



# Electric Tow Tractor

QDD70/80/90-XD2-L  
QDD60/70/80/90/100-XD2  
QDD60/70/80/90/100-XD2-I  
QDD70/80/90-XD3-L  
QDD60/70/80/90/100-XD3  
QDD60/70/80/90/100-XD3-I

## Operation and Maintenance Manual



Original Instruction

HANGCHA GROUP CO., LTD.

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## FOREWORD

By carefully reading the current operation instructions, the user can master the technical knowledge required for safe operation of tow tractor. The contained information of the operating instructions is concise and well organized.

The large arc streamlined shape of the vehicle is beautiful and elegant. The vehicle owns good stability with battery positioned at the bottom of the chassis. The front and rear axles of the vehicle are fully elastic suspension system with low vibration and good comfort. The low-position wide-opening pedal is very convenient for getting on and off. Various operating pedals, instruments, steering wheels and switches are configured according to ergonomic requirements, and are comfortable and flexible. The standard side replacement battery design makes battery replacement quicker, more efficient and safer for continuous working conditions. The optional fully enclosed cab can be adapted to all weather. Major electrical components like motor controller, contactor, battery socket, emergency power off switch etc. are all foreign famous brands. The main force components such as the frame, drive axle and steering axle are designed with high strength to meet high-intensity working conditions. The emergency power off switch is standard configuration and meets European safety standards. The AC power system has high efficiency, complete protection functions, and greatly improves reliability and service life. The front and rear wheel are equipped with brakes for flexible and reliable braking. The vehicle uses the electromagnetic brake as the parking brake, abandons the traditional hand brake and realizes the intelligent parking brake, which is convenient for the operator and improves safety. The large-screen LCD display and fault code diagnosis table can be accurately displayed in harsh environments. The newly configured AC control system provides efficient and precise adjustment performance and extends working hours after a single charge. The whole vehicle is equipped with LED, and the front turn signals are equipped with the latest streamer technology. The vehicle has good maintainability, and the AC brushless AC motor is maintenance-free, which greatly saves the use cost; easy-to-remove rear platform cover facilitates commissioning and maintenance of the electronic control system; the side removable battery makes the battery maintenance very convenient; the electronically controlled electrical components are placed together and highly integrated.

Our company will continue to carry out equipment research and development. Therefore, please understand that our company must reserve the right to modify the configuration, equipment and technology.

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# I. Safety instruction

1. Only trained and authorized operator shall be permitted to operate the truck.
2. Obey the traffic rules.
3. Maintain adequate safe running distance between vehicles.
4. Inspect the truck at periodic intervals for leaks, deformation, defects, etc. The life of the truck will be shortened or an accident could occur.
  - Make sure to replace the “key component” in schedule maintenance.
  - Wipe off oil, grease or water from the floor board and foot and hand controls.
  - Strictly prohibit smoking and spark near the storage battery when checking it.
  - Be careful do not be scalded when inspecting the motor, controller and etc.
  - Controller is equipped with accumulator. Forbid to touch within B+ and B- to prevent from wounding by electricity. Before checking or cleaning, please connect loads (contactor circuit or horn for example) between B+ and B- first to discharge for capacitor of controller.
  - Electrical appliances, controllers, and motors should strictly keep out of the water and rain.
5. Whenever you discover a fault, stop the forklift, hang a "DANGER" or "OUT OF ORDER" sign on it, remove the key and notify a manager. The truck may only be used after the fault has been eliminated.
  - Arrange for immediate repair in the event of a fault when lifting or driving uphill or downhill, or a leakage of battery electrolyte, hydraulic oil or brake fluid.
  - Operators must wear a helmet, work shoes and overalls.
6. Batteries generate explosive gases. Keep sparks and open flames away from the battery. After charging or adding electrolyte, clean the truck carefully.
  - Keep tools away from the battery terminals to prevent sparks or short-circuits.
7. The truck is designed to operate on solid and flat cement, asphalt or concrete surfaces. Check the road condition in advance. . Clean the work space, remove all obstacles, wipe out the macadam, mud, wipe off waste oil and water.
  - The truck is designed to operate in the following climatic conditions: temperature range

-20 °C to 50 °C; maximum wind speed 10 m/s; maximum relative air humidity 90% (at 20°C).

— The altitude is no more than 2000m.

8. The truck is not suitable for use in flammable or explosive working environments. The vehicle is not equipped with a fire extinguisher. The fire extinguisher should be easily accessible. The staff should be familiar with the fire extinguisher storage place and the use of the fire extinguisher.
9. Before start, press the horn, ensure no others around you. It is forbidden to overload.
10. Don't make a sudden start, sudden brake or sharp turning. The maximum cornering speed is controlled at one third of the maximum operating speed.
11. Do not use the vehicle in harsh weather conditions such as sand, snow, lightning, heavy rain or typhoon. Especially when the wind speed is greater than 5m/s, the use of vehicles should be avoided.
12. Ground unevenness and wheel breakage will cause vehicle vibration and noise. Pneumatic tires must be inflated as required. Excessive or low pressure is not allowed.
13. Without permission of factory, the trucks can not be modified. The manufacturer or qualified personnel assigned by the manufacturer can assemble the line on the vehicle and can install the road lighting, work lights and signal lights.
14. When the truck anchors, move the truck to the place where traffic conditions permit. If it is caused by brake or steering system, move it by a suitable truck (refer to the vehicle conveying content); for other reasons, use a suitable truck to drag, when dragging, tie rope at the external truck body. Remove the battery plug when dragging. Please obey traffic rules when dragging the truck on road.
15. There are warning signs and operation methods on nameplate, Please follow this operation manual and nameplate of this truck. Check the nameplate and replace damaged or detached ones.
16. When charging the battery, turn off the key switch first, and then disconnect the link between controller and battery, otherwise, the controller may be damaged.
17. The tire is divided type rim , Inflation and replacement must be in accordance with the following requirements strictly.

- 18.** It is strictly forbidden to ramp and turn on the ramp, otherwise the vehicle will be in danger of overturning.
- 19.** The speed of the vehicle should be controlled below 5km/h when turning. If the truck is going to turn over, do not attempt to get out of the truck, because the speed of overturn is much faster than you. You should hold the steering wheel handle, and this practice will keep you in the seat. Please tie safety belt.
- 20.** In the process of installment and assembly, there will be noise and vibration. Please choose the right tool and assembly method. Depress the noise and vibration as less as possible to reduce the noise pollution to circumstance.
- 21.** The truck is designed to operate on solid and flat cement, asphalt or concrete surfaces. When there are snows, ice accretion, hydrops, or other foreign matter and obstacle, operate the forklift only after cleaning them, otherwise the truck maybe out of control and even cause safety accidents.
- 22.** The work place should be bright enough. At night, turn on the head lamp and work with enough light.

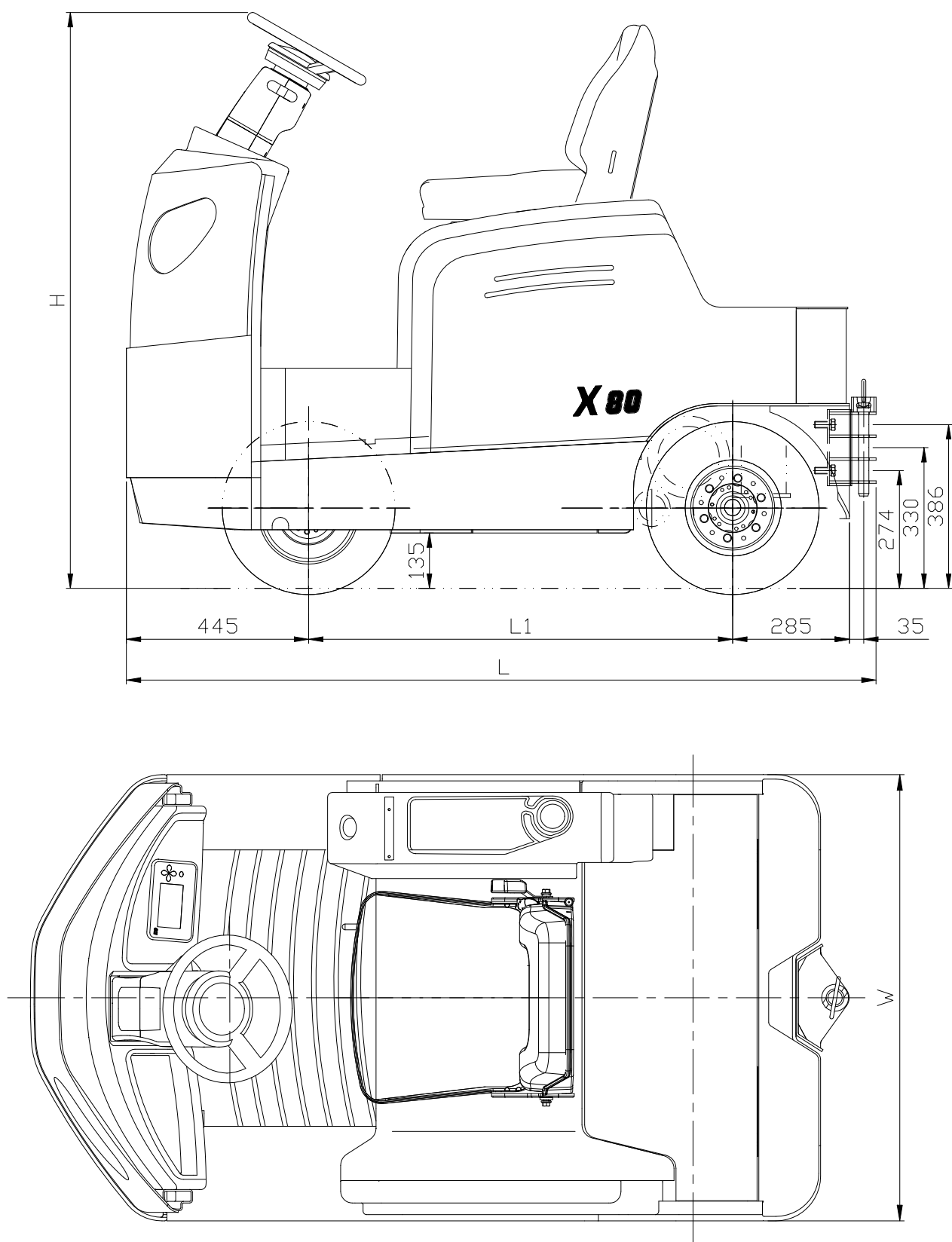
## II Main Technical data

| Model                         |                                       | QDD60-XD2<br>QDD60-XD3 | QDD70-XD2<br>QDD70-XD3 | QDD80-XD2<br>QDD80-XD3 |
|-------------------------------|---------------------------------------|------------------------|------------------------|------------------------|
| Performance                   | Drawbar traction 1hr×N                | 1500                   | 1750                   | 2000                   |
|                               | Max. drawbar traction N (5 min)       | 4500                   | 5250                   | 6000                   |
|                               | Traction load on dry concrete road kg | 6000                   | 7000                   | 8000                   |
|                               | Max. travel speed km/h                | 18                     | 18                     | 18                     |
|                               | Outside turning radius mm             | 1650                   | 1650                   | 1650                   |
|                               | Gradeability(no load) %               | 25                     | 25                     | 25                     |
|                               | Gradeability(full load) %             | 5                      | 5                      | 5                      |
| Weight                        | Weight kg                             | 1200                   | 1250                   | 1300                   |
|                               | Load assigned - front wheel kg        | 570                    | 570                    | 570                    |
|                               | Load assigned - rear wheel kg         | 630                    | 680                    | 730                    |
| Motor                         | Model                                 | HPQ4.5-48HC            | HPQ4.5-48HC            | HPQ4.5-48HC            |
|                               | Rated capacity kW                     | 4.5                    | 4.5                    | 4.5                    |
|                               | Rated voltage V                       | 33                     | 33                     | 33                     |
|                               | Rated current A                       | 100                    | 100                    | 100                    |
|                               | Rated speed r/min                     | 1780                   | 1780                   | 1780                   |
|                               | Exciting mode                         | AC                     | AC                     | AC                     |
|                               | Rating                                | S2-60 min              | S2-60 min              | S2-60 min              |
|                               | Insulation grade                      | H                      | H                      | H                      |
| Dimension                     | Overall length (L) mm                 | 1830                   | 1830                   | 1830                   |
|                               | Overall width (W) mm                  | 996                    | 996                    | 996                    |
|                               | Overall height without cab (H) mm     | 1416                   | 1416                   | 1416                   |
|                               | Wheelbase (L1) mm                     | 1035                   | 1035                   | 1035                   |
|                               | Thread –front wheel mm                | /                      | /                      | /                      |
|                               | Thread –rear wheel mm                 | 877                    | 877                    | 877                    |
|                               | Ground clearance mm                   | 135                    | 135                    | 135                    |
|                               | Drawbar center height mm              | 274/330/386            | 274/330/386            | 274/330/386            |
| Battery voltage/capacity V/Ah |                                       | 48/300                 | 48/300                 | 48/360                 |
| Controller type               |                                       | Inmotion               | Inmotion               | Inmotion               |
| Wheel                         | Front wheel/quantity                  | 4.00-8/1               | 4.00-8/1               | 4.00-8/1               |
|                               | Rear wheel/quantity                   | 4.00-8/2               | 4.00-8/2               | 4.00-8/2               |

| Model                         |                                       | QDD90-XD2   | QDD100-XD2  | QDD60-XD2-I |
|-------------------------------|---------------------------------------|-------------|-------------|-------------|
| Performance                   | Drawbar traction 1hr×N                | 2250        | 2500        | 1500        |
|                               | Max. drawbar traction N (5 min)       | 6750        | 7500        | 4500        |
|                               | Traction load on dry concrete road kg | 9000        | 10000       | 6000        |
|                               | Max. travel speed km/h                | 18          | 18          | 18          |
|                               | Outside turning radius mm             | 1650        | 1865        | 1650        |
|                               | Gradeability(no load) %               | 25          | 25          | 25          |
|                               | Gradeability(full load) %             | 5           | 5           | 5           |
| Weight                        | Weight kg                             | 1380        | 1550        | 1150        |
|                               | Load assigned - front wheel kg        | 590         | 700         | 530         |
|                               | Load assigned - rear wheel kg         | 790         | 850         | 620         |
| Motor                         | Model                                 | HPQ4.5-48HC | HPQ4.5-48HC | HPQ4.5-48HC |
|                               | Rated capacity kW                     | 4.5         | 4.5         | 4.5         |
|                               | Rated voltage V                       | 33          | 33          | 33          |
|                               | Rated current A                       | 100         | 100         | 100         |
|                               | Rated speed r/min                     | 1780        | 1780        | 1780        |
|                               | Exciting mode                         | AC          | AC          | AC          |
|                               | Rating                                | S2-60 min   | S2-60 min   | S2-60 min   |
|                               | Insulation grade                      | H           | H           | H           |
| Dimension                     | Overall length (L) mm                 | 1830        | 2045        | 1830        |
|                               | Overall width (W) mm                  | 996         | 996         | 996         |
|                               | Overall height without cab (H) mm     | 1416        | 1416        | 1416        |
|                               | Wheelbase (L1) mm                     | 1035        | 1250        | 1035        |
|                               | Thread –front wheel mm                | /           | /           | /           |
|                               | Thread –rear wheel mm                 | 870         | 877         | 870         |
|                               | Ground clearance mm                   | 135         | 135         | 135         |
|                               | Drawbar center height mm              | 274/330/386 | 274/330/386 | 274/330/386 |
| Battery voltage/capacity V/Ah |                                       | 48/420      | 48/420      | 48/271      |
| Controller type               |                                       | Inmotion    | Inmotion    | Inmotion    |
| Wheel                         | Front wheel/quantity                  | 16X6-8/1    | 4.00-8/1    | 4.00-8/1    |
|                               | Rear wheel/quantity                   | 4.00-8/2    | 4.00-8/2    | 4.00-8/2    |

| Model                         |                                       | QDD70-XD2-I<br>QDD70-XD3-I | QDD80-XD2-I<br>QDD80-XD3-I | QDD90-XD2-I<br>QDD90-XD3-I | QDD100-XD2-I<br>QDD100-XD3-I |
|-------------------------------|---------------------------------------|----------------------------|----------------------------|----------------------------|------------------------------|
| Performance                   | Drawbar traction 1hr×N                | 1750                       | 2000                       | 2250                       | 2500                         |
|                               | Max. drawbar traction N (5 min)       | 5250                       | 6000                       | 6750                       | 7500                         |
|                               | Traction load on dry concrete road kg | 7000                       | 8000                       | 9000                       | 10000                        |
|                               | Max. travel speed km/h                | 18                         | 18                         | 18                         | 18                           |
|                               | Outside turning radius mm             | 1650                       | 1650                       | 1650                       | 1650                         |
|                               | Gradeability(no load) %               | 25                         | 25                         | 25                         | 25                           |
|                               | Gradeability(full load) %             | 5                          | 5                          | 5                          | 5                            |
| Weight                        | Weight kg                             | 1200                       | 1250                       | 1300                       | 1385                         |
|                               | Load assigned - front wheel kg        | 530                        | 530                        | 530                        | 570                          |
|                               | Load assigned - rear wheel kg         | 670                        | 720                        | 770                        | 815                          |
| Motor                         | Model                                 | HPQ4.5-48HC                | HPQ4.5-48HC                | HPQ4.5-48HC                | HPQ4.5-48HC                  |
|                               | Rated capacity kW                     | 4.5                        | 4.5                        | 4.5                        | 4.5                          |
|                               | Rated voltage V                       | 33                         | 33                         | 33                         | 33                           |
|                               | Rated current A                       | 100                        | 100                        | 100                        | 100                          |
|                               | Rated speed r/min                     | 1780                       | 1780                       | 1780                       | 1780                         |
|                               | Exciting mode                         | AC                         | AC                         | AC                         | AC                           |
|                               | Rating                                | S2-60 min                  | S2-60 min                  | S2-60 min                  | S2-60 min                    |
|                               | Insulation grade                      | H                          | H                          | H                          | H                            |
| Dimension                     | Overall length (L) mm                 | 1830                       | 1830                       | 1830                       | 1830                         |
|                               | Overall width (W) mm                  | 996                        | 996                        | 996                        | 996                          |
|                               | Overall height without cab (H) mm     | 1416                       | 1416                       | 1416                       | 1416                         |
|                               | Wheelbase (L1) mm                     | 1035                       | 1035                       | 1035                       | 1035                         |
|                               | Thread –front wheel mm                | /                          | /                          | /                          | /                            |
|                               | Thread –rear wheel mm                 | 870                        | 870                        | 870                        | 870                          |
|                               | Ground clearance mm                   | 135                        | 135                        | 135                        | 135                          |
|                               | Drawbar center height mm              | 274/330/386                | 274/330/386                | 274/330/386                | 274/330/386                  |
| Battery voltage/capacity V/Ah |                                       | 48/271                     | 48/271                     | 48/271                     | 48/404                       |
| Controller type               |                                       | Inmotion                   | Inmotion                   | Inmotion                   | Inmotion                     |
| Wheel                         | Front wheel/quantity                  | 4.00-8/1                   | 4.00-8/1                   | 16X6-8/1                   | 16X6-8/1                     |
|                               | Rear wheel/quantity                   | 4.00-8/2                   | 4.00-8/2                   | 4.00-8/2                   | 4.00-8/2                     |

