direction. While the rear wheel is powered by motor to drive the motorcycle forward. One wheel is mainly composed of tire, aluminum rim, wheel hub, bearing, bush, oil seal, axle, etc.

3.1 Tyre

The tyres are important parts of travelling system. They contact with the road directly and support the whole weight of vehicle. Making use of their elasticity, the tyres can ease the shock and vibration during the driving and ensure the driving balance and adhesion force of motorcycle. This electric motorcycle is equipped with vacuum tyres.

The tyre is composed of tread, carcass, buffer layer and tyre bead. The tyre tread directly contacts with the road. It has various patterns on the surface, so that the motorcycle can get appropriate adhesion force on different road pavement. Carcass should have certain strength, in order to keep cooling, it cannot be too thick. The tyre bead is formed by the cord ply and bead ring, so that the tire is firmly attached on the wheel hub. If the circumference of tyre bead is too short, it will make the tire dismantling difficult. If the circumference is too long, it will make the tyres easy to jump out. The cord ply is the skeleton of tyres, they intersects each other and forms an certain angle with the cross section of tyre (called crown cord angle).The cord lines of radial tyre array in the direction of meridian line, so its crown cord angle is 0°. The radial tires have advantages such as: reducing power loss, saving fuel, long service life, etc.

3.2 Wheel rim

Fig. 5-6 Check of rear fork

Fig. 5-7 Adjustment of rear fork
The wheel rim is a skeleton to support and fix the tyre. This wheel rim is a die casting type. It is cast into a whole with wheel hub from aluminum alloy, and then machined. This type of wheel rim has the nature of high strength, simple process, and easy assembly, but poor flexibility. It cannot be adjusted. If the rim is deformed or damaged, the whole rim needs to be replaced.

3.3 Wheel hub

Electric motorcycle wheel hub can be divided into front wheel hub and rear wheel hub. It is single driven by the rear wheel hub. The driving motor is mounted in the rear hub, which supplies power to the motorcycle. The construction of front/rear wheel hub is shown as in Fig.5-8.

3.4 Troubleshooting of wheels

If the front tyre pressure is insufficient, check the air leakage of tyre valve and wear of tread. The maintenance limit of front wheel tread is 2mm. Repair or replace the tyre valve if air leakage occurs.

Fig.5-8 Construction of Front/Rear Wheel

Fig.5-9 Adjust of Front/Rear Wheel Hub
3.5 Removing, Installation and Troubleshooting

(1) Remove the bolt and front brake caliper.

(2) Screw off the nut and remove the front wheel axle. Check the axle for deformation.

(3) Remove the front wheel and bush of front wheel axle. Check the bush for wear or damage.

(4) Remove the oil seal of front wheel. Check the blade for wear or damage.
(5) Unscrew the motor shaft and remove the motor assy. Check the motor shaft for deformation. Check for damaged parts, tyre tread depth and tyre pressure.

(6) Check the motor shaft for wear or damage.

For the damage form, fault and repair of front/rear wheel, please refer to the Table 5-4.