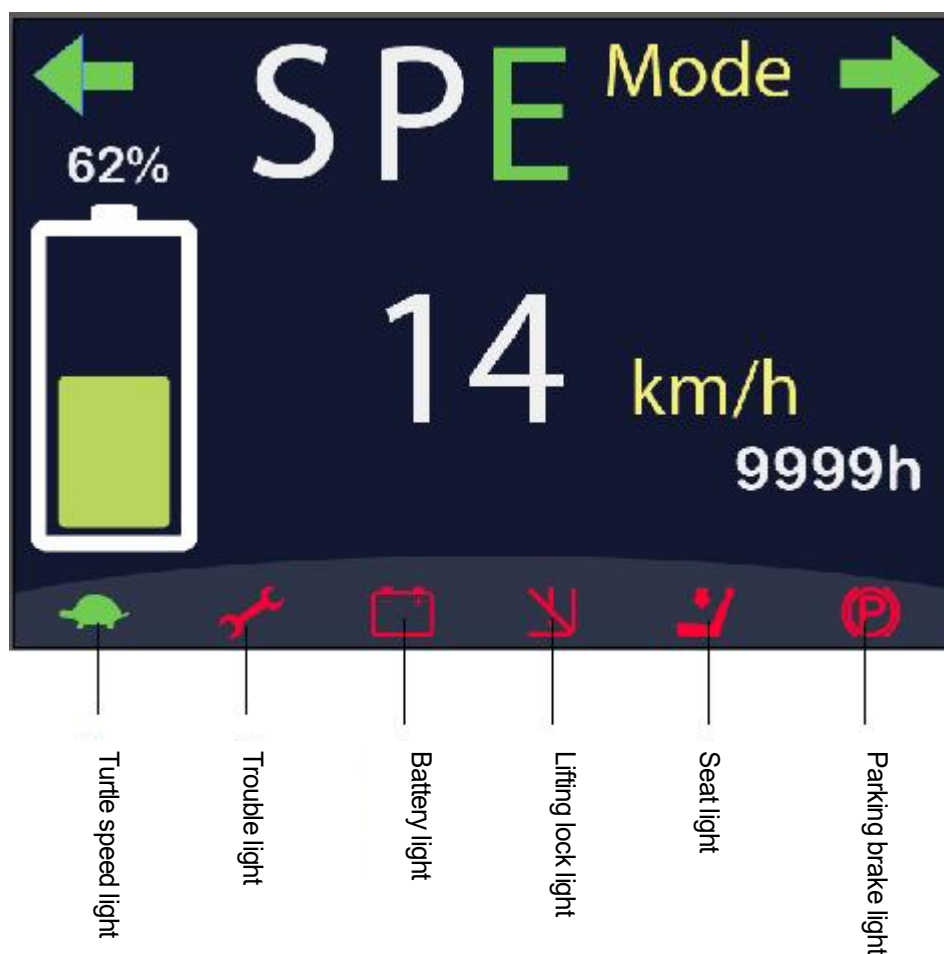
| Model                         |                                       | QDD70-XD2-L<br>QDD70-XD3-L | QDD80-XD2-L<br>QDD80-XD3-L | QDD90-XD2-L<br>QDD90-XD3-L |
|-------------------------------|---------------------------------------|----------------------------|----------------------------|----------------------------|
| Performance                   | Drawbar traction 1hr×N                | 1750                       | 2000                       | 2250                       |
|                               | Max. drawbar traction N (5 min)       | 5250                       | 6000                       | 6750                       |
|                               | Traction load on dry concrete road kg | 7000                       | 8000                       | 9000                       |
|                               | Max. travel speed km/h                | 18                         | 18                         | 18                         |
|                               | Outside turning radius mm             | 1865                       | 1865                       | 1865                       |
|                               | Gradeability(no load) %               | 25                         | 25                         | 25                         |
|                               | Gradeability(full load) %             | 5                          | 5                          | 5                          |
| Weight                        | Weight kg                             | 1450                       | 1450                       | 1500                       |
|                               | Load assigned - front wheel kg        | 700                        | 700                        | 700                        |
|                               | Load assigned - rear wheel kg         | 750                        | 750                        | 800                        |
| Motor                         | Model                                 | HPQ4.5-48HC                | HPQ4.5-48HC                | HPQ4.5-48HC                |
|                               | Rated capacity kW                     | 4.5                        | 4.5                        | 4.5                        |
|                               | Rated voltage V                       | 33                         | 33                         | 33                         |
|                               | Rated current A                       | 100                        | 100                        | 100                        |
|                               | Rated speed r/min                     | 1780                       | 1780                       | 1780                       |
|                               | Exciting mode                         | AC                         | AC                         | AC                         |
|                               | Rating                                | S2-60 min                  | S2-60 min                  | S2-60 min                  |
|                               | Insulation grade                      | H                          | H                          | H                          |
| Dimension                     | Overall length (L) mm                 | 2045                       | 2045                       | 2045                       |
|                               | Overall width (W) mm                  | 996                        | 996                        | 996                        |
|                               | Overall height without cab (H) mm     | 1416                       | 1416                       | 1416                       |
|                               | Wheelbase (L1) mm                     | 1250                       | 1250                       | 1250                       |
|                               | Thread –front wheel mm                | /                          | /                          | /                          |
|                               | Thread –rear wheel mm                 | 870                        | 870                        | 870                        |
|                               | Ground clearance mm                   | 135                        | 135                        | 135                        |
|                               | Drawbar center height mm              | 274/330/386                | 274/330/386                | 274/330/386                |
| Battery voltage/capacity V/Ah |                                       | 48/420                     | 48/420                     | 48/420                     |
| Controller type               |                                       | Inmotion                   | Inmotion                   | Inmotion                   |
| Wheel                         | Front wheel/quantity                  | 16X6-8/2                   | 16X6-8/2                   | 16X6-8/2                   |
|                               | Rear wheel/quantity                   | 4.00-8/2                   | 4.00-8/2                   | 4.00-8/2                   |



### III Operating device and application method

#### 1 Instrument

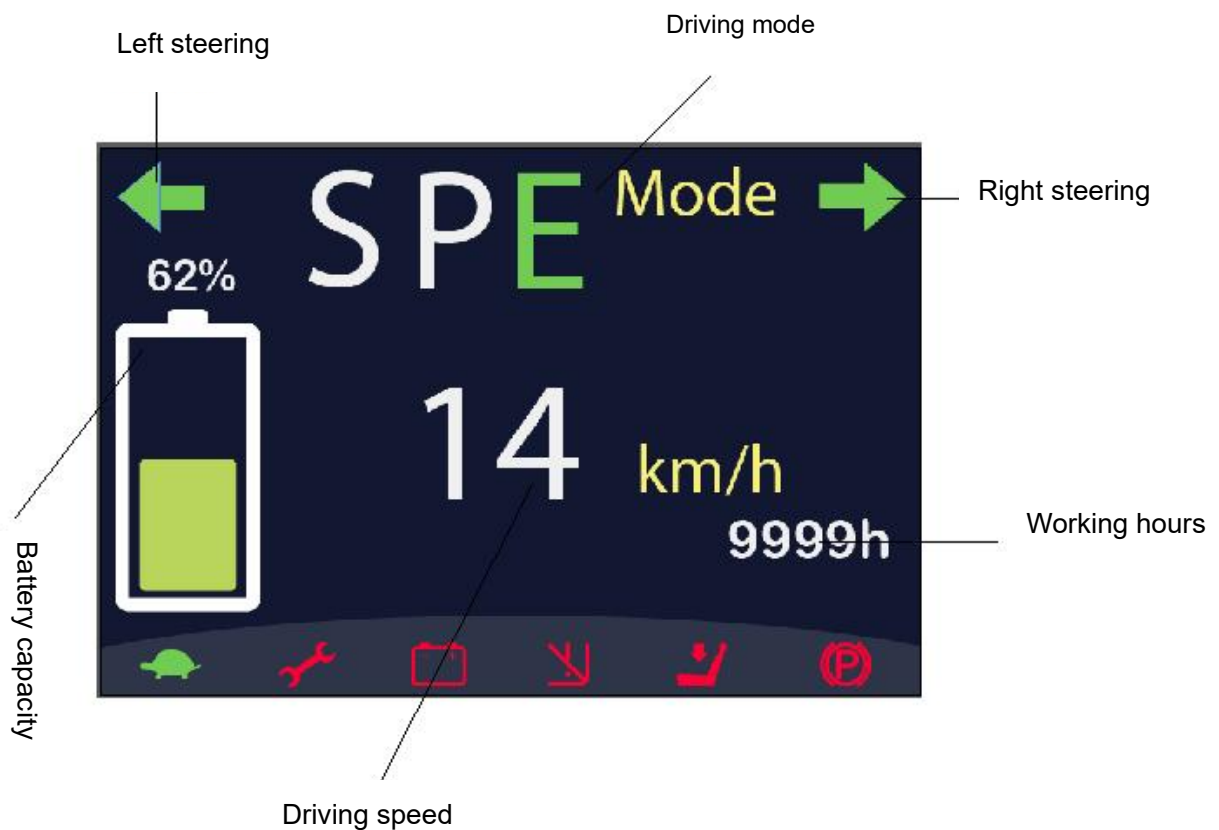
The multi-function display shows the battery capacity, the service hours, the operating mode, the travel speed and fault code information etc. Graphic illustrations on the multi-function display act as warning indicators. Check fault code and parameter setting through the right button.



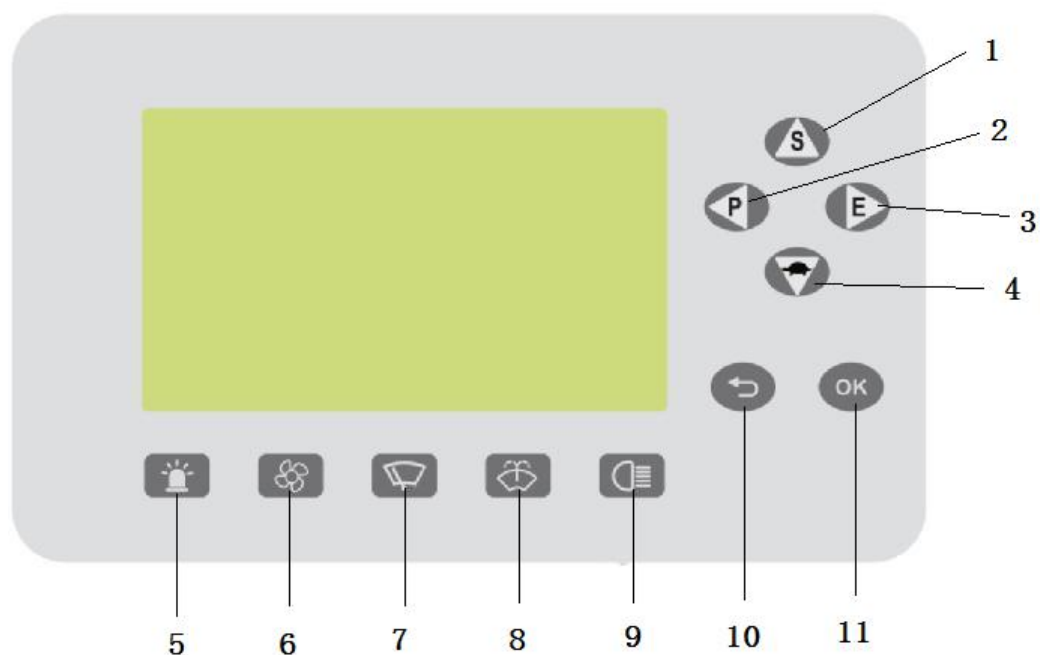
| No. | Parameter name     | Description                                                                      | Remark                 |
|-----|--------------------|----------------------------------------------------------------------------------|------------------------|
| 1   | Turtle speed light | Light up when the vehicle is operating in turtle speed mode                      |                        |
| 2   | Trouble light      | Light up when a controller in the vehicle is faulty                              |                        |
| 3   | Battery light      | Light up when the battery level is below 20%                                     |                        |
| 4   | Lifting lock light | When the power level is lower than or equal to 10%, the lifting lock light is on |                        |
| 5   | Seat light         | Light up when the driver leaves the seat                                         | 0: light up; 1: go out |

|   |                     |                                                  |  |
|---|---------------------|--------------------------------------------------|--|
| 6 | Parking brake light | Light up when the driver operates the hand brake |  |
|---|---------------------|--------------------------------------------------|--|

## Main display interface



| Parameter name   | Description                                                                       | Remark   |
|------------------|-----------------------------------------------------------------------------------|----------|
| Driving mode     | Display the current working mode, with 4 working modes of "S", "P", "E" and "SPE" |          |
| Driving speed    | Display current vehicle speed in KM/h                                             |          |
| Battery capacity | Show current battery level icon                                                   |          |
| Working hours    | Tractor accumulating working hours                                                |          |
| Left steering    | Show left turn arrow indication                                                   | Optional |
| Right steering   | Show right turn arrow indication                                                  | Optional |



| No. | Designation              | Function                     | Remark   |
|-----|--------------------------|------------------------------|----------|
| 1   | S mode switch            | Change to “S” working mode   |          |
| 2   | P mode switch            | Change to “P” working mode   |          |
| 3   | E mode switch            | Change to “E” working mode   |          |
| 4   | Turtle speed mode switch | Change to “SPE” working mode |          |
| 5   | Caution light switch     | Turn on/off caution light    |          |
| 6   | Fan switch               | Turn on/off fan              | Optional |
| 7   | Wiper switch             | Turn on/off wiper            | Optional |
| 8   | Washer switch            | Turn on/off washer switch    | Optional |
| 9   | Beam light switch        | Turn on/off beam light       | Optional |
| 10  | Return button            |                              |          |
| 11  | OK button                |                              |          |

Driving mode introduction:

There are four operating modes: “S”, “P”, “E” and “SPE”, and the button to switch the operating mode is “S” button, “P” button, “E” button, “Turtle speed” button respectively. When the operating mode is not changed, the default operating mode is E mode.

S mode: Super mode allows for the fastest acceleration and deceleration and the maximum grade

ability. It is used for climbing steep inclines and handling a large number of goods in a short period of time. However, it consumes the most power and should therefore be used sparingly.

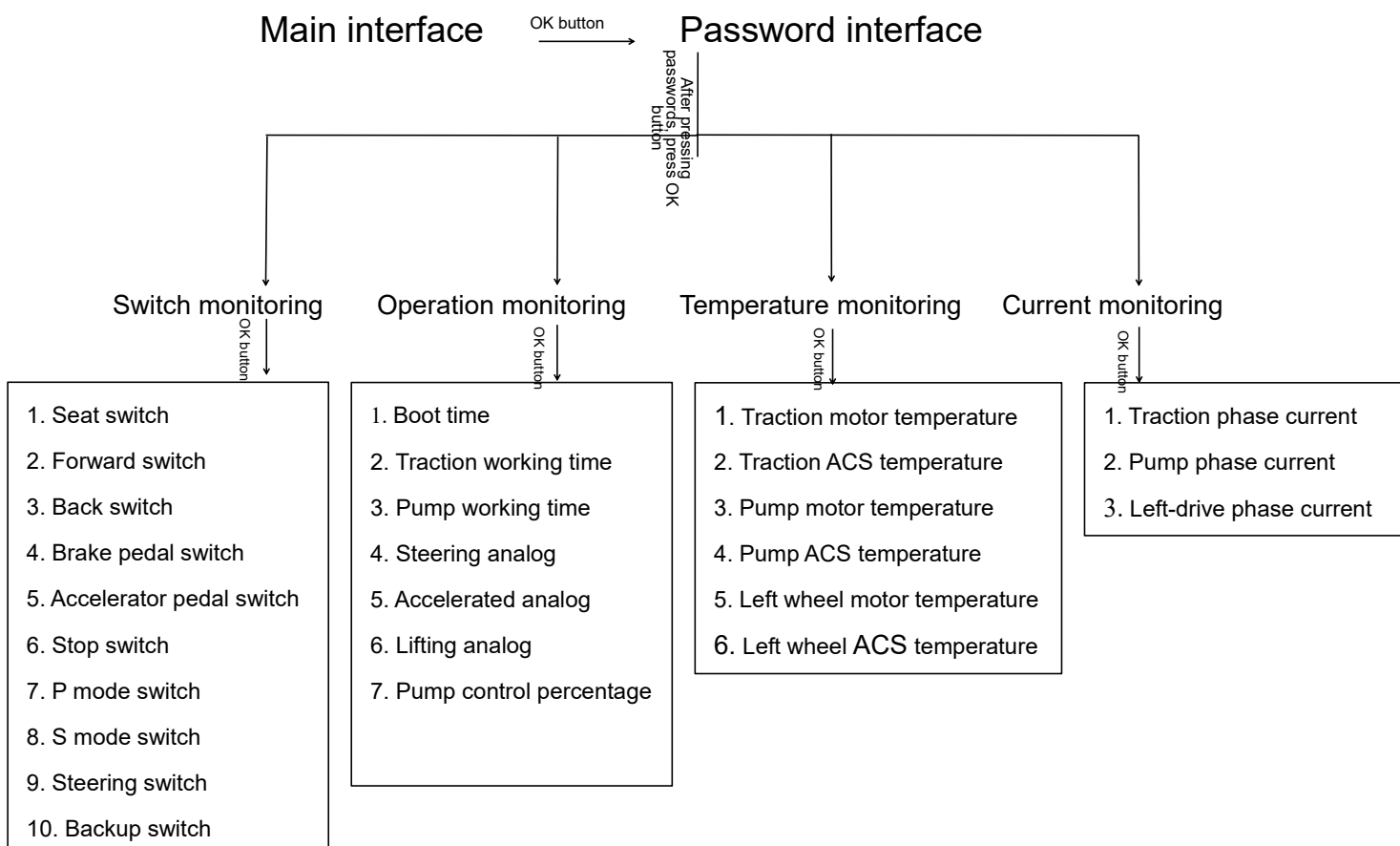
P mode: Power mode offers slightly lower performance than Super mode and is used for long-distance transport situations that require greater power or speed.

E mode: Economy mode offers optimized all-round performance and energy saving. It is suitable for prolonged operation on a single charge and is recommended for normal work.

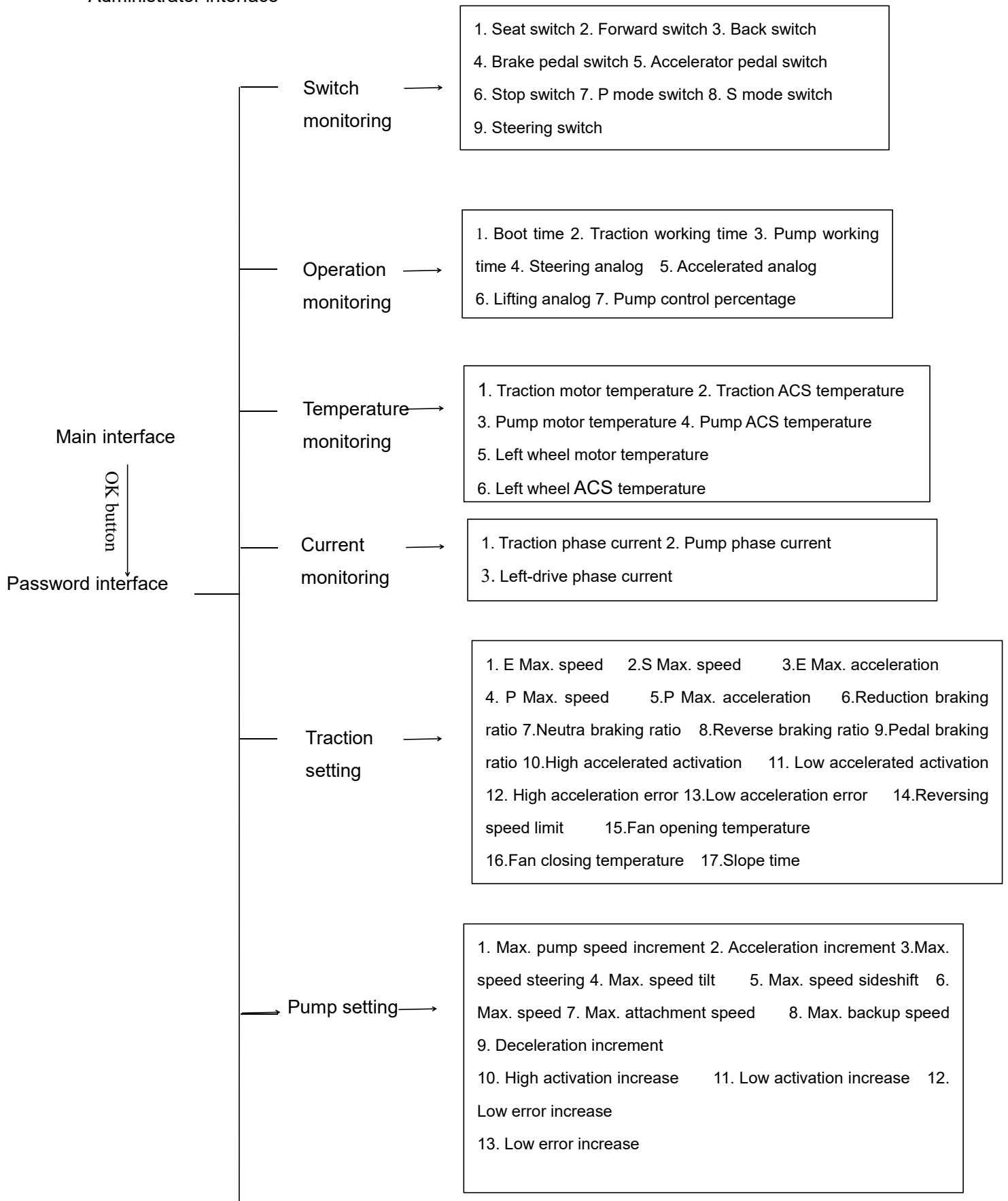
SPE mode: Safe mode limits the maximum travel speed to about 7 km/h. It is used for working in congested warehouses and confined spaces. In this mode, the turtle speed indicator lamp will be illuminated.

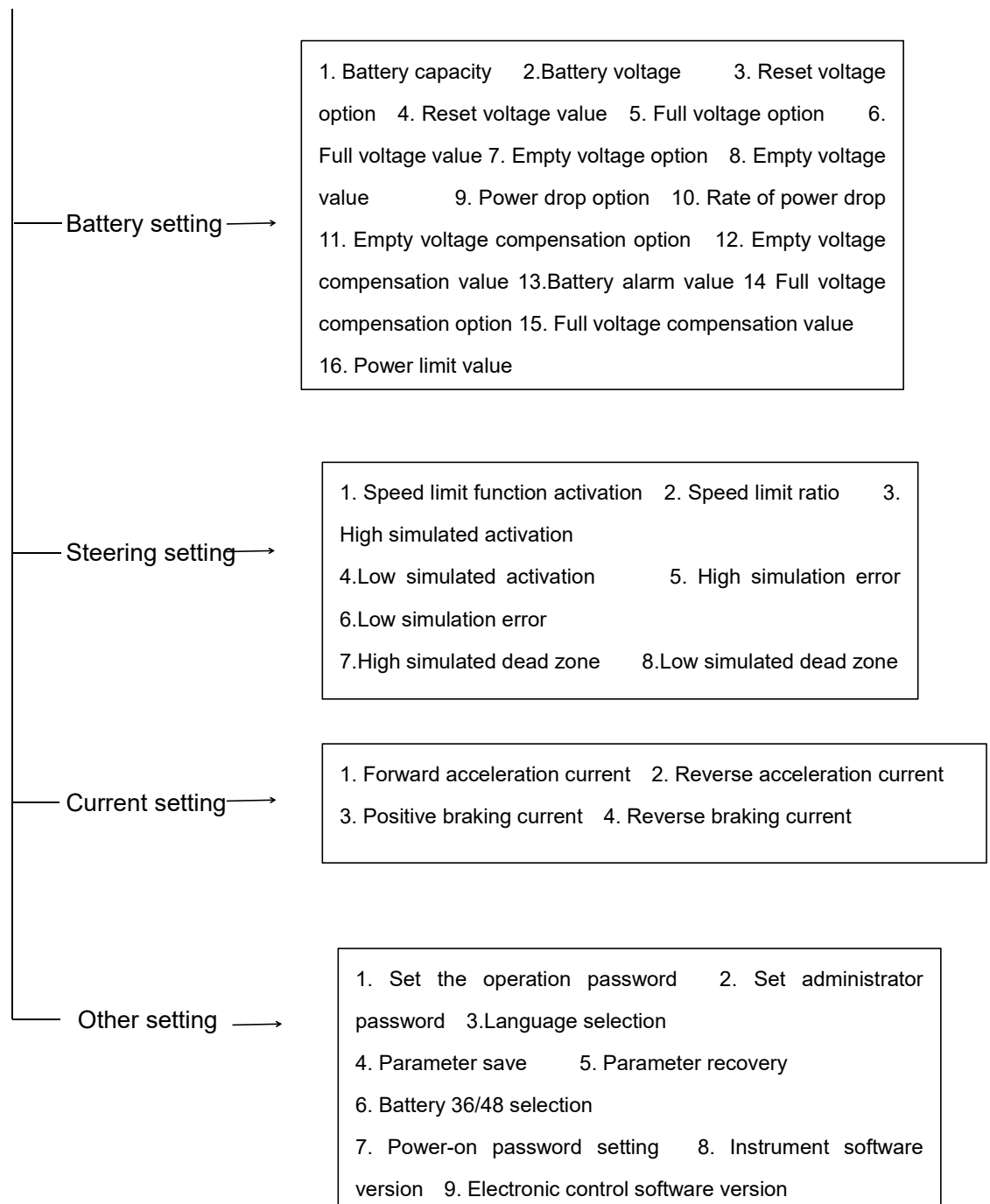
## Instrument menu structure

Operator interface



## Administrator interface





## 2 Display and control



| No. | Designation                   | No. | Designation                    |
|-----|-------------------------------|-----|--------------------------------|
| 1   | Steering wheel                | 6   | Instrument                     |
| 2   | Horn button                   | 7   | Steering wheel locating device |
| 3   | Turn light & Headlight switch | 8   | Brake pedal                    |
| 4   | Reversing switch              | 9   | Accelerator pedal              |
| 5   | Key switch                    | 10  | Emergency stop switch          |

### **Steering wheel [1]**



Turn the truck left or right. Rotate in counterclockwise, the truck travels to left; rotate in clockwise, the truck travels to right.

### **Horn [2]**

It is in the middle of the steering wheel, press to sound.

### **Turn light & Headlight switch [3]**

Placed in the left of the steering column under the steering wheel, it is a push-pull and knob type combination switch. Push forward, right turn light goes on, and pull backward, left turn light goes on. The light switch is a knob type three-speed switch, one gear –OFF, second gear–rear lamps on, the third gear-head lamps and rear lamps on.

### **Reversing switch [4]**

It is arranged on the right side of the steering column below the steering wheel to control the front and rear direction of the vehicle, toggle forward--go forward, toggle backward—back up

### **Key switch [5]**

Key switch lies in the right of instrument panel, and is used to control electric system circuit. Insert the key, turn clockwise, it is connected. Return to original place, it is cut off. It is not allowed to turn off the key switch during travelling.

### **Steering wheel positioning device [7]**

It is used to adjust the position of the steering wheel and fix the steering wheel.

### **Brake pedal [8]**



As the brake pedal is pressed, the truck slows down. Except something emergency happened, or else do not slam the brake pedal.

When the brake pedal friction lining abrasion, the auto adjuster lost function, and the clearance between brake shoe and drum increased, so you need to adjust manually as follows:

- (1) Raise the wheel that needs to adjust;
- (2) Take out the rubber plug from the rim;
- (3) Put the screwdriver into the adjust hole, put down the tooth of ratchet wheel, make brake shoes inflation, at the same time, rotate the wheel, until you are unable to rotate the wheel;
- (4) Press upward and adjust 2-3 tooth of ratchet wheel, then the wheel can rotate freely, but it allows slight friction between lining and drum;
- (5) Plug the rubber stopple.

Auto adjuster composed of top lever, bottom lever, and detent, when the clearance between lining and drum increased, and the performance of braking is bad, you can reverse the truck, and press the brake pedal, do this 2 to 3 times, so it can achieve the purpose of auto adjustment.

After pressing the brake pedal, the micro-switch close the electrical circuit, and the stop lamp light up, at the same time, the brake cylinder make the lining and drum clapping tightly, so that brake the truck. Release the pedal, the control circuit closed, and the brake shoes shrink, then, press the acceleration pedal, and the truck will run.

### **Brake shoe change**

When the distance to rivet head is larger than 0.3mm due to brake shoe wear, it should be changed.

### **Accelerator pedal [9]**



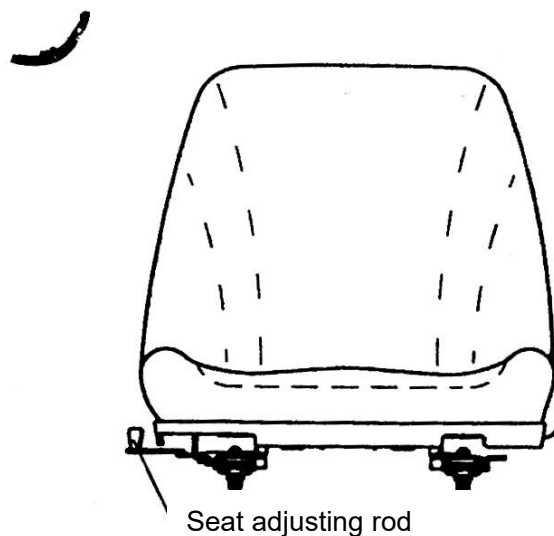
The pedal is located on the right side of the front baseboard, push forward the direction switch, and press the acceleration pedal, the current supplied to the motor will increase, and the speed of the truck increase, so through the control of the pedal, you can change the speed of the truck. Push backward the direction switch, press the pedal, and the truck move backwardly.

### **Emergency stop button [10]**

When you press the red button on your right hand, the main electrical circuit is shut down. Press down when parking and pull before starting, rotate in clockwise, it bounds. Caution: It is generally forbidden to press this button when truck is travelling to avoid circuit burnout.

## **3 Truck body part**

### **Seat**



Seat is adjustable and safety belt is configured. Seat adjusting rod is installed in the right of seat. When adjusting the seat, push this adjusting rod backward and press it, meanwhile, slide the seat forward or backward to your needed position.

Loosen the adjusting rod, and then the seat position is locked.

Before using the truck, make sure the seat is locked. a. before adjusting seat, key switch must be shut down. b. Only when the truck stops can you adjust seat position

### **Safety belt**

While you are on the vehicle and wearing the safety belt, your back and waist should close to the seat as much as possible. Do not tilt the seat back too much or the seat belt will not stretch properly.

Often check if the bolts of the fixed seat belt are loose, whether the buckle and the shrinking device are normal, and belt pins are loose. Not allowed to tie the knot. Do not let the belt press on the hard or fragile objects. And also do not make friction with the sharp edge to avoid damaging the belt.

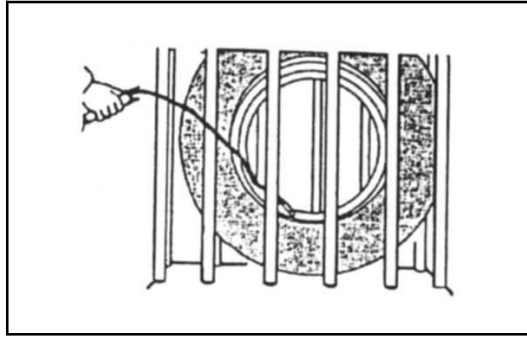
The components installed on the safety belt can not be removed arbitrarily. If the safety belt used frequently, you should always do exterior inspection, when found something abnormal, please immediately replace new belt. The belt can be used for 3-5years, if there is something abnormal, it should be scrapped early.

### **Tyre replacement**



#### **Warning**

- When using the air compressor, the pressure should be adjusted first, because the maximum output pressure of the air compressor is much higher than the specified pressure of the tire, otherwise, it will cause serious accidents.
- Place the tire in a protective frame when inflating for safety.
- To ensure safety, place the tire in a protective frame when inflated.



- ① Park the tractor on a horizontal and solid ground.
- ② Pull the parking brake lever and place chocks before front wheels to prevent movement of forklift.
- ③ Put the lifting jack under the counterweight.

**Caution:** Make sure the jack capacity is greater than 2/3 of service weight of forklift.

- ④ Loosen wheel nuts 1-2 turns by turning them counter-clockwise.



**Warning**

Do not remove wheel nuts until rear tires  
are raised from ground.

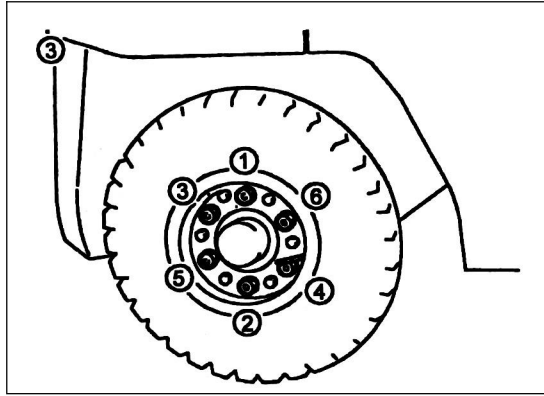
- ⑤ Raise the forklift with jack until rear wheels off the ground. Support forklift truck by putting additional wooden blocks under both sides of the front truck frame as shown below.
- ⑥ Take out the wheel nut of rear wheel, and then replace the wheel.



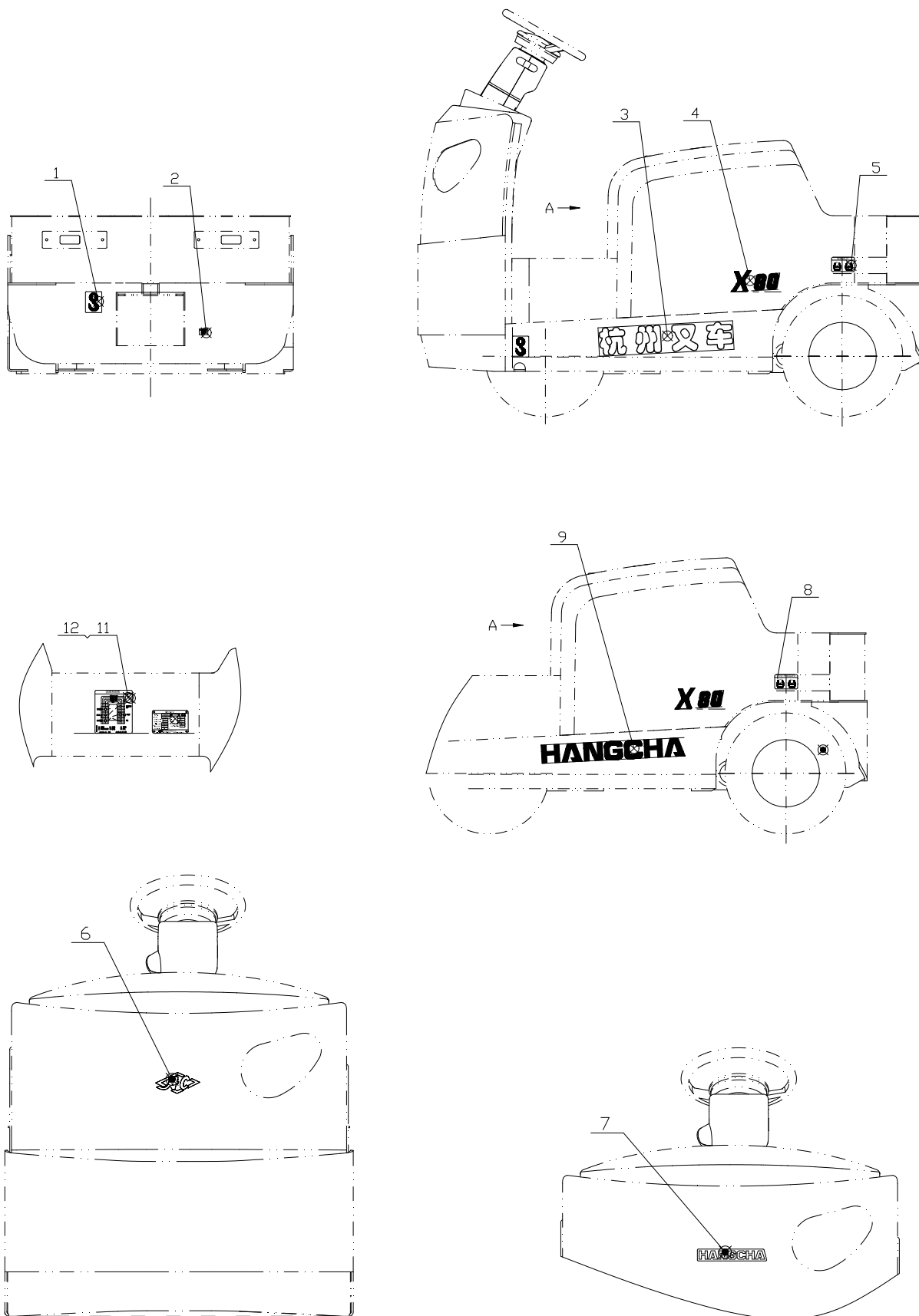
**Warning**

- a. When removing tire from wheel rim, do not remove rim set bolts and nuts before releasing air;
- b. Make sure that wooden blocks used to support lift truck are solid,

- ⑦ Retighten nuts as shown in figure below.
- ⑧ Remove the wooden block under chassis body. Let down the forklift slowly. Then take away the chocks and jack from the rear part of the front wheel.
- ⑨ Retighten the wheel nut with the correct torque. Please refer to *Tightening Torque Table*.
- ⑩ Adjust tire pressure to specified value.



## 4 Nameplate and safety labels



| No. | Designation              | Remark                                                                                                                                                           |
|-----|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | Hoist label              | Fixed point when using the crane to handle equipment                                                                                                             |
| 2   | Tie-down point label     | Fixed point when the truck is towed.                                                                                                                             |
| 3   | Character label          |                                                                                                                                                                  |
| 4   | Tonnage label            |                                                                                                                                                                  |
| 5   | Tire pressure label      | Domestic pneumatic tire                                                                                                                                          |
| 6   | HC logo                  | Domestic sales                                                                                                                                                   |
| 7   | Character label          | Export sales                                                                                                                                                     |
| 8   | Tire pressure label      | Export pneumatic tire                                                                                                                                            |
| 9   | Tire pressure label      | Export sales                                                                                                                                                     |
| 10  | Product nameplate        | The rated capacity on the label is the max. load capacity by the label listed equipment. Any change to the tractor or other equipment may change rated capacity. |
| 11  | Lubrication system chart | Domestic sales                                                                                                                                                   |
| 12  | Lubrication system chart | Export sales                                                                                                                                                     |

## **IV Operation**

### **1 New truck check**

The new trucks have been strictly inspected before leaving the factory, but there may be some looseness during transportation. so before use the new truck, thus make sure the truck run safely. Therefore, after receiving the goods, it is recommended to do the following check after receiving the trucks.

- Check technical documentation – instructions, certificate of quality, packing list – if complete.
- Check the tightening of each connector, paying special attention to the connection of transmission, steering, braking, wheels, etc.
- Check if the motor, controller, appliance, instrument, wiring and joint are intact and firm, electric equipment and instrument are intact and work normally.
- Check if batteries are complete and intact, especially notice the battery shell for fracture.
- Check running of motor and driving part, and the work condition of braking and steering system.
- Check if the tool box is complete.

### **2 During running in**

New trucks should initially be run under low-load conditions. In particular the following requirements should be met within the first 100 hours of operation:

- Avoid the new battery over discharging in early period. ( In the former 10 times cycle, the actual capacity only reach 80% of the rated capacity.)
- Required preventive maintenance must be carried out thoroughly.
- Avoid sudden braking, acceleration or cornering.
- Change oil or lubrication in advance according to regulations.
- Limit the load weight to 70–80% of the rated load.

## 3 Operating instructions

### 3.1 Check before driving

- Check if battery level height and specific gravity meet specified value, if the filling cap is closed, if the battery wire firmly contacts. And then close the cover.
- Check if instrument works normally, each joint connects firmly, and turn on the power switch to check if the instrument displays normally.
- Check driving mechanism, if each connecting piece is intact and connecting is reliable.
- Check if the steering is flexible and normal.
- Check if the tire nut loosens.
- Check if there is lubrication oil leakage in the rear axle. If it is serious, check if it is normal.



**Caution:** Hold the steering wheel or handle with your left hand, hold the seat with your right hand, and get on and off.

### 3.2 Drive the truck

- Pull up (just pop up when turning clockwise) the emergency power off button.
- Turn on the power switch with key, the instrument panel lights up, it shows running time first, then the power capacity. The timer works.
- Release the hand brake.
- Push forward or pull backward the reversing handle.
- Before stepping the accelerator pedal, please look around, after confirming there is no barrier, step the pedal slowly, and then the truck start stably and speed up gradually. Never allow stepping the pedal rapidly.

### 3.3 Travel

- During travelling, control the speed by the degree of stepping the accelerator pedal.
- During travelling, it's not allowed to turn off the key switch.
- In general smooth travelling condition, when slowing down, it can release the accelerator pedal until fully released without using the brake pedal. If brake pedal needed, first release

the accelerator pedal, increase pressure to brake pedal gradually, thus slows down the truck and brakes. Sudden brake not only quicken wear of brake friction plate, brake drum and tire, but also gears, shafts of rear axle and motor are easily damaged by impact. Besides, sudden brake is not good for directional steering.

- During travelling, please observe if there is special noise or odour, abnormal occurrence when brake or turn.
- When turning, according to turning radius dimension and working aisle width, slow down in advance. The speed is restricted to one third of the maximum travelling speed, never turn with full speed to avoid accident.

### 3.4 Reverse

Reverse is allowed when the truck is completely stopped, confirm the driving direction and no barrier around, and then step the accelerator pedal or turn the accelerator switch, control the speed and reverse.

### 3.5 Park

- Release the accelerator pedal, slowly park the truck, and step brake pedal if necessary.
- Place the reverse switch in neutral position.
- The electromagnetic brake acts as a parking brake and stops braking itself after the power is turned off.



#### Caution

- Stop on solid road surface.
- Do not park on road junction, passageway; the truck cannot park on the running route.
- Do not park on the slope, or block the wheel if no other choice.
- Do not park in dangerous place.

### 3.6 Tow

- The vehicle is running backwards and is approaching the trailer slowly.
- Operate the hook handle and pull the traction pin up. The traction pin is inserted after the trailer lever hits the hook.
- Make sure the traction pin is inserted.

### **Warning**

- Do dragging work stably, it's prohibited to do it in high speed, and speed is lower than 2.5km/h.
- Trailer must be equipped with brake device.
- Trailer must stop on flat solid road, and not allowed to park on slope.
- Only operating the hanger handle can insert and pull the traction pin, people is not allowed to enter truck or the trailer, cause it may be dangerous.

## **3.7 Truck off-running**

- Make daily driving record, hand to the supervisor for check and sign.
- Pull up parking brake, and place the reversing switch in neutral.
- Turn off power switch, pull out the key.
- Press emergency power off button.
- Wipe the truck and get rid of the impurity embedded on the tire.
- Explain the truck condition to the person in charge of charging, after acceptance check, the operator can leave.

## V Maintenance and lubrication

When the truck is in use, due to the influence of various factors, the mechanic, parts will loose gradually, and friction and mechanical damage may happen accidentally. If not carry out the necessary maintenance and lubrication, the whole truck performance will deteriorated, and the reliability of mechanic will also be decreased, even make accidents. So it is very important to carry out regular maintenance and lubrication according to the mileage. Because the trucks have different work conditions, so the interval miles (time), items of maintenance and lubrication is different. We recommended maintenance and lubrication interval as follows, you can make maintenance and lubrication according to own actual situation.



### **Caution**

- The truck must be regularly checked and maintained to keep it in good working order.
- Inspection and maintenance are often easily overlooked. Early detection enables problems to be settled in a timely manner.
- Use original Hangcha Group spare parts.
- Do not use different types of oil when changing or topping up oil.
- Waste oil and battery fluid must not be poured away indiscriminately, but recycled or disposed of in accordance with local environmental laws and regulations.
- Establish and follow a comprehensive maintenance and service schedule.
- Maintain current and complete records of all maintenance and servicing activities.
- Untrained personnel must not attempt to carry out truck repairs.