**Table 5-4**

<table>
<thead>
<tr>
<th>Parts</th>
<th>Damage Form</th>
<th>Failure Description (Parts)</th>
<th>Failure Description (Vehicle)</th>
<th>Repair</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front Wheel</td>
<td>Deformation of front wheel rim</td>
<td>Front wheel rim is deformed</td>
<td>The steering handlebar trembles or shakes during driving; wandering of motorcycle</td>
<td>Replace the front wheel rim</td>
</tr>
<tr>
<td></td>
<td>Excessive wear of bearing seat hole of wheel hub</td>
<td>Bearing and bearing seat hole are not matched tightly</td>
<td>The steering handlebar trembles or shakes during driving; wandering of motorcycle</td>
<td>Replace the front wheel rim</td>
</tr>
<tr>
<td></td>
<td>Excessive wear or damage of bearing</td>
<td>Axial clearance or radial clearance of bearing is too large or the bearing cant rotate freely</td>
<td>The steering handlebar trembles or shakes during driving; wandering of motorcycle</td>
<td>Replace the bearing</td>
</tr>
<tr>
<td>Condition</td>
<td>Description</td>
<td>Issue</td>
<td>Replacement</td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
<td>-------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>Tyre puncture or fracture</td>
<td>Tyre pressure of front wheel is insufficient</td>
<td>The steering handlebar cant move freely</td>
<td>Replace the tyre</td>
<td></td>
</tr>
<tr>
<td>Excessive wear of tyre (tread depth &lt; 2mm)</td>
<td></td>
<td>The motorcycle is liable to skid with a poor anti-sideslip performance</td>
<td>Replace the tyre</td>
<td></td>
</tr>
<tr>
<td>Rear Wheel</td>
<td>Excessive wear of rear brake drum</td>
<td>The rear brake is out of work</td>
<td>Replace the rear wheel hub</td>
<td></td>
</tr>
<tr>
<td>Excessive wear or damage of bearing</td>
<td>Axial clearance or radial clearance of bearing is too large or the bearing cant rotate freely</td>
<td>The motorcycle is wandering during driving with a swinging rear wheel</td>
<td>Replace the bearing</td>
<td></td>
</tr>
<tr>
<td>Rear tyre</td>
<td>Tyre puncture or fracture</td>
<td>The steering handlebar cant move freely</td>
<td>Replace the tyre</td>
<td></td>
</tr>
<tr>
<td>Excessive wear of tyre (tread depth &lt; 2mm)</td>
<td></td>
<td>The motorcycle is liable to skid with a poor anti-sideslip performance</td>
<td>Replace the tyre</td>
<td></td>
</tr>
</tbody>
</table>

### 3.6 Construction and Troubleshooting of Brake

In need of slowing down or stopping the electric motorcycle during driving, the brake will apply a force or torque to the wheel to prevent its rotation. Generally the front wheel brake is operated by the right hand and the rear wheel brake by left hand. Electric motorcycle brake can be divided into drum brake and disc brake.  

#### 3.6.1 Drum brake

Drum brake is composed of brake drum, brake shoe, brake cam, brake arm, supporting shaft, return spring and brake cover. The brake drum is made of steel and is fixed in the wheel hub by bimetal casting. It rotates together with the wheel. The brake cover is fixed on the rear fork supporter and can’t rotate. The brake shoe, brake cam and brake arm are mounted in the brake cover. When applying the brake, the brake cam is turned by the brake cable to expand the brake shoe against the inner surface of brake drum. In this way, the friction resistance is produced, so that the brake drum (wheel) gets braking torque, and thus slows down or stops. The construction of front/rear brake is shown as following.

![CONSTRUCTION OF FRONT BRAKE](image1)

![CONSTRUCTION OF REAR BRAKE](image2)
3.6.2 Adjustment of brake

①Grip the front brake lever with right hand and check its brake performance. The standard free play of front brake lever is 10~20mm. Readjust the front brake if the value is out of this specification. The wear limit of disc brake is 3.5mm, see the adjustment of front brake in Fig. 5-12.

Removal, Installation and Maintenance

(1) Check oil in the brake oil reservoir.

(2) Check the front brake hose for damage, replace it if necessary.
(3) Unscrew and remove the front brake caliper Assy.

(4) Check the front brake shoe for wear. Replace it if necessary.

(5) Remove the locknut of front wheel axle.

(6) Remove the front wheel and dismantle the bolt to check the wear of front brake disc. The limit value of disc is 3mm.
② Grip the rear brake lever with left hand and check its brake performance. The standard free play of rear brake lever is 10~20mm. Readjust the rear brake if the value is out of this specification. Replace the rear brake shoe if it is worn to the limit value 2.0mm when the fixing pointer on the rear brake arm exceeds the reference scale mark on the rear brake drum cover. If it is a disc rear brake, please check it refer to the requirement of front brake. See the adjustment of rear brake in the following picture.

Removal, Installation and Maintenance

(1) Check the rear brake cable for flexible movement. Lubricate or replace the rear brake cable if necessary.

(2) Remove the adjusting nut of rear brake.
(3) Remove the nut of rear wheel axle.

(4) Remove the motor Assy.

(5) Check the brake hub for rust or wear.

(6) Remove the rear brake shoe, check it for wear or damage. Measure the thickness of rear brake plate to see if it exceeds the service limit. Service limit: 2.0mm
For the damage form, failure description and repair of front/rear brake, please refer to the Table 6-2.