# 1 Maintenance

## Maintenance interval mileage (time)

Daily maintenance everyday after using

Level 1 maintenance every 1000km~2000km(300h)

Level 2 maintenance every 5000km~8000km (1000h)

## Daily maintenance (everyday): clean is the basic, and check the fastening is the key

- Check if the repair item has been repaired.
- Check if the battery is fully charged, if the electrolyte level and gravity specific meet the standard value, if the filling cap is intact, and if the battery casing leaks.
- Check the battery cables for burning, if the terminals loosen or clean. Check all the instruments, lamps, horn are normal, and all terminals are connected firmly.
- Check all parts for lubrication leaks.
- Check all the brake mechanic parts are intact, and are connected reliably. And whether the brake is flexible and the free travel of the pedal.
- Check the steering wheel working conditions and whether steering are lightly and flexible.
- Check if the shaft and tire bolts loosen.
- Listen to the motor, drive system, and frame, check if there are abnormal noises, and the instruments works normally.
- Check the rear axle seat, frame and battery box for damage or breakage, and whether the weld is cracked or not.
- Clean the truck every day, and wipe the inside and outside of the truck. Remove the battery, and wash the acid on the inside and outside surface of the battery box periodically.
- Check if the parking brake is normal

## Level 1 maintenance (Monthly)      Focus on Lubrication and fastening, and thoroughly clean the truck

- Remove the battery, clean and inspect the battery completely, and charge the battery. Clean the battery connector, if there is ablation, repair or replace it.
- Hoist the battery box, and clean the acid inside and outside completely.
- Clean the acid and mud on the frame and other parts.
- Check and tighten the rear axle bolts of the gearbox to inspect and add lubricant.

- Check half shaft sleeve seat and bolts.
- Check the fixed bolt of fastening direction mechanism. Check steering wheel for an empty return.
- Check the wheel tightening nut and shaft bolts.
- Check the brake lining for wear.
- Check the tightening brake wheel bolts and brake base bolts.
- Inspect or replace the straight pin and cotter of brake mechanism.
- Check the free travel of brake pedal.
- Check the front and rear tires, wheel hub, tightening bolt and nuts.
- Clean the motor, check and tighten the bolts.
- Check the instruments, lamps, horn, fuses, switch, insulation to motor shell, and tighten the bolts. Check the junction box's posts and its insulation to the truck body.
- Check if all the wires are intact, and tighten their terminals.
- Check the abrasion of contact point; when the point is too hard or friction, it needs to be replaced.

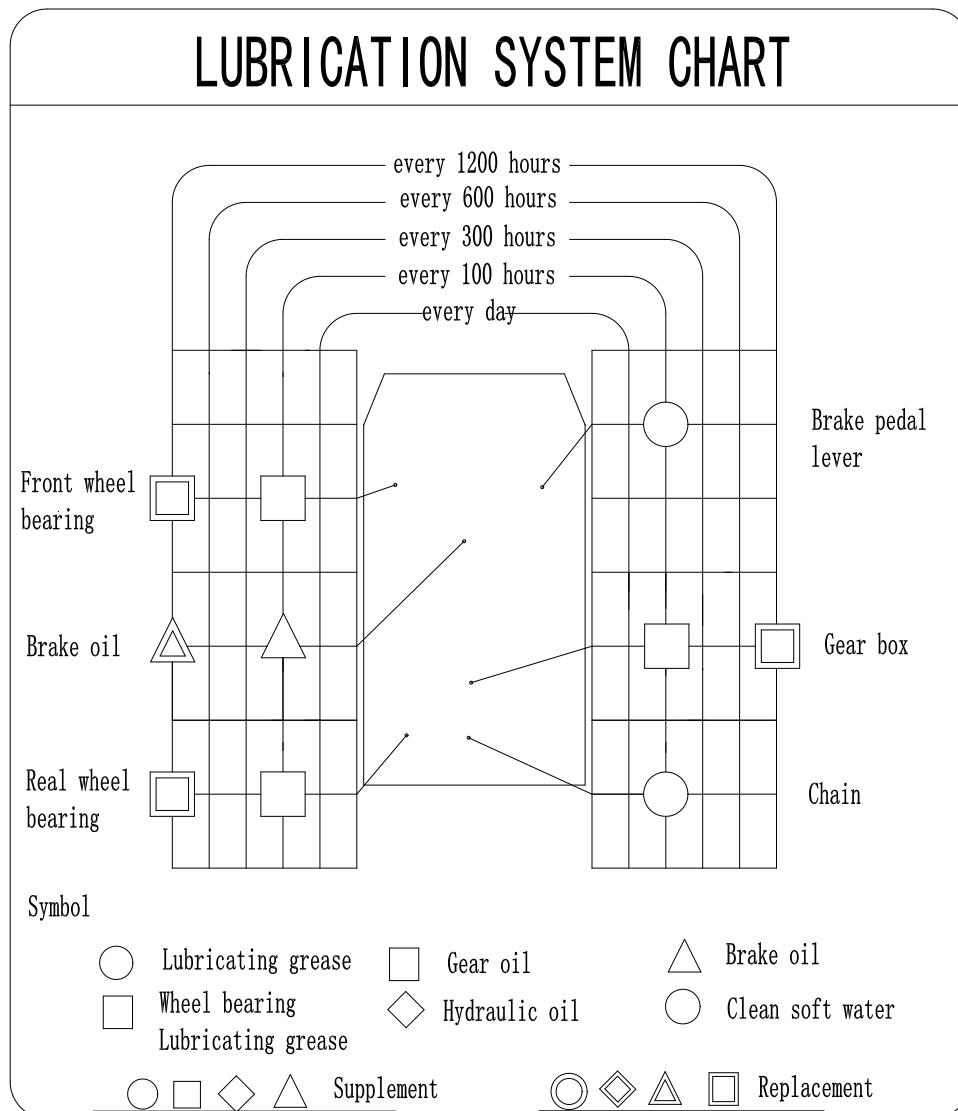
**Level 2 maintenance (Every half year)                      clean is the basic, and adjustment is the key**

Besides all the level 1 maintenance, add the following items:

- Check the axle housing, clean the tank and replace oil.
- Check the lubrication of wheel hub and add lubricant.
- Check the seal ring of wheel hub, replace it in time according to the friction.
- Check the friction of tires, repair or replace it in time.
- Check the steering wheel working conditions, and steering chain device, add or replace lubricant.
- Check the steering axle for crack or the weld line ruptures.
- Check the steering sprocket and chain tension and adjust as appropriate.
- Check abrasion of brake lining, and replace it according to abrasion situation.
- Check the abrasion of all pins of braking mechanism, deformation, repair or replace it.
- Adjust the free travel of brake pedal.
- Inspect and repair the electrical system.
- Every two years: Check controller safety system by presenting a fault according to Fault

Code Chart, and check if the fault code is correct.

## 2 Lubrication



Lubrication is one of the important factors that can affect the performance and life-span of truck. When using the truck, combined with the maintenance, add lubricant or grease to the appointed point according to the lubrication schedule.

Caution: The lubrication parts must be cleaned before adding lubricant. Generally, the lubricating oil is added to the specified mark, the grease is added to the extrusion, and dust and dirt are prevented from infiltrating.

Axle housing: GL-5 85W/140 industrial vehicle gear oil.

Steering mechanism, chain (seat type), brake pedal and other joints: 2# automotive universal lithium grease.

Rear axle wheel bearing: 2# automotive universal lithium grease.

Brake fluid reservoir: DOT4 brake fluid.

### 3 Replace the key safe parts periodically

Some parts can't be found damage through schedule maintenance. In order to make sure the safety of truck, users should replace the parts periodically according to the following table.

If the part is abnormal before the replacing time, it should be replaced immediately.

| Key safe part's description                         | Term of using (year) |
|-----------------------------------------------------|----------------------|
| Brake hose or hard tube                             | 1~2                  |
| Brake fluid reservoir                               | 2~4                  |
| Brake master cylinder, cylinder head and dust cover | 1                    |

### 4 Table for bolt's tightening torque

Unit: N·m

| Bolt's diameter | Grade   |         |         |          |
|-----------------|---------|---------|---------|----------|
|                 | 4.6     | 5.6     | 6.6     | 8.8      |
| 6               | 4~5     | 5~7     | 6~8     | 9~12     |
| 8               | 10~12   | 12~15   | 14~18   | 22~29    |
| 10              | 20~25   | 25~31   | 29~39   | 44~58    |
| 12              | 35~44   | 44~54   | 49~64   | 76~107   |
| 14              | 54~69   | 69~88   | 83~98   | 121~162  |
| 16              | 88~108  | 108~137 | 127~157 | 189~252  |
| 18              | 118~147 | 147~186 | 176~216 | 260~347  |
| 20              | 167~206 | 206~265 | 245~314 | 369~492  |
| 22              | 225~284 | 284~343 | 343~431 | 502~669  |
| 24              | 294~370 | 370~441 | 441~539 | 638~850  |
| 27              | 441~519 | 539~686 | 637~784 | 933~1244 |

**Note:** ·Use entirely 8.8 grade bolt in the important joint position.

·Bolt's grade can be found in the head of the bolt, if it can't be found, the grade is 8.8.

## **VI Storage and hoist**

### **1 Park the truck for a long time**

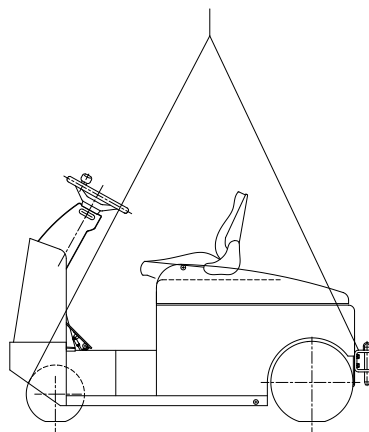
Carry out the following maintenance and inspection on the basis of the operation after the vehicle returning the garage:

- Disconnect the battery plug to prevent discharging, and park the truck in shadow.
- The exposed parts and some shaft coated with rust-proof oil
- Cover the ventilated holes and other places where moisture can easily enter.
- Cover the entire truck with a cover.
- Fill all lubrication points with oil (grease).
- It is necessary to use wooden blocks to cushion the truck body to reduce the weight of the tire.

#### **Start running after parking for a long time**

- Remove rust preventive oil on exposed parts.
- Discharge the gear oil inside the drive axle, clean the inside and add new oil.
- Clean impurity and water on the hydraulic oil tank, and add new oil.
- Recharge battery, fit on truck and connect.
- Carefully check before start.
- Inspect starting, reversing, steering, braking and parking etc. function.

### **2 Hoist the truck**



Tractor is generally used as a short-distance towing trailer. It is inappropriate for long-distance transportation. If the tractor is to be transported from a long distance, it must be transported by tools such as vehicles and ships with a load of more than 1.5 tons.

When lifting the tractor, hang the hooks at three places (see the lifting placard for “lifting from this”): two hanging holes on the left and right sides of the front truck body; the rear traction hooks. Take care to prevent the hook from slipping off, and then slowly lift the truck with the lifting device.

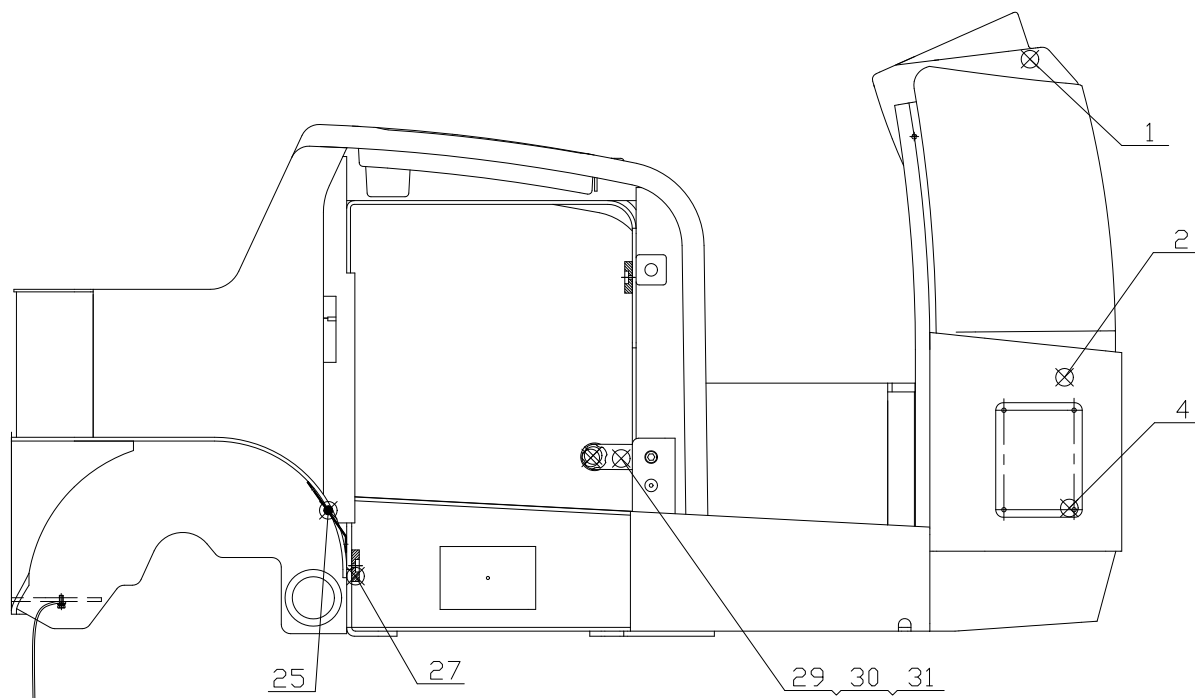
## VII Main part introduction

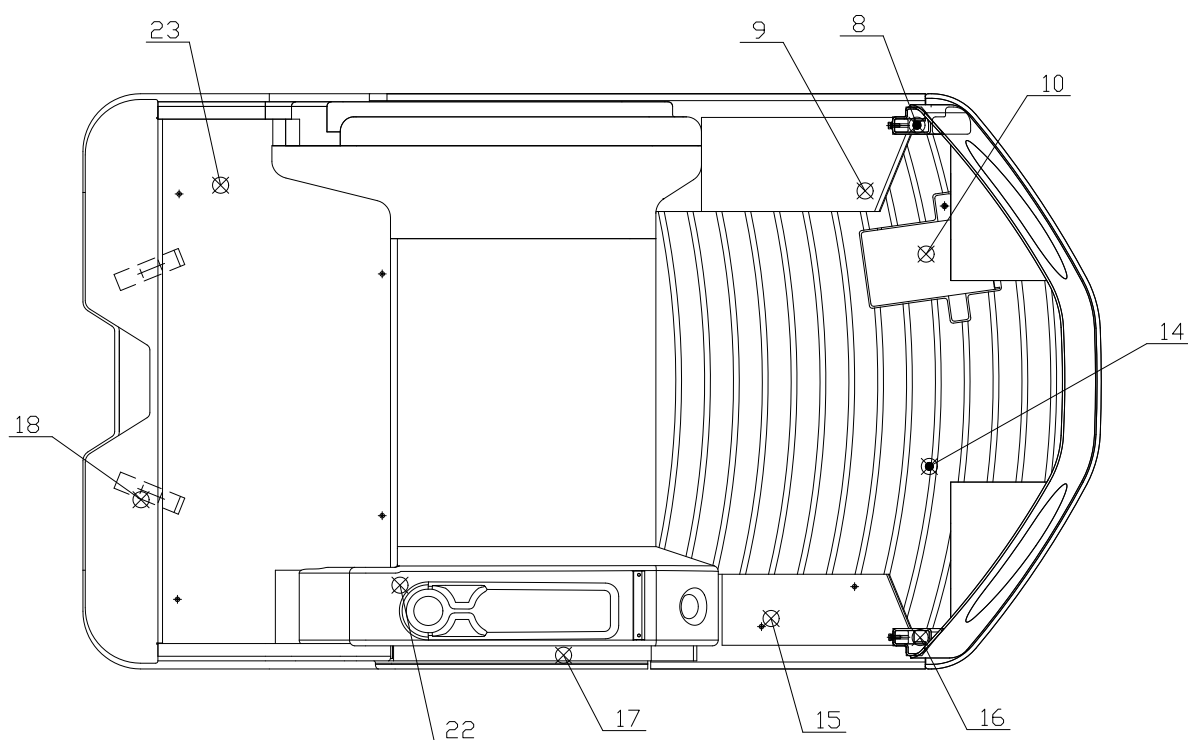
Electric towing tractor is front wheel steering and rear wheel drive. It is mainly composed of five parts: truck body system, drive system, steering system, control system and electrical system.

### 1 Truck body system

The truck body system consists of frame, instrument frame assembly, traction pin, and front and rear floor.

The frame is welded with steel plate, the instrument frame is welded with steel plate, and is fixed on the frame with bolts. The instrument frame is equipped with display meter, key switch and etc. The controller is installed at the rear of the frame. Water washing is strictly prohibited here.





1.Instrument mask

2. Frame

4.Cover plate

8.Right front support leg plug

9. Right pedal

10.Pedal

14.Pedal pad

15. Left pedal

16. Left front  
support leg plug

17.Door assembly

18. Stop plate

22. Plastic housing

23.Back plate

25.Rubber pad

27.Guide plate

29.Rocket

30 Tightening bolt

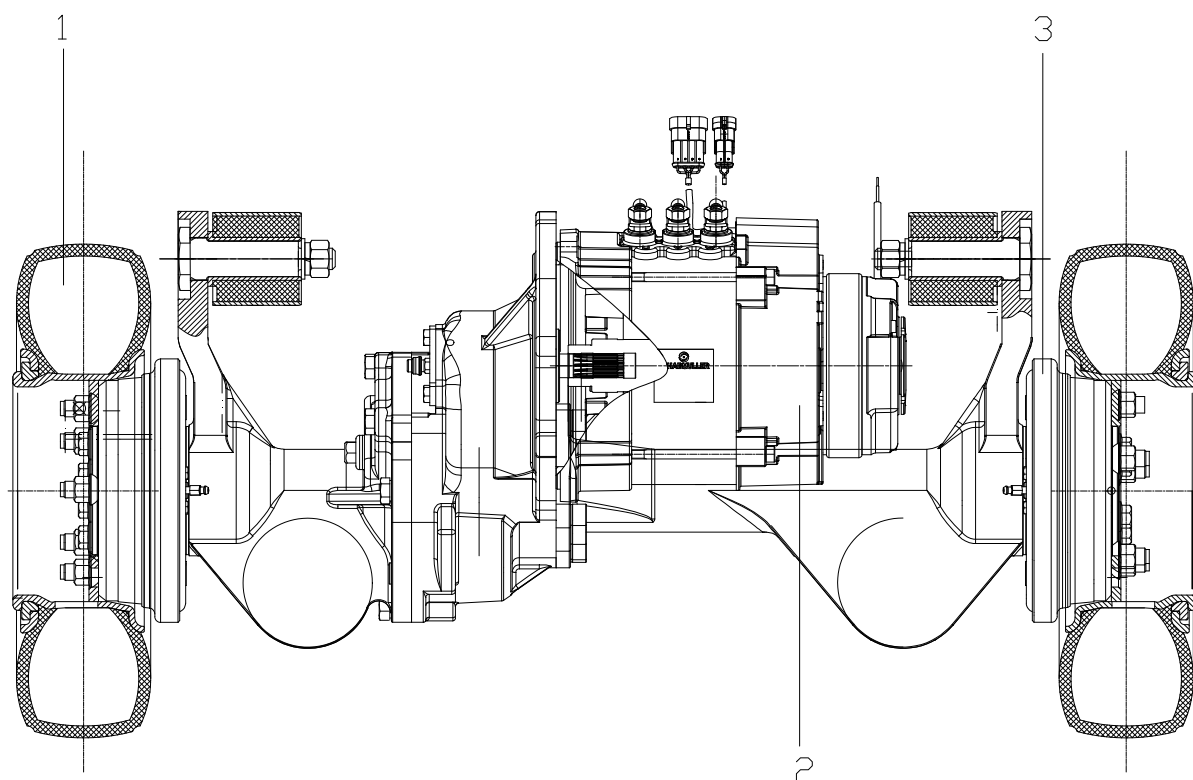
31. Stop block

## Truck body system

## 2 Drive system

The drive system is composed of AC traction motor, drive axle, wheel and so on, as shown in the figure below.

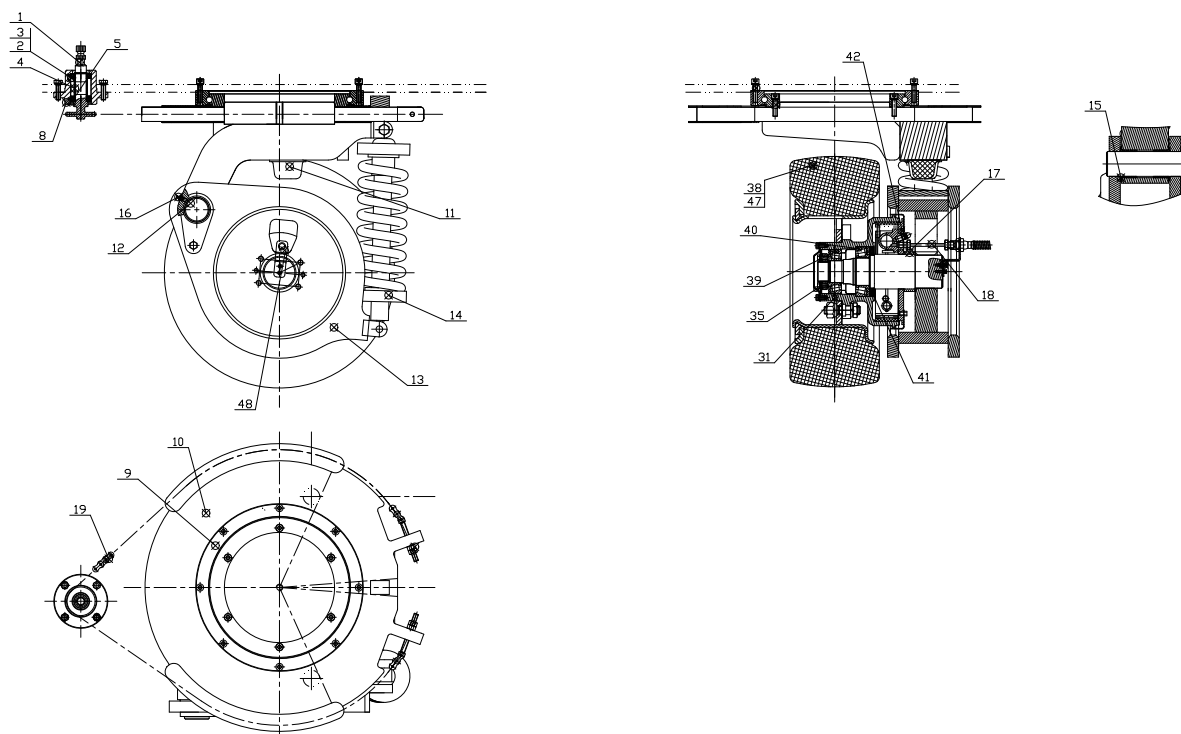
The gears and bearings in the drive axle are splash-lubricated and the lubricant grade is GL-5 85W/140.



1. Wheel      2.AC motor      3. Drive axle

### 3 Steering system

Steering system is composed of steering wheel, steering column, universal joint, and steering wheel assembly etc.



|                               |                    |                             |                |                        |
|-------------------------------|--------------------|-----------------------------|----------------|------------------------|
| 1. Minor sprocket             | 2. Bearing         | 3. Check ring               | 4. Spacer bush | 5. Check ring          |
| 8. Minor sprocket seat        | 9. Pivotal bearing | 10. Large chain wheel assy. | 11. Shock pad  | 12. Shaft pin assembly |
| 13. Steering bracket assembly | 14. Damper         | 15. Bush                    | 16. Oil cup    | 17. Base plate         |
| 18. Front brake oil tube      | 19. Chain          | 31. Hub                     | 35. End cap    | 38. 轮胎 Tire            |
| 39. Bearing                   | 40. Bearing        | 41. Oil seal                | 42. Brake      | 48. 支架 Bracket         |

#### Turning wheel assembly

Turning wheel assembly has the merits of small turning resistance, small adverse impact, large angle transmission ratio, flexible shift, light weight and easy installation.

Turning wheel bearing should replace the lubricating grease periodically, remove the bearing to clean, and add general purpose lithium base grease for automobile into the wheel hub appropriately, and adjust the bearing tension. The adjustment method is: tighten the fasten nut until the front wheel can not rotate, then loose the fasten nut for 1/6-1/8 circle. The turning chain should be cleaned periodically, add oil for lubricating, and add general purpose lithium base grease for automobile to every joint of the chain.

When the rated traction weight of the tractor is different, the steering tires used are different.

When the tractor's rated traction weight is 6t~8t, the pneumatic tire is used for steering tire; when the traction weight of tractor is 9t~10t, the solid tire is used for steering tire.

## 4 Electrical system

The vehicle's electrical system uses 48V, 24V lighting, double wire circuit, and all circuits are not grounded. The electrical system includes batteries, motors, controllers, accelerator, instrument, headlights, turn signals, brake lights, horn and other equipment.

### 4.1 lead-acid battery

The battery is made up of positive plate, negative plate, separator, battery jar, and battery lid. The positive plate is tube-shape, negative plate is pasted type. The separator is of the microporous type. The battery and lid are heat-sealed. All battery cells connected by welding, there are 24 cells.

#### Battery weight and dimension

| Model<br>Weight (kg) | QDD60/70-XD2<br>QDD60/70-XD3 | QDD80/90-XD2<br>QDD80/90-XD3 | QDD100-XD2<br>QDD100-XD3 | QDD70/80/90-XD2-L<br>QDD70/80/90-XD3-L |
|----------------------|------------------------------|------------------------------|--------------------------|----------------------------------------|
| Allowable lightest   | 504                          | 560                          | 685                      | 685                                    |
| Allowable heaviest   | 588                          | 588                          | 720                      | 720                                    |
| Dimension (mm)       | 830×414×627                  | 830×414×627                  | 830×630×627              | 830×630×627                            |

#### Precautions for Battery Use:

##### 1. Battery maintenance

It is important that the battery be properly charged in time, which will affect vehicle performance and battery life.

Over-discharge and over-charge will reduce battery life.

If there is abnormal situation such as odor, too fast electrolyte drop, high electrolyte temperature, please contact the agent or Hangcha after-sales service.

##### 1.1 Maintenance precautions

(1) Maintenance personnel must undergo rigorous training.

(2) Never connect the battery's positive and negative terminals to each other, as this may cause a spark, fire or explosion. Fireworks, mobile phones and electronic products are strictly prohibited.



(3) Maintain and replace batteries and charge in designated well-ventilated areas, and place fire and power warning signs in conspicuous places.

(4) Check the electrolyte level daily. Do not use the truck when the electrolyte volume is low. Fill the distilled water (after charging) and always keep the electrolyte level at the specified height.

(5) The specific gravity of electrolyte was measured weekly.

(6) Make sure the battery surface is clean and dry. The connection terminals should be kept clean and dry. Surface area water and dirt can cause automatic discharge.



(7) Tighten the vent cap and clear the small holes to prevent dust from entering the electrolyte.

(8) Measures in winter: Maintain a good charging environment. Do not park the truck out in the cold or in the freezer for long time especially after the battery is used, it is forbidden to put it in a low temperature environment below 0 °C.



#### Warning

1. It is forbidden to place metal components and any other objects on it,

and it is forbidden to connect the two poles of the battery to avoid short circuit, spark, or even explosion.

2. The electrolyte contains sulfuric acid, which is highly corrosive. If it comes into contact with the body, it may cause burns. Wear goggles, rubber shoes and rubber gloves when handling. Contact with clothing: take off immediately. Contact with skin or eyes: flush with running water for 15 to 20 minutes. Accidental ingestion: drink plenty of water and see a doctor immediately.

3. Explosive gases are generated inside the battery, smoking, flames and sparks are prohibited. Mobile phones and other electronic products are prohibited. Otherwise, the battery will explode.

4. Use a damp cloth when cleaning (no dry cloth or fabric) to prevent static electricity.

### 1.2 Daily, weekly, monthly, long-term storage maintenance

| Time  | Content                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Daily | <ol style="list-style-type: none"> <li>1. After the battery is discharged, it needs to be charged in time.</li> <li>2. Check the electrolyte level. When the electrolyte level is low, add distilled water to the specified liquid level (after charging). If it is too high, it should be sucked out</li> <li>3. Check if the vent cap is damaged.</li> <li>4. Keep the battery surface clean and tidy.</li> <li>5. Check whether the appearance is deformed, whether the surface is oxidized, stripped, whether the installation position is offset, whether the box is damaged or not.</li> </ol> |

| Time              | Content                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Weekly            | <ol style="list-style-type: none"> <li>1. The specific gravity of the electrolyte is tested and recorded.</li> <li>2. Check if the small hole of the vent cover is blocked and dredged to prevent dust from falling into the battery.</li> <li>3. Check if the battery stud bolt connection is loose (use torque wrench, torque is 25Nm).</li> <li>4. Check if there is any fluid in the box and handle it.</li> </ol> |
| Monthly           | <ol style="list-style-type: none"> <li>1. Check whether the battery stud bolt is oxidized, whether the battery socket is damaged or deformed, or there is foreign matter.</li> <li>2. Equalizing charge is performed once a month.</li> </ol>                                                                                                                                                                          |
| Long-term storage | The battery should be stored in a dry, ventilated place. Before storing the battery, fully charge it, and then charge it once every 30 days.                                                                                                                                                                                                                                                                           |

## 2. Specific gravity detection and conversion

The specific gravity of the electrolyte is tested at least once a week.

### 2.1 Specific gravity detection

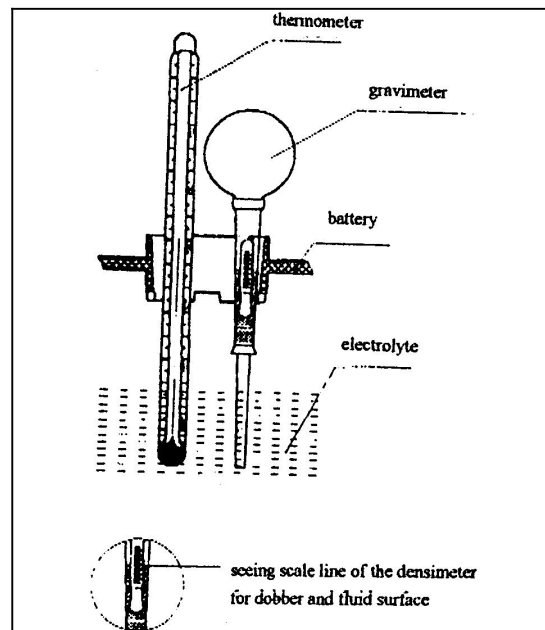
- (1) Use a thermometer to measure the temperature of the electrolyte.
- (2) Vertically insert the flexible tube of a pipette-type density meter into the electrolyte and squeeze the bulb. Electrolyte will enter the glass tube and the float will rise up.
- (3) Take the density reading



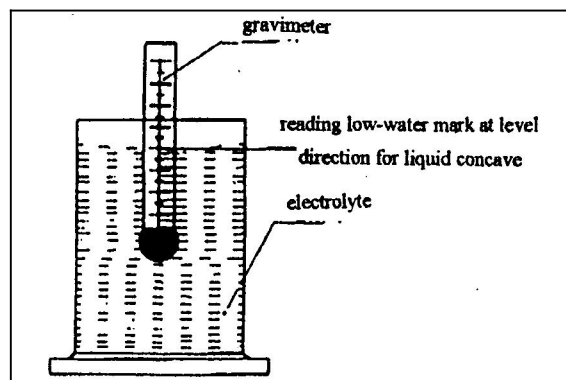
**Caution**

**Hold the density meter vertically so**

**that the float does not touch the sides of the glass tube.**



Use a hydrometer to measure the specific gravity of electrolyte.



### 2.2 Specific gravity conversion

Convert electrolyte density at the standard temperature of 30°C based on the following formula:

$$D_{30} = D_t + 0.0007 (t - 30)$$

Wherein:  $D_{30}$ —electrolyte density at 30°C

$D_t$ —measured electrolyte density at  $t^{\circ}\text{C}$ .

$t$ —

electrolyte temperature during density measurement.

The specific gravity of the electrolyte mentioned in the manual refers to the specific gravity at 30 °C.

Specific gravity of the electrolyte varies with temperature.

Electrolyte after full charge: specific gravity 1.28 g/cm<sup>3</sup>

Electrolyte after 80% discharge: specific gravity 1.14g/cm<sup>3</sup>

### 3. Check the electrolyte level and add distilled water

Do not use the truck when the electrolyte is low.

Check the electrolyte level once a day. When the electrolyte level is low, add distilled water to the specified surface height (should be replenished after charging).

#### Warning

1. Using a battery when the electrolyte level is low may lead to overheating and shorten the life span of the battery.
2. When the amount of electrolyte is not correct, it will cause the battery to overheat and even burn the battery and electrical system components.

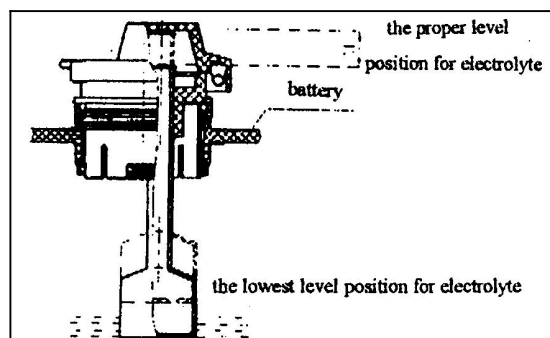
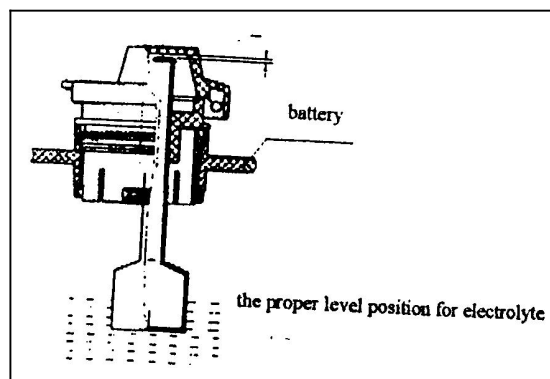
#### 3.1 Check electrolyte level

##### Battery without hydrometer

Electrolyte is 15 ~ 20mm higher than splashguard level.

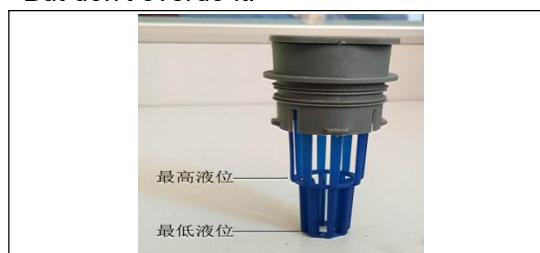
##### Battery with hydrometer

Measure electrolyte level by reading the vent cap hydrometer.



#### 3.2 Topping up distilled water

After the charging is completed, distilled water should be added, and the liquid level is 15-20mm higher than protective screening (that is, in the middle position of the screen). But don't overdo it.

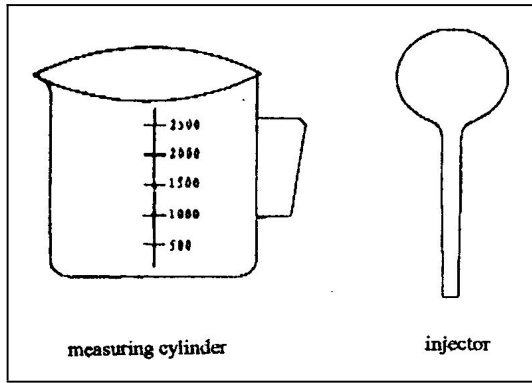
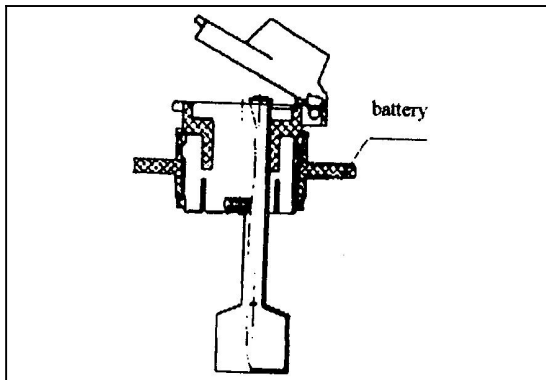


Procedures:

- (1) Wear protective eyewear, rubber boots and rubber gloves.
- (2) Fill a squeeze bulb pipette with a certain amount of distilled water.
- (3) Open all the vent or filler caps on the battery unit.
- (4) Inject distilled water into battery cells using squeeze bulb pipette.

##### Battery with hydrometer

Stop adding water when the red hydrometer float rises and a white line appears.



#### Battery without hydrometer

Stop adding water when electrolyte is 15-20mm higher than splashguard level.

(5) After topping up, tightly fasten the vent or battery caps.

(6) Use a damp cloth to wipe clean the surface of each battery cell.

(7) Use a squeeze ball pipette to draw off any excess water.

#### Warning

1. When adding distilled water, do not exceed the specified maximum level. Adding too much water may cause electrolyte leakage and damage the forklift when charging or discharging the battery.
2. Do not use a dry cloth or fabric to wipe the surface of the battery to prevent static electricity from causing an explosion.

### 4. Battery charging

#### Warning

1. The forklift should be charged as soon as possible after use. It must be charged in time before the battery is 20% left. Excessive discharge will shorten battery life.

2. Charge in a designated well-ventilated place, away from inflammable and explosive materials, and place a fire and electric warning sign in conspicuous places.

3. Open the forklift hood and battery vent cover while charging to completely release hydrogen. When charging the battery, it is forbidden to use an open flame, mobile phone or other electronic products to prevent explosion. Do not charge when thunder.

4. During the charging process, it is forbidden to suddenly turn off the power switch or unplug the battery, otherwise it will cause sparks and damage the plug and electrical components. Usually it is continuously and automatically filled.

5. After the charging is completed, distilled water should be added, and the liquid level is 15-20mm higher than protective screening (that is, in the middle position of the screen). But don't overdo it.

#### 4.1 Charger requirement and selection

##### 4.1.1 Charger

- (1) When the charger is in use, its casing needs to be reliably grounded.
- (2) Disconnect power when replacing fuse.
- (3) Only qualified professionals are permitted to disassemble the charger casing for testing or maintenance.
- (4) Do not rebuild or disassemble charger.
- (5) Take measures to prevent damage

caused by charger overheating in high temperature season. If necessary, suspend work temporarily.

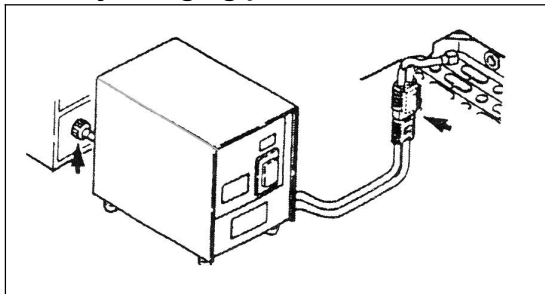
- (6) Never continuously charge multiple batteries, which will overheat the charger and may even damage it. After charging, let the charger rest for an hour before re-using it.

#### 4.1.2 Charger selection

Choose charger according to battery voltage and capacity (see parameter list). Generally, the charger current is selected according to the middle value of the battery capacity (1/10 to 1/7), that is, the current = (1/10 to 1/7) battery capacity. For example, the battery capacity is 630Ah, the charger current = (1/10 ~ 1 / 7) 630 = 63A ~ 90A, the choice of 70A-80A charger is most suitable.

Please use the Hangcha pure charger.

#### 4.2 Daily charging procedures



- (1) When the forklift meter shows 20% of the remaining power, it should be charged in time.
- (2) Turn off the forklift key switch and press the red emergency stop button.
- (3) Open the forklift cover and unplug the forklift cable from the battery socket.
- (4) Open the battery venting cover to release the explosive gas, and measure the temperature of the electrolyte. If it exceeds 45 °C, it needs to be naturally cooled to below 45 °C, and then charged. The electrolyte

temperature during charging should not exceed 55 °C.

- (5) Check if the charger plug and the battery socket are damaged. After checking the error, plug the battery into the charger plug. It is strictly forbidden to misconnect positive and negative poles.
- (6) Plug in the charger and press the charger's charging switch to charge.
- (7) After the charging is completed, the charging device is automatically powered off. Now disconnect the power of the charger and then unplug the charger.
- (8) Check the electrolyte level as required in the manual. If it is not enough, add distilled water (filled with Hangcha pure distilled water).
- (9) For those equipped with automatic water filling system, distilled water should be added according to the relevant parts of Operation and Maintenance Manual (Automatic Water Filling System of Battery (optional)).
- (10) Close the vent cover, clean the battery surface, and close the battery cover. Plug the forklift cable plug into the battery socket and the charging is completed.

#### 4.3 Equalizing charge

##### 4.3.1 Reason of equalizing charge

With time, the voltage, density and capacity of a battery tend to become unbalanced. The voltage and specific gravity of some cells increase more slowly compared with other cells when charging, and decrease at a faster rate when discharging.

Equalizing charge should be applied when

any of the following situations occur:

(1) The discharge voltage frequently falls below the cut-off voltage;

(2) The discharge current is frequently too high;

(3) The battery is not charged in a timely manner after discharge is complete;

(4) The battery frequently gets insufficient charge, or hasn't been used for a long time;

#### 4.3.2 Equalizing charge method

Please follow the instructions of the charger.

Set to equalizing charge mode and charge.

Equalizing charge is performed once a month.