### Table 6-2 Repair of Front/Rear Brake

<table>
<thead>
<tr>
<th>Parts</th>
<th>Damage Form</th>
<th>Failure Description (Parts)</th>
<th>Failure Description (Vehicle)</th>
<th>Repair</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front Brake Assy.</td>
<td>Insufficient brake fluid</td>
<td>Insufficient brake fluid</td>
<td>The front brake is out of work.</td>
<td>Add DOT3 or DOT4 brake fluid to the upper limited level, bleed the oil pipe of brake system.</td>
</tr>
<tr>
<td></td>
<td>Brake fluid is polluted or obvious deterioration.</td>
<td></td>
<td>Do</td>
<td>Replace the brake fluid.</td>
</tr>
<tr>
<td></td>
<td>Surface of oil cylinder is damaged or scratched.</td>
<td></td>
<td>Do</td>
<td>Replace the front brake main cylinder Assy.</td>
</tr>
<tr>
<td></td>
<td>Cracks at the oil cylinder</td>
<td>Oil cylinder is leaking</td>
<td>Do</td>
<td>Replace the front brake main cylinder Assy.</td>
</tr>
<tr>
<td>Front Brake Caliper Assy.</td>
<td>Gases are mixed in the brake hose.</td>
<td>Do</td>
<td>Bleed the oil pipe of brake system.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Front brake hose is aging or breaking.</td>
<td>Brake hose is leaking</td>
<td>Do</td>
<td>Replace the front brake hose.</td>
</tr>
<tr>
<td></td>
<td>Brake friction plate is worn to limit.</td>
<td>Do</td>
<td>Replace the brake friction plate as a set.</td>
<td></td>
</tr>
<tr>
<td>Front Brake Disc</td>
<td>Front brake disc is excessively worn (the thickness is less than the limit value 3mm).</td>
<td>Front brake caliper is leaking</td>
<td>Do</td>
<td>Replace the front brake disc.</td>
</tr>
<tr>
<td></td>
<td>Front brake is deformed.</td>
<td>Seal ring is leaking</td>
<td>Front brake has abnormal sound or is out of work.</td>
<td>Replace the front brake disc.</td>
</tr>
<tr>
<td>Rear Brake Shoe</td>
<td>Friction plate is worn excessively (the minimum thickness should be not less than 2mm).</td>
<td>Rear brake is out of work or can not return.</td>
<td>Replace the brake shoe as a set.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Surface of brake shoe is wear to groove or excessively wear.</td>
<td>Brake is out of work or can not return.</td>
<td>Replace the brake shoe as a set.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Contact surface of brake shoe friction plate and brake drum is less than 60%.</td>
<td>Brake is out of work.</td>
<td>Replace the brake cam.</td>
<td></td>
</tr>
<tr>
<td>Brake Cam</td>
<td>Moving part is etched or has</td>
<td>Brake is out of work</td>
<td>Replace the brake cam.</td>
<td></td>
</tr>
</tbody>
</table>

71
| Arc surface of brake cam is worn excessively (no more than 3mm). | Brake is out of work | Replace the brake cam. |

### 3.7 Poor Braking Performance in Running

#### 3.7.1 Fault diagnosis and exclusion
When the braking performance is decreased, or the brake is weak during driving, the braking effect can be achieved by adjusting the nut or replacing the brake shoe.

#### 3.7.2 Adjustment of brake

1. Recheck and adjust the free play of front/rear brake lever.
2. Adjust the free play of front brake lever to the range of 10mm~20mm.
3. Adjust the free play of rear brake lever to the range of 10mm~20mm.

#### 3.7.3 Check and clean

1. Check the steel rope for interference or wear, clean it in the cleaning solvent.
2. Then add lubrication between the steel rope and jacket.
3. Check the steel rope jacket for break or fracture, replace the steel rope if necessary.
4. Check the brake shoe for wear, replace it if it exceeds the service limit 2.0mm.
5. Check the brake disc for wear, replace it if exceeds the service limit 3.0mm.

#### NOTES

1. In the use of braking, firstly apply the rear brake to decelerate, and then apply the front brake for parking.
2. In the course of fast driving, the speed should be decelerated ahead of time.
3. Alternately step and release the rear brake to stop the vehicle.
4. It is forbidden to decelerate before applying the front brake.