## 4.2 Lithium battery

### 1 Safety warning

- 1.1 Electrodes short circuit is prohibited, do not heat the battery, or throw the battery into water;
- 1.2 Fully charge the new battery before use;
- 1.3 Do not mix different brands, different types, different capacities, and old and new batteries;
- 1.4 The battery combination should not be used in the case of inconsistent capacity saturation of each single cell to avoid overcharge and over discharge of the cell;
- 1.5 Battery charging method should use professionally configured charging equipment, do not use charging equipment at will;
- 1.6 If the battery occurs odour, heating, discoloration, deformation or any abnormal phenomenon during use, storage or recharging, immediately remove it from the equipment or charger and stop using it. Please immediately contact our technician department or after-sales department;

### 2 The following operations are strictly prohibited

- 2.1 Do not put the battery near heat source, dangerous goods and hazardous material, such as fire, heater, corrosive chemical or hazardous machinery; store the batteries in cool, dry and well ventilated places if not used;
- 2.2 Do not immerse the battery in water or any other liquids, which may cause personnel injury or property loss;
- 2.3 Electrodes short circuit is prohibited. Avoid any metal or other conductive objects touching the positive and negative terminals of the battery. This operation may result in personal injury or property damage;
- 2.4 It is forbidden to transport or store batteries together with metals such as tools, cables, etc.
- 2.5 Do not hammer, throw or step on the battery;
- 2.6 Do not connect the battery with the battery of other type in series or in parallel; this operation may result in personal injury or property damage;
- 2.7 Do not operate the whole power system with lithium ion battery protection circuit board or battery management system in series or in parallel; This operation may result in personal injury or property damage. If needed, contact our technical department for correct technical support;
- 2.8 Do not let children or other person lacking of safety knowledge have access to the equipment. This operation may result in personal injury or property damage;
- 2.9 Do not disassemble, squeeze, puncture, storage at elevated temperature or bake the batteries. Violent vibration, impact and falls from heights should also be avoided. This operation may lead to security risks;
- 2.10 Do not operate the equipment in a location where static electricity and magnetic field is strong. Or it may damage safety protection device, and lead to potential safety hazard;
- 2.11 Do not recharge without proper protection device (lithium ion battery circuit board protection, BMS etc.) or with improper charging device (charger or DC power). This operation may result in personal injury or property damage.

### 3 Basic terms and environmental conditions for lithium ion battery

#### 3.1 Basic terms and definitions

##### 3.1.1 Nominal voltage

A suitable approximate value used to indicate the battery voltage;

### 3.1.2 Rated capacity

The capacity value specified by the manufacturer when the battery is fully charged under specified conditions;

### 3.1.3 Actual capacity

The capacity actually discharged when a fully charged single cell is discharged at a specified current under specified conditions:

### 3.1.4 Overdischarge

The state when the battery voltage is lower than the discharge cutoff voltage is generally regarded as the state in which the battery enters the overdischarge state, which generally refers to the state when the battery voltage reaches 0 V or even the voltage is negative;

### 3.1.5 Maximum charging voltage

The charging voltage recommended by the manufacturer that should not be exceeded during charging;

### 3. 1.6 Overcharge

The state when the battery voltage is higher than the maximum charging voltage is usually regarded as the battery entering the overcharge state;

### 3.1.7 Overcurrent

The battery's operation and charging current are higher than the maximum allowable operation of the manufacturer, and the state of charging current is usually considered as the battery entering the overcurrent state;

### 3.1.8 Normal temperature charge retention and capacity recovery capability

The battery is discharged at 0.3C after 28 days storage at  $20^{\circ}\text{C}\pm 5^{\circ}\text{C}$ . The ratio of discharge capacity to rated capacity is called normal temperature charge retention capability;

Then charged at 0.3C at  $20^{\circ}\text{C}\pm 5^{\circ}\text{C}$ , and then discharged to the termination voltage. The ratio of discharge capacity to rated capacity is called capacity recovery capability.

### 3.1.9 Charge termination current

The current at which the battery terminates charging during a specified constant voltage charge;

### 3. 1. 10 State of charge

The amount of electricity stored in the battery is generally expressed as a percentage. For example, 30% SOC means that the battery currently stores 30% of the nominal capacity. SOC is the abbreviation of State Of Charge, and the battery (group) is charged state;

### 3.1.11 Explosion

The battery casing is broken, and solid matter inside is flushed out of the battery and makes a sound;

### 3.1.12 Fire

Open fire appears in the battery case;

### 3.1.13 Leakage

The internal components of the battery (electrolyte or other substances) leak out of the reservoir;

### 3.1.14 Battery Management System (BMS)

An Electronic and electrical system monitors battery voltage, current, and temperature and communicates with other systems such as chargers, loads, thermal management systems, etc. through a series of control actions to optimize battery performance. BMS is the abbreviation of Battery Manager System.

### 3. 1.15 CAN communication: Control Area Network;

3.1.16 Charging mode CC/CV: CC mode is constant current charging mode, and CV mode is constant voltage charging mode.

### 3.2 Basic environment in use

3. 2.1 Charging temperature: 0℃~45℃; Discharge temperature: -20℃~50℃; the best use temperature is 15℃~35℃;

3.2.2 When the ambient humidity HR is less than 85%, the battery should be kept as dry as possible;

3.2.3 When charging the battery, try not to fully charge or discharge, thus increase the battery life.

## 4 Cautions for use and maintenance of lithium ion battery

### 4. 1 Basic requirements for battery use

4.1.2 Under any circumstances, when testing or using the battery, the terminal voltage of the single battery must be tested in real time. It is strictly forbidden to test the battery pack in series without a management system or a protection board to avoid overcharging or overdischarging of the battery;

4.1.3 The new battery is generally only 50% charged. Please do not use it for a long time before the BMS and charger are commissioned, so as to avoid the truck being stopped due to insufficient battery power during use;

4.1.4 Battery management system: In order to ensure the safe and effective use of the battery and maximize the service life of the battery, the lithium battery product should be equipped with a dedicated power lithium battery management system (BMS) and a dedicated lithium battery charger, when a small number of small capacity batteries are used in series and in groups, you can also use a reliable lithium battery protection board. The Battery Management System (BMS) is as follows:

|                                   |                                         |        |
|-----------------------------------|-----------------------------------------|--------|
| BMS<br>parameter<br>configuration | Overcharge protection voltage           | 3.75V  |
|                                   | Maximum charging current                | 200A   |
|                                   | Overcharge release voltage              | 3.67 V |
|                                   | Undervoltage release voltage            | 2.8 V  |
|                                   | Undervoltage protection voltage         | 2.7 V  |
|                                   | Over-discharge protection voltage       | 2.2 V  |
|                                   | Over temperature protection temperature | 60℃    |
|                                   | Over discharge release voltage          | 2.6 V  |

4. 1.5 In the process of using the battery, it is strongly recommended to adhere to the principle of shallow charge and discharge. The best performance is between 30% and 100% of the power. When the open-circuit voltage of single batteries drops to 3.0V, the actual charge is less than 10%. At this time, the battery pack should be charged in time;

4.1.6 When testing or using the vehicle, always pay attention to the remaining battery capacity of the battery pack, and avoid using the trailer to transport the vehicle for charging when the power is exhausted. In the process of trailer, auxiliary systems such as DC/DC (power supply for lighting, wipers, etc.), steering power, brake power, etc. are still consuming power. Trailer for a long

distance will also lead to battery overdischarge;

4.1.7 The high-voltage safety protection work of the battery pack must be well done. The drive main circuit and the low-voltage electrical circuit (including the vehicle body) must be properly isolated, and the reliable DC air circuit breaker and fast DC fuse should be selected;

4.1.8 It is strictly forbidden to separately draw power from the individual batteries in the battery pack to supply power to the low-voltage electrical equipment of the vehicle, so as to avoid the destruction of the consistency of the entire battery.

#### **4.2 Basic requirements for lithium ion battery installation**

4.2.1 The battery pack should be installed in the correct orientation. Do not reverse or reverse the installation.

4.2.2 Do not violently disassemble, and avoid personal and property losses.

#### **4.3 Basic requirements for lithium ion battery connection**

4.3.1 During the battery connection operation, be sure to pay attention to the correct port insertion;

4.3.2 Be careful during battery connection, avoid that the whole battery is reversed and shorted.

#### **4.4 Basic requirements for storage and maintenance of lithium ion battery**

The battery pack is stored in an incompletely charged state, typically around 40%. Product storage environment requirements are as follows:

4.4.1 Storage temperature: storage time <3 months, then stored at  $-40^{\circ}\text{C} \sim 60^{\circ}\text{C}$ , 40% SOC; storage time > 3 months, then stored at  $0^{\circ}\text{C} \sim 25^{\circ}\text{C}$ , 40% SOC;

4.4.2 Storage humidity: 2% RH ~ 90% RH. Storage within 85% RH is recommended.

4.4.3 Storage environment: The product should be stored in a clean, ventilated and cool environment, and avoid direct sunlight, high temperature, corrosive gas, severe vibration, mechanical shock and heavy pressure; away from heat source; altitude is less than 1500 meters, atmospheric pressure is 86kPa~ 106kPa.

#### **4.5 Basic requirements for lithium ion battery transportation**

4.5.1 During the transportation of the battery, it is necessary to avoid exposure to sunlight for a long time and rain;

4.5.2 During the loading and unloading process, the battery should be handled gently to prevent falling, rolling, and heavy pressure;

4.5.3 During the process of transportation and use, the battery should be protected from strong impact and excessive extrusion, so as to avoid battery case or internal structural damage;

4.5.4 During the process of transportation and use, the battery should take necessary protection against the positive and negative electrodes of the battery to avoid short circuit and fire.

#### **4.6 Preparation for lithium ion battery installation operation**

4.6.1 Please read the instructions such as the battery instruction manual, battery installation operation and maintenance manual provided by our company;

4.6.2 Strict insulation treatment must be performed on tools such as socket wrenches, fixed wrenches, and screwdrivers used for installation operations;

4.6.3 Wear anti-smashing shoes and insulated gloves when installing. Do not wear watches, metal bracelets, necklaces, etc.

#### **4.7 Daily maintenance**

- 1) There should be professionals when charging, make sure the plug and socket is well contacted, charging facility work normally, and each battery connections are well contacted. If abnormal, only charge after being repaired;
- 2) Check the vehicle dashboard before charging and discharging to ensure that all values are within the normal range;
- 3) When charging and discharging, avoid water or other conductive objects splash to the battery connector, for example, use when exposed to heavy rain. Before using the product, please read the product specification, instruction manual and use attentions to understand the use method and application range of the product. In the event of incorrect product use, incorrect connection of the circuit or the input power, load function and other parameters that do not conform to the performance parameters marked in the product specification are improper use. The company does not assume any responsibility for damage to products, loads and peripheral connections caused by improper use.

**Cautions:**

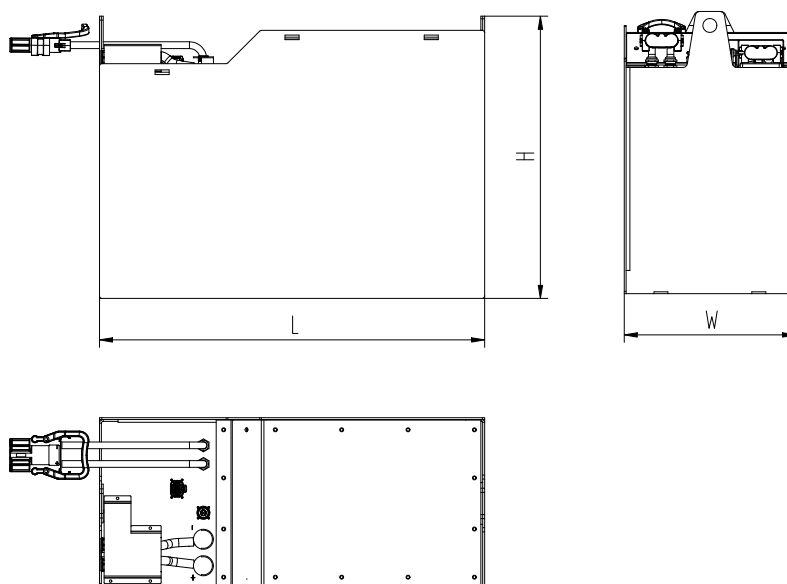
1. Charge the lithium battery immediately after per discharge to avoid battery loss;
2. Never place the battery near high temperature heat source, such as fire and heater etc.
3. Do not use the battery in a location where static electricity and magnetic field is great, otherwise the safety devices may be damaged, causing hidden trouble of safety;
4. Avoid using the battery under high temperature (direct sunlight) for a long time, otherwise, it may cause overheat of the battery or function invalid or service life being shortened;
5. Do not operate an electric vehicle equipped with a lithium battery in an environment where the temperature exceeds 55 °C; if the power battery system is below -25 °C, the power battery system needs to be self-heated to -10 °C to operate the vehicle.
6. Do not dismantle the battery box under any circumstance;
7. Never drop or knock the battery box etc.;
8. Short circuit of the battery is prohibited, never put any other object or tool to avoid battery short circuit;
9. Never wash battery box directly, prevent water getting into the battery and ensure the safety; it's forbidden to mix batteries of different brands, volumes and types;
10. Battery should be kept in a cool and dry place and avoid direct sunlight;

**Maintenance instruction:**

1. Do not change the battery setting parameter at will without the permission of the manufacturer;
2. If the lithium battery needs to interrupt or suspend charging, do not hot plug, avoid current arc to damage charging base;
3. Charging time below 0 °C will be longer than normal temperature charging time;
4. If the lithium battery is not used for a long time, it is necessary to charge and discharge the battery once a month.

## 5 Size and weight

| Item                                       | Long (L)<br>(mm) | Width (W)<br>(mm) | High (H)<br>(mm) |
|--------------------------------------------|------------------|-------------------|------------------|
| <b>QDD60-XD2-I</b><br><b>QDD60-XD3-I</b>   | 830              | 369               | 607              |
| <b>QDD70-XD2-I</b><br><b>QDD70-XD3-I</b>   | 830              | 369               | 607              |
| <b>QDD80-XD2-I</b><br><b>QDD80-XD3-I</b>   | 830              | 369               | 607              |
| <b>QDD90-XD2-I</b><br><b>QDD90-XD3-I</b>   | 830              | 369               | 607              |
| <b>QDD100-XD2-I</b><br><b>QDD100-XD3-I</b> | 830              | 369               | 607              |



### **Warning**

Weight and dimension of the battery has a great influence on the stability and bearing capacity of the truck travelling.

When installing or replacing battery, pay attention to the fixing position of the battery on the truck.

## 6.Lithium battery charging

This forklift truck is equipped with Titan can only charger.

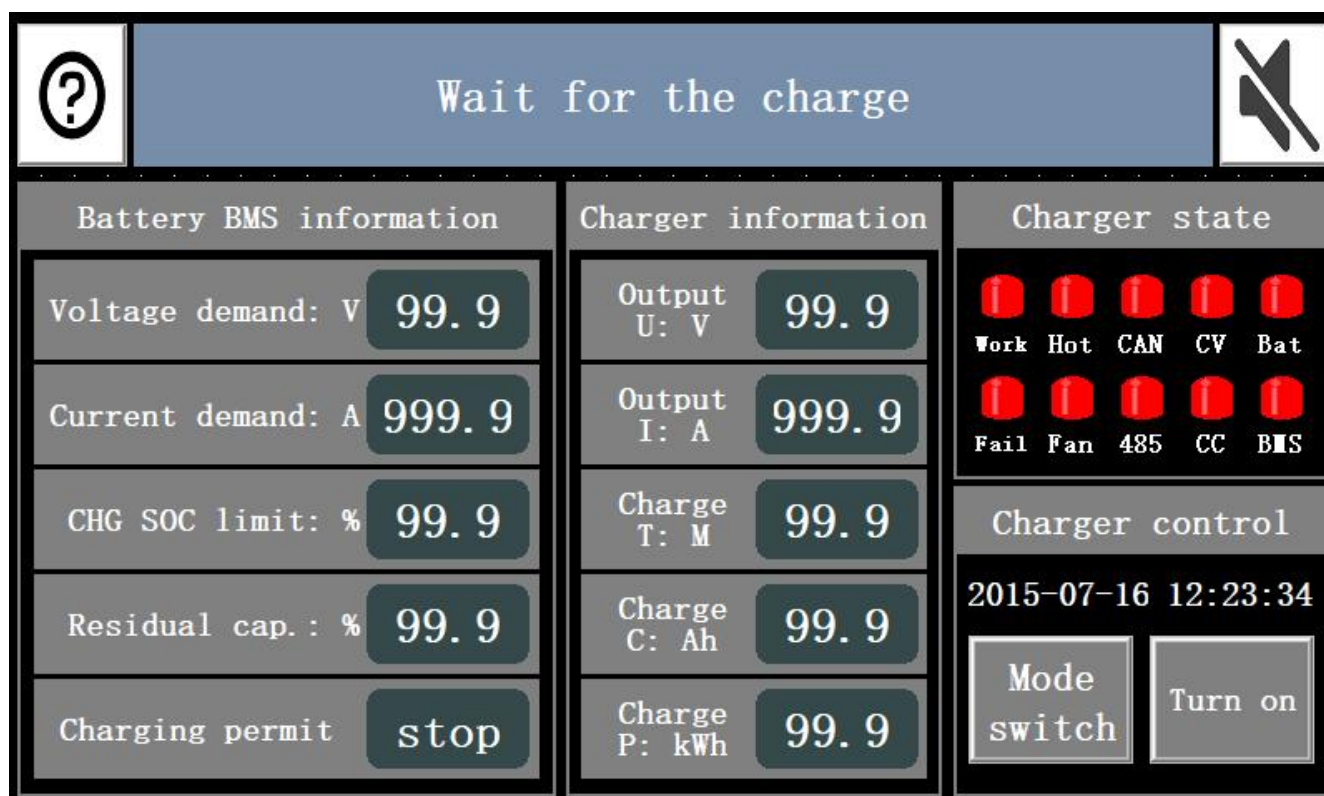
3.0 t-3.5t with SLC-80200 smart charger , 1.5t~2.5t with SLC-48200smart charger , 1.0t with SLC-48100smart charger

### Touch screen display interface

#### Start-up interface



#### Main interface



Click on the icon: , Enter the help description interface.

Click on the icon:  or , on-off alarm sound,  to turn on the alarm sound state,  to turn

off the alarm sound state.

The control operation requires password permission. **The default password is: 123456.**

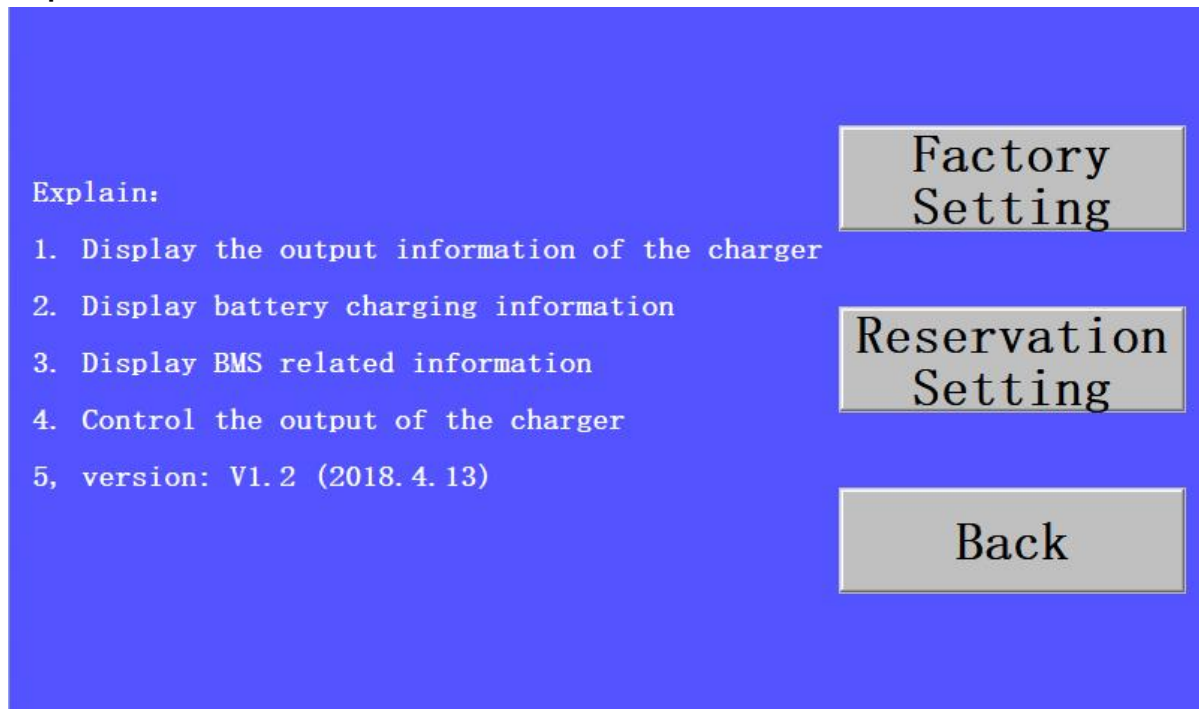
Click on the boot icon: toggle charging control to turn on or off.

Click on the purple part of the charging status information bar, enter into the single charging module information display bar.

Click on the battery BMS battery bar to enter the detailed BMS information display bar.

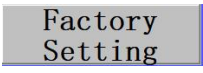
Click on the mode switch, you can perform the normal mode booking mode switch.

#### Help interface.

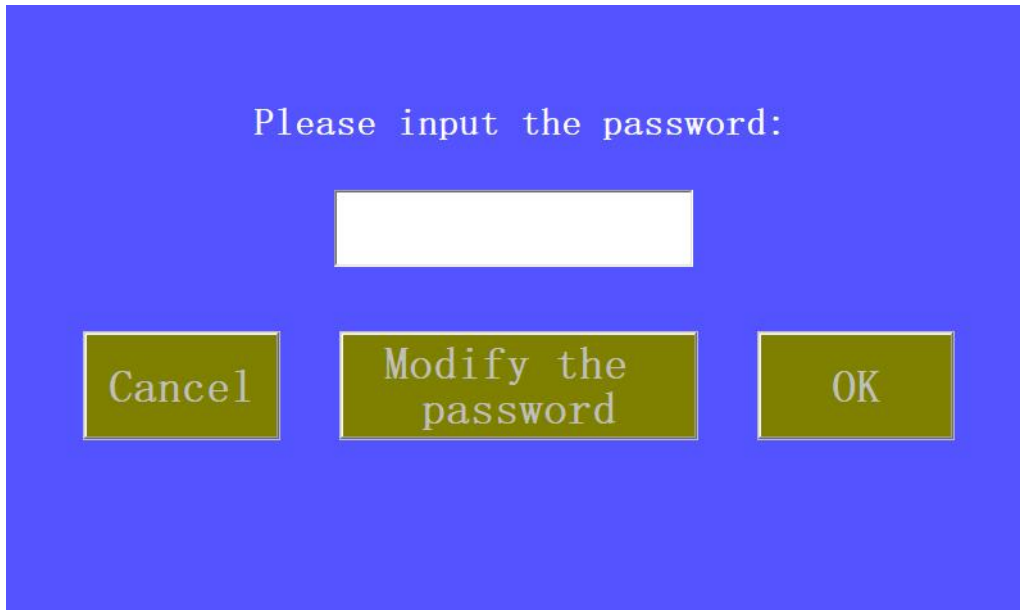


Click on the icon: , return to main interface.

Click on the reservation icon to set the time for booking mode. **The default password is 123456.**

Click on the icon: , enter the password input interface, enter the correct password into the factory parameter setting interface .

### Password entry interface (similar to operation password input interface)

A screenshot of a password entry interface with a blue background. At the top, the text "Please input the password:" is displayed in a light blue monospace font. Below this text is a white rectangular input box. At the bottom, there are three olive green buttons with white text: "Cancel", "Modify the password", and "OK".

Please input the password:

Cancel      Modify the password      OK

Enter the correct password in the password entry box. **The default password is 888888.**

Click on the icon: , return to help description interface.

Click on the icon: , enter the password modify interface.

Click on the icon: , if the password is entered correctly, enter the parameter setting interface, otherwise the password input error is prompted. Please enter it again.

### Password modification interface (similar to operation password modify interface)

A screenshot of a password modification interface with a blue background. The title "Setting the password modification" is at the top in a light blue monospace font. Below the title are three prompts with corresponding white input boxes: "Please enter the old password:", "Enter the new password first time:", and "Enter the new password second times:". Below these inputs is a message: "The old password is incorrectly entered, please reenter it!". At the bottom are two olive green buttons with white text: "Cancel" and "OK".

Setting the password modification

Please enter the old password:

Enter the new password first time:

Enter the new password second times:

The old password is incorrectly entered, please reenter it!

Cancel      OK

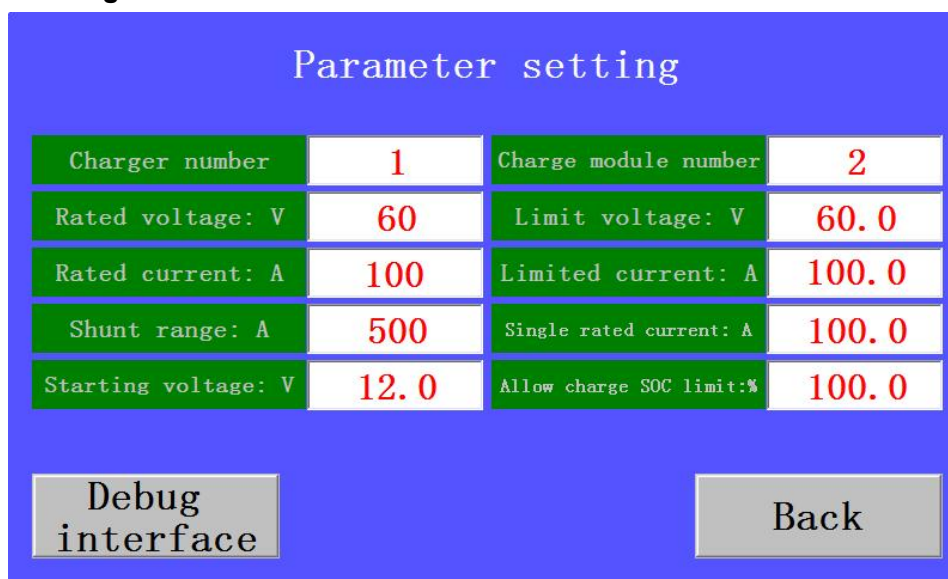
Enter in sequence according to the prompt: Enter the user's old password, enter the new

password for the first time and enter the new password for the second time.

Click on the icon: , if the user's old password is entered correctly, the first time the new password is entered and the second time the new password is entered, the modification is successful. Otherwise, the prompt modification fails. Please re-enter.

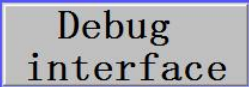
Click on the icon: , Return to the password entry interface.

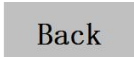
### Parameter setting interface



The screenshot shows a 'Parameter setting' window with a blue background. It contains a table with two columns of parameters. The first column has green headers and white values, while the second column has green headers and red values. At the bottom, there are two buttons: 'Debug interface' and 'Back'.

| Parameter setting   |      |                           |       |
|---------------------|------|---------------------------|-------|
| Charger number      | 1    | Charge module number      | 2     |
| Rated voltage: V    | 60   | Limit voltage: V          | 60.0  |
| Rated current: A    | 100  | Limited current: A        | 100.0 |
| Shunt range: A      | 500  | Single rated current: A   | 100.0 |
| Starting voltage: V | 12.0 | Allow charge SOC limit: % | 100.0 |

Buttons:  

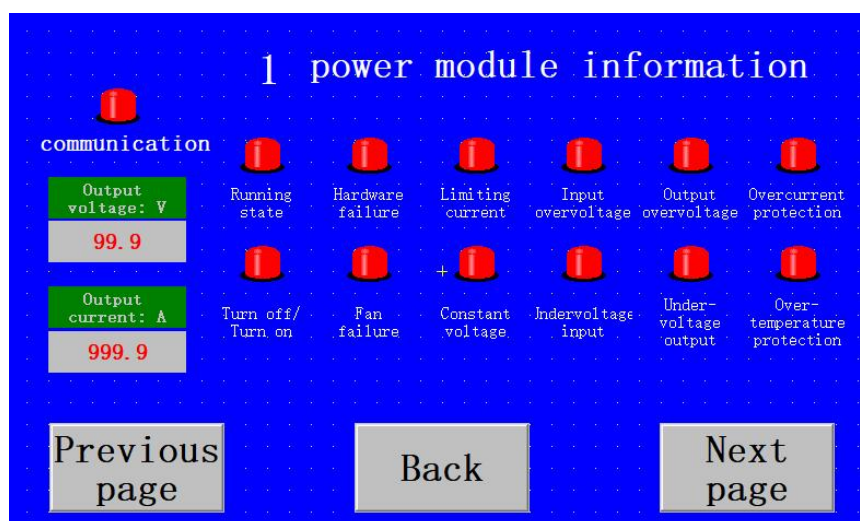
Click on the icon: , return to the help description interface.

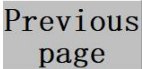
Parameter setting information: rated voltage, rated current and shunt range are related to machine hardware, and must not be arbitrarily modified after the factory.

Consult the manufacturer if the above parameters need to be modified. The charging machine number is easy for the user to distinguish, and the user can set it at will.

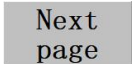
Debug interface for the factory to adjust the test, users can not operate at will.

## Power module information display interface



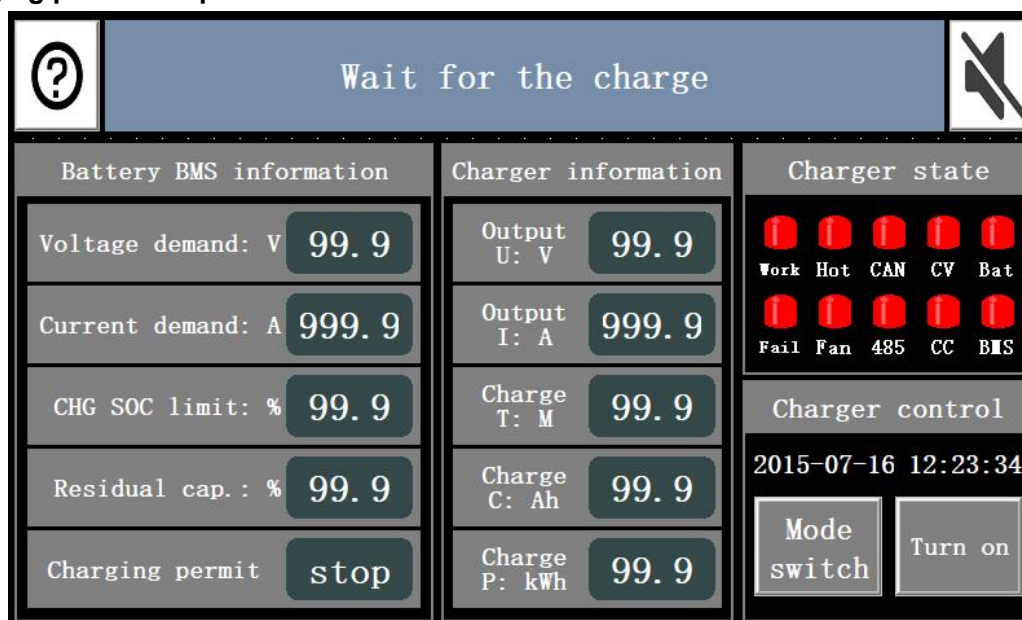
Click on the icon: , switch module information backward.

Click on the icon: , return to the main interface.

Click on the icon: , switch module information forward.

Display single power module output voltage, output current, various operating conditions.

## Charging process explanation



The charging step:

1. Choose "turn on" charging control mode. The "CAN" and "485" indicator lights are bright green.
2. DC charging gun and battery connection is normal.
3. "Residual capacity" is less than "allowed to charge the SOC limit" to start charging.
4. "Battery" indicator light is bright green (charging machine detected the battery voltage, this

light), "BMS" indicator light green.

5. The "working" light is bright green. When the "output voltage" is similar to the "battery voltage", the charging motor outputs the relay to absorb and the charging machine officially begins to charge the battery. At this point, "output current" and "output voltage" will be output according to "current demand" and "voltage demand".

6. BMS charging complete, send charging termination command, charging motor end charging.

7. During the charging process, charging motor failure ("overheated "and" abnormal "lights of charging motor information are all charging motor failures), BMS charging or" charging allowed "in a prohibited state, and artificial charging control in a" stop "state, all will terminate the charging.

\* In appointment mode, the charging machine will only work when the appointment time is set.

## User wiring instruction



AC input air switch power supply. The input is an Yida plug and the output is a charging gun.

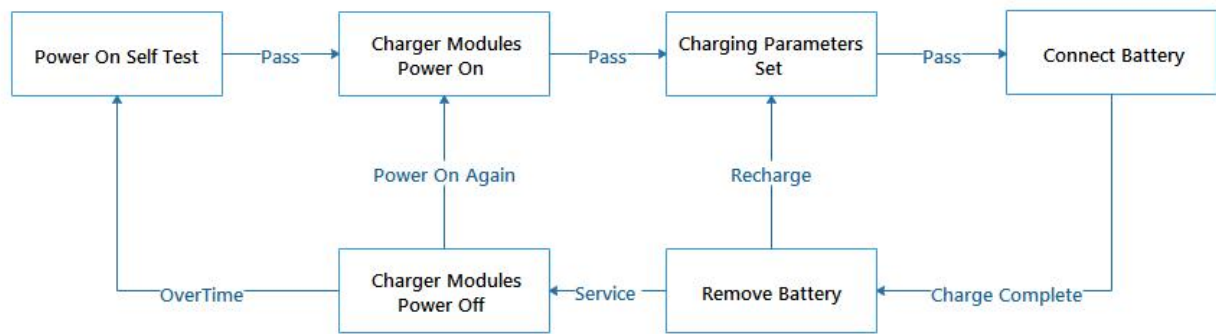
**Warning: PE protection of the earth must be connected, otherwise it may threaten life safety.**

### Operating instructions

#### 1.Cautions

- 1) Before the charger is turned on, it should be checked whether the battery box wiring is correct, whether there will be a short circuit or a positive and negative electrode connection. To avoid overloading the charging machine and burning components or lines.
- 2) It can be put into use only after the charger has no abnormal, overheating and other warning information.
- 3) For the safety of charging machines and equipment, it is forbidden to directly disconnect the battery switch under the condition of output current, except in case of emergency.

#### 2. Operation flow chart



### Concrete operation

#### 1) Power check

Make sure that AC input zero wire and DC output positive and negative electrode wiring are correct, and that there is no short circuit in input and output; The input voltage and frequency are normal; At any time in the state of electricity.

Offline online charging lines can not be connected at the same time.

#### 2) Power on

Check whether the AC fan wind direction is correct after the power is on.

The touch screen can be turned on normally, communication with the charging machine is normal.

#### 3) Access to the battery

The battery voltage level and current level meet the requirements of the charging machine.

Battery polarity is not reversed. Battery's fine. No abnormalities.

#### 4) Power off

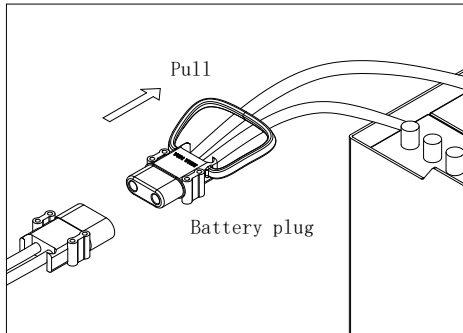
After the charging current and voltage drop to 0, exit the battery.

Turn off the AC input air switch.

### 4.3 Replace the battery

The battery box is welded with steel plates and fixed with tightening bolts. The battery box is removed from the side, when the battery needs to be replaced:

- ①Park the truck on a flat solid ground and power off;
- ②Open the cover and unplug the battery.



- ③Loosen the bolt and turn the limit block and rocker arm clockwise to move to the state shown in figure 2 below:



Figure1



Figure 2

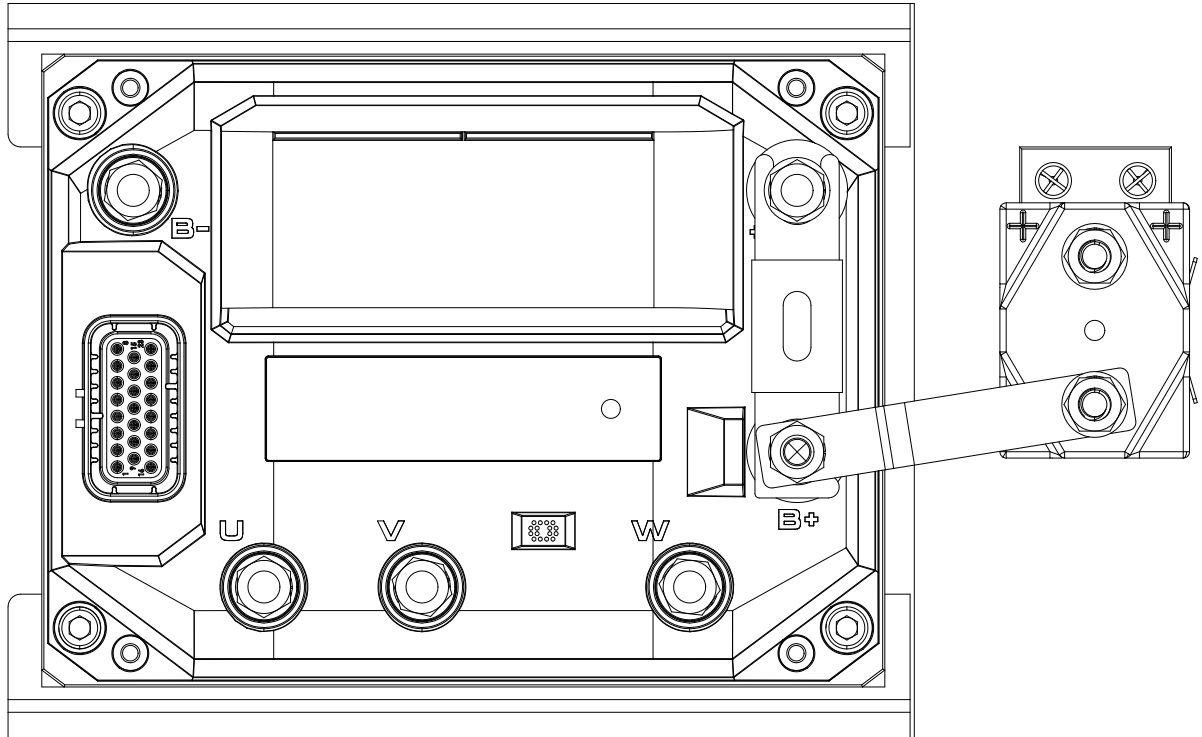
- ④Side remove the battery;
- ⑤Replace the battery, reinstall the battery, turn the limit block and rocker arm counterclockwise, move it to the state shown in Figure 1, tighten the bolt, plug in the battery, and close the cover.



#### Caution

- Before replacing the battery, make sure that the voltage, capacity, and size and weight of the new battery are equal to the vehicle specifications.
- Do not discharge the battery liquid waste at will, but dispose it according to local environment protection law.

## 4.4 Controller



### Summary:

International advanced closed-loop system and the advanced control technology are integrated in the controller. Faults displayed by codes improve the efficiency of maintenance. The peripheral components can also be detected by the meter, and the functions of the handheld unit can be realized by the meter.

#### (1) Drive motor

The drive motor adopts a three-phase AC variable frequency motor with high power conversion rate, no commutator and brush, and realizes maintenance-free.

#### (2) Safety and protection features

- ①Polarity protection of the battery
- ②Circuit connection protection
- ③All inputs are protected against connections errors
- ④Current overload protection
- ⑤It have detecting element, limit peak current
- ⑥Thermal protection

If the controller temperature exceeds 85°C, thermal protection will work; the maximum current

reduces in proportion to the thermal increase. Once the temperature exceeds 115°C, it will shut down automatically and give a warning.

If the motor temperature exceeds 145°C, thermal protection will work; the maximum current reduces in proportion to the thermal increase. Once the temperature exceeds 165°C, it will shut down automatically and give a warning.

#### ⑦ Battery overdischarge protection

When the capacity of battery is low, there will be a buzzer alarm, the maximum speed and current reduce greatly.

#### ⑧ External guard protection

Electric control is hermetical which can protect against dust and liquid into the body.

#### ⑨ Starting order protection

The drive request must be issued after the electric lock switch is closed and the vehicle is started.

⑩ When electrical elements are damaged, the control can protect itself to avoid more damage.

### (3) Operation features

① Close-loop control system make the vehicle speed follow accelerator, which make control easily whether low speed or high speed.

② Regeneration technology makes direction change more smoothly.

③ Three regenerative braking mode:

A. Regenerative brake from accelerator pedal release partly.

B. Regenerative brake from direction reverse

C. Regenerative brake from traveling downhill

Besides increasing driving security, it can recycle parts of electric energy, and prolong work hours of every shift.

⑤ Speed control during traveling downhill: motor speed lies on accelerator. If motor speed exceeds the setting value of accelerator, the controller will brake automatically, which gives an optimal protection of ramp.

### **Caution:**

— Before maintaining the controller, cut off the power. Connect a 10-100 ohm resistance to the positive and negative poles of controller to release residual voltage in the capacitor, or else there

might be an electric shock.

— Magnetic field and radiation of surroundings will effect on the inverter, controller may be damaged due to the long time effect. So keep away from magnetic field and radiation.

## **4.5 AC motor**

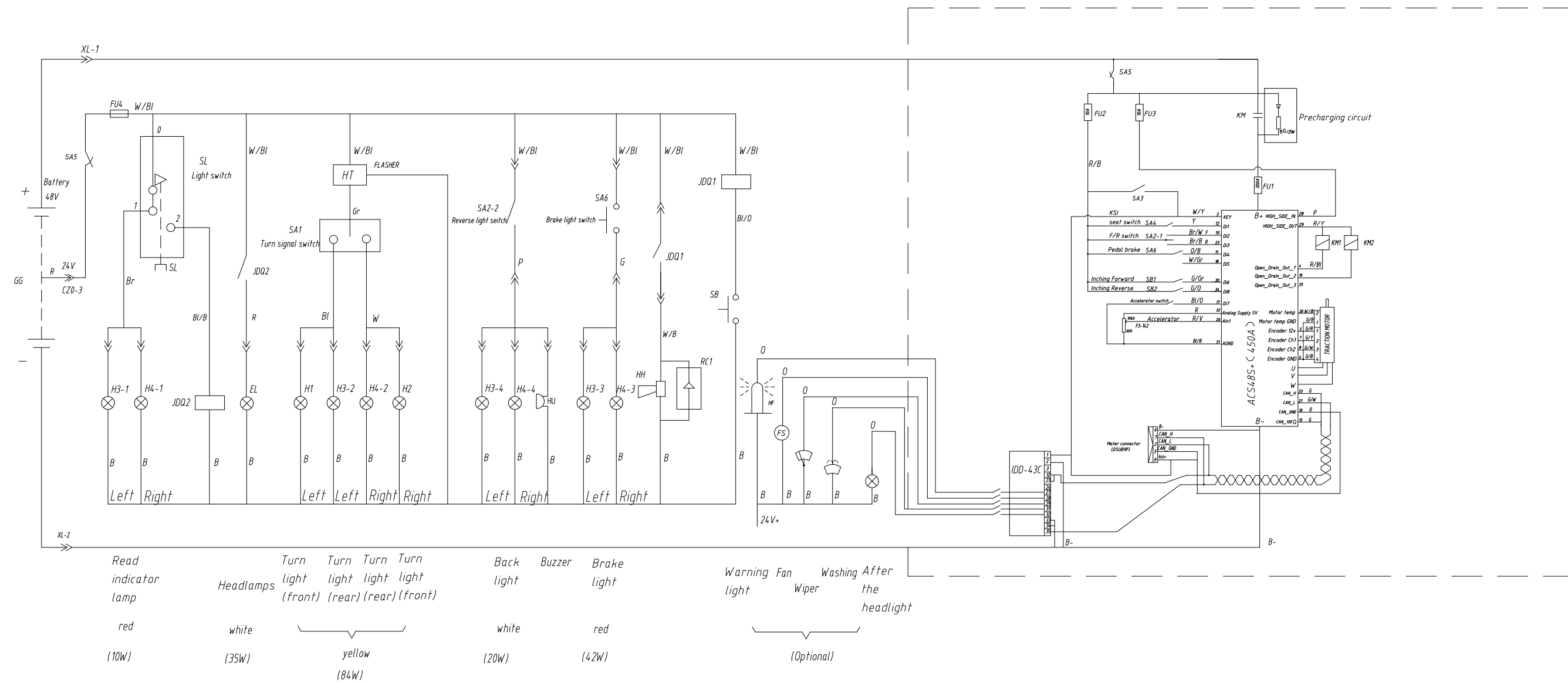
The traction motor adopts a three-phase AC variable frequency motor with high power conversion rate, no commutator and brush, and realizes maintenance-free.

Motor's work condition sensed by an encoder mounted in the motor. And send the signal to the logical card of controller to control the motor.

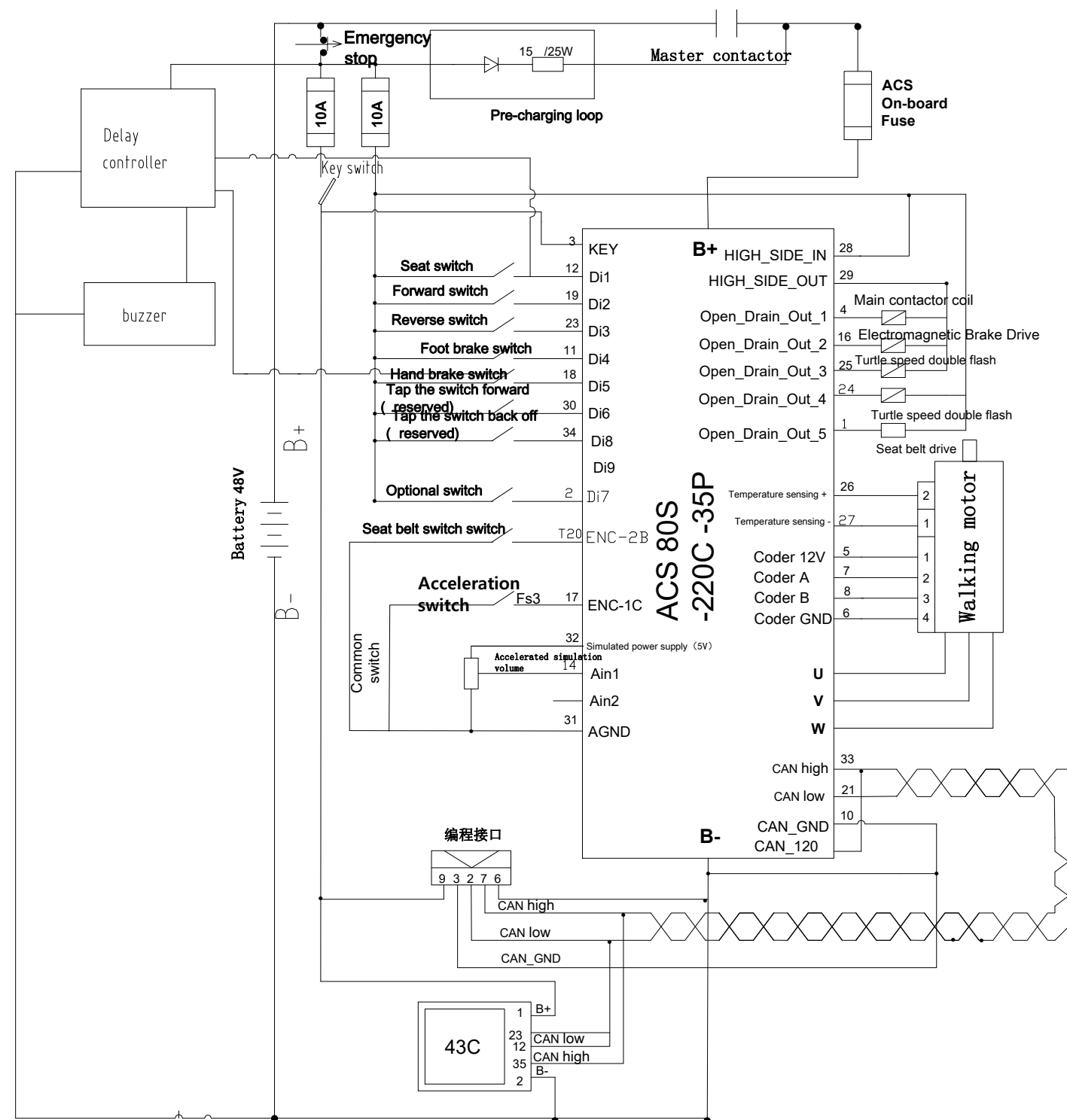
## **4.6 Cautions**

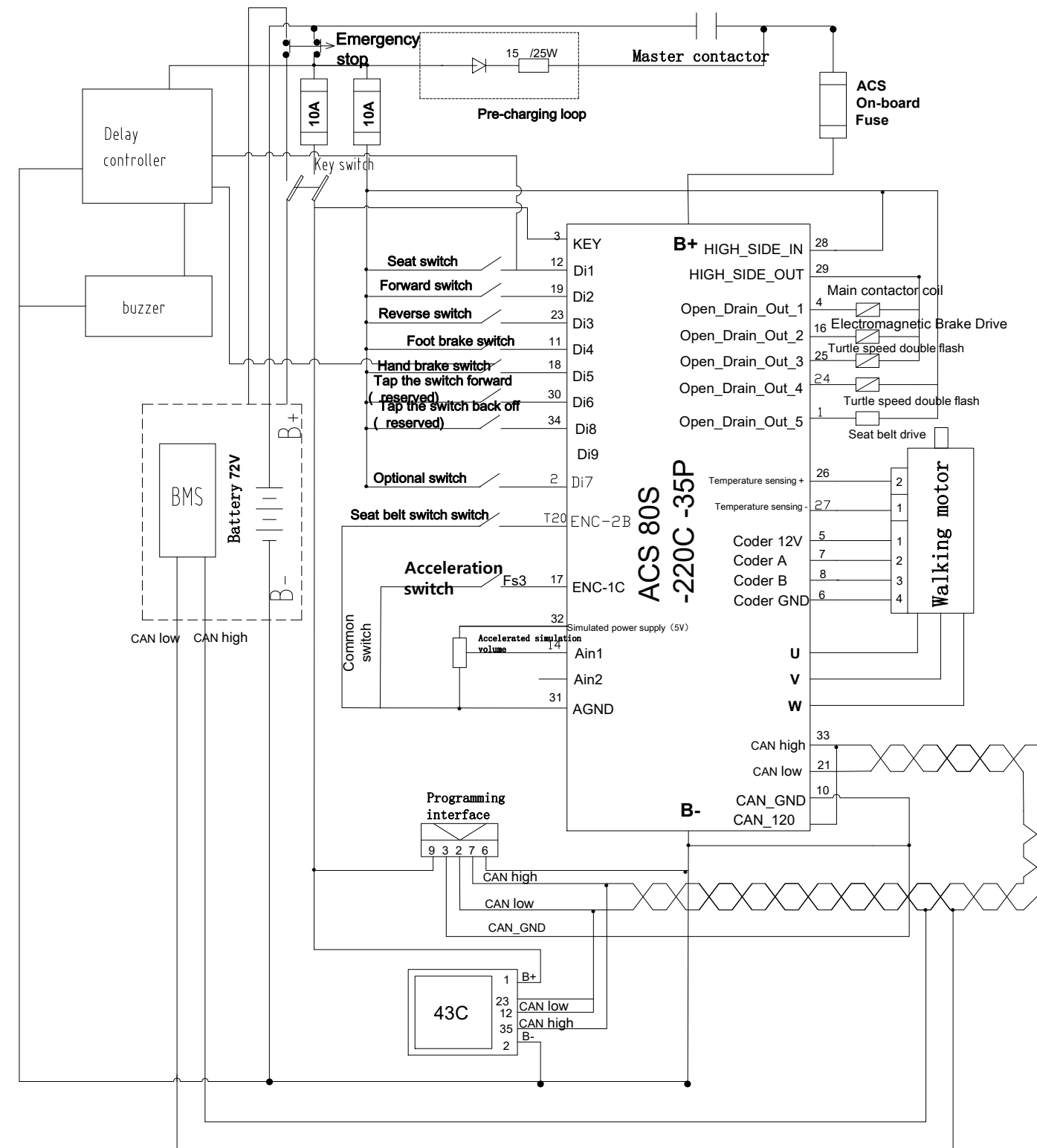
- (1) When charging the battery, first disconnect the switch, then disconnect the controller from the battery, otherwise the controller may be damaged.
- (2) Before maintaining the controller, cut off the power. Connect a 10-100 ohm resistance to the positive and negative poles of controller to release residual voltage in the capacitor, or else there might be an electric shock.
- (3) Magnetic field and radiation of surroundings will effect on the inverter, controller may be damaged due to the long time effect.
- (4) When the truck is running, it is forbidden to cut off the power (disconnect the power plugs), otherwise the controller may be damaged.
- (5) The fuses in the replacement circuit must be of the same specification

4.7 Electrical system principle



QDD60/70/80/90/100-XD2(-I)、QDD70/80/90-XD2-L





QDD60/70/80/90/100-XD3-I

## VIII Handling of common faults

### 1 Common fault and corrections

| Fault                    | Probable cause                                                                                    | Corrective action                                                                                                                                                      |
|--------------------------|---------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Rear axle noise          | Bearing wear or loose                                                                             | Repair or replace severe wear or loose bearing                                                                                                                         |
|                          | Severe gear tooth or shaft keyway wear makes overlarge clearance                                  | Periodic noise is individual tooth damage, you need replace gear                                                                                                       |
|                          | Tooth surface metal spalling or tooth rupture                                                     | Sudden crash in work are tooth fracture, you need dismantle the transmission box to check to avoid parts damage                                                        |
|                          | Differential gear, half shaft inner end or half shaft keyway wear of loosen                       | Noise caused when turning, it may be overlarge back lash between differential planetary gears, or half shaft keyway wear, please repair if serious.                    |
|                          | Bolt looseness                                                                                    | Screw down bolt or replace.                                                                                                                                            |
| Rear axle heating        | Small backlash of driving gear and driven gear or over tight bearing. Or insufficient lubrication | First check lubricating oil quantity and quality, add or replace if necessary. And then check driving gear and driven gear backlash or driving bearing preload degree. |
| Heavy steering           | Straight pipe bended                                                                              | Check steering shaft and correct                                                                                                                                       |
|                          | Return bearing damage for oil lack                                                                | Clean, add oil grease to replace damaged spare parts                                                                                                                   |
|                          | Chain is too tight                                                                                | Adjustment of chain tightness                                                                                                                                          |
|                          | Pressure is low                                                                                   | Inflate to the specified value                                                                                                                                         |
| Insufficient brake force | Water or oil on linings                                                                           | Clean or replace                                                                                                                                                       |
|                          | Uneven wear or contact of linings                                                                 | Grind or replace                                                                                                                                                       |
|                          | The gap between the brake pad and the brake drum is too large                                     | Adjust the gap                                                                                                                                                         |
|                          | Air in brake lines                                                                                | Bleed air, adjust                                                                                                                                                      |
| Brake dragging           | No free play of brake pedal                                                                       | Adjust                                                                                                                                                                 |
|                          | Incorrect brake shoe sliding                                                                      | Adjust                                                                                                                                                                 |
| Brake noise              | Lining surface harden or impurity on it                                                           | Repair or replace                                                                                                                                                      |
|                          | Warped back plates or loosed blots.                                                               | Repair or replace                                                                                                                                                      |
|                          | Brake shoes warped or improper install                                                            | Repair or replace                                                                                                                                                      |

|  |              |         |
|--|--------------|---------|
|  | Worn linings | Replace |
|--|--------------|---------|

## 2 Electrical control fault and corrections

### Controller fault code

Most faults in the electrical control system can be displayed through the multi-function meter, and fault information can be found based on the fault code displayed by the digital multi-function meter. If equipped with a handheld unit, it is easier to find the cause of the malfunction.

### Controller fault diagnosis

| Code | Type              | Fault                                                            | Reason                                                                                                                                                                       |
|------|-------------------|------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 101  | Application error | Accelerator pedal switch is activated when the key is turned on  | Accelerator pedal is activated when the truck starts.                                                                                                                        |
| 102  | Application error | Direction switch is activated when the key is turned on          | Direction switch(Forward/Backward) is activated when the truck starts.                                                                                                       |
| 103  | Application error | Forward/Backward direction switches are activated simultaneously | Forward/Backward direction switches are activated simultaneously                                                                                                             |
| 104  | Application error | Traction analog voltage error                                    | Over-limit accelerator pedal analog (less than 30 or larger than 2800)                                                                                                       |
| 105  | Application error | Traction switch error                                            | When the accelerator pedal switch is not activated, analog voltage is larger than 30%                                                                                        |
| 111  | Application error | CAN communication error                                          | CAN communications electrical failure, the error may be a wiring error, not connect the terminal resistance, the connection terminal breaks or communication unit is damaged |
| 114  | Application error | Low battery voltage                                              | Alarm when the power is less than 25%, travel slowly when the power is less than 15%                                                                                         |
| 115  | Application error | Startup procedure error                                          | Internal error occurred while starting                                                                                                                                       |
| 116  | Application error | Lift switch is activated when the key is turned on               | Lift switch is activated when the truck starts.                                                                                                                              |
| 117  | Application error | Pump switch 1 is activated when the key is turned on             | Pump switch 1 is activated when the truck starts                                                                                                                             |
| 118  | Application error | Pump switch 2 is activated when the key is turned on             | Pump switch 2 is activated when the truck starts                                                                                                                             |
| 119  | Application error | Pump switch 3 is activated when the key is turned on             | Pump switch 3 is activated when the truck starts                                                                                                                             |
| 120  | Application       | Pump switch 4 is activated when                                  | Pump switch 4 is activated when the                                                                                                                                          |

| Code | Type              | Fault                                            | Reason                                                                                                                           |
|------|-------------------|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
|      | error             | the key is turned on                             | truck starts                                                                                                                     |
| 121  | Application error | Pump analog voltage error                        | Over-limit pump analog (less than 10 or larger than 2800)                                                                        |
| 122  | Application error | Lift switch and speed lifter error               | When the lift switch is not activated, analog voltage is larger than 30%                                                         |
| 124  | Application alarm | Direction switch is activated when driver leaves | Driver leaves the forklift, but the direction switch is still activated, turn off the direction switch and this error disappears |
| 125  | Application error | Main contactor does not close                    | Main contactor does not close                                                                                                    |
| 301  | Traction alarm    | Low traction ACS temperature                     | ACS temperature is lower than -20℃                                                                                               |
| 302  | Traction alarm    | High traction ACS temperature                    | ACS temperature is higher than 80℃                                                                                               |
| 303  | Traction alarm    | Traction ACS temperature sensor error            | ACS temperature sensor is disconnected or short                                                                                  |
| 304  | Traction alarm    | Low traction motor temperature                   | Motor temperature is lower than -35℃                                                                                             |
| 305  | Traction alarm    | High traction motor temperature                  | Motor temperature is higher than 145℃                                                                                            |
| 306  | Traction alarm    | Traction motor temperature sensor error          | Motor temperature sensor is disconnected or short                                                                                |
| 307  | Traction alarm    | Traction encoder error                           | Motor speed encoder is disconnected or short                                                                                     |
| 308  | Traction alarm    | High traction ACS voltage                        | To 24V truck, voltage is higher than 36V; to 48V truck, voltage is higher than 68V; to 80V truck, voltage is higher than 98V     |
| 309  | Traction alarm    | Low traction ACS voltage                         | To 24V truck, voltage is lower than 18V; to 48V truck, voltage is lower than 24V; to 80V truck, voltage is lower than 60V        |
| 310  | Traction alarm    | Traction ACS use default parameter               | Traction ACS use default parameter, the error will disappear after restart                                                       |
| 311  | Traction alarm    | Traction power is reduced                        | ACS output power is reduced                                                                                                      |
| 312  | Traction alarm    | Traction calibration parameter error             | Calibration parameter error                                                                                                      |
| 316  | Traction alarm    | Traction current sensor error                    | Current sensor use default parameter                                                                                             |
| 317  | Traction alarm    | Traction outlet error                            | Outlet is disconnected or short                                                                                                  |

| Code | Type           | Fault                                                 | Reason                                                                                                                                                       |
|------|----------------|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 318  | Traction alarm | Traction other error                                  | Other error                                                                                                                                                  |
| 351  | Traction error | Traction ACS short or motor short                     | ACS short or motor U,V,W short                                                                                                                               |
| 352  | Traction error | Too high traction ACS temperature                     | ACS temperature is higher than 125℃                                                                                                                          |
| 353  | Traction error | Too high traction motor temperature                   | Motor temperature is higher than 180℃                                                                                                                        |
| 354  | Traction error | Traction ACS current sensor error                     | ACS current sensor error                                                                                                                                     |
| 355  | Traction error | No charging after power on the traction ACS capacitor | Within 10-second power on the ACS, the voltage is lower than 85% of the nominal voltage                                                                      |
| 356  | Traction error | Traction ACS no response                              | ACS no response, check the wiring, if the wiring is correct, it means ACS is damaged                                                                         |
| 357  | Traction error | Slave node ACS communication timeout                  | Slave node ACS communication timeout                                                                                                                         |
| 358  | Traction error | Traction ACS communication SDO error                  | Traction ACS communication SDO error                                                                                                                         |
| 359  | Traction error | Master node ACS communication timeout                 | Master node ACS communication timeout                                                                                                                        |
| 360  | Traction error | Too low traction ACS voltage                          | To 24V truck, ACS voltage is less than 18V; to 48V truck, ACS voltage is less than 18V; to 80V truck, ACS voltage is less than 40V                           |
| 361  | Traction error | Too high traction ACS voltage(software)               | To 24V truck, ACS voltage is higher than 36V; to 48V truck, ACS voltage is higher than 68V; to 80V truck, ACS voltage is higher than 106V software testing)  |
| 362  | Traction error | Too high traction ACS voltage(hardware)               | To 24V truck, ACS voltage is higher than 36V; to 48V truck, ACS voltage is higher than 68V; to 80V truck, ACS voltage is higher than 106V (hardware testing) |
| 363  | Traction error | Too high traction ACS PCB                             | ACS PCB temperature is higher than 125℃                                                                                                                      |
| 364  | Traction error | Other error                                           | Other error                                                                                                                                                  |
| 401  | Pump alarm     | Low pump ACS temperature                              | ACS temperature is lower than -20℃                                                                                                                           |
| 402  | Pump           | High pump ACS temperature                             | ACS temperature is higher than 80℃                                                                                                                           |

| Code | Type       | Fault                                             | Reason                                                                                                                       |
|------|------------|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
|      | alarm      |                                                   |                                                                                                                              |
| 403  | Pump alarm | Pump ACS temperature sensor error                 | ACS temperature sensor is disconnected or short                                                                              |
| 404  | Pump alarm | Low pump motor temperature                        | Motor temperature is lower than -35℃                                                                                         |
| 405  | Pump alarm | High pump motor temperature                       | Motor temperature is higher than 145℃                                                                                        |
| 406  | Pump alarm | Pump motor temperature sensor error               | Motor temperature sensor is disconnected or short                                                                            |
| 407  | Pump alarm | Pump encoder error                                | Motor speed encoder is disconnected or short                                                                                 |
| 408  | Pump alarm | High pump ACS voltage                             | To 24V truck, voltage is higher than 36V; to 48V truck, voltage is higher than 68V; to 80V truck, voltage is higher than 98V |
| 409  | Pump alarm | Low pump ACS voltage                              | To 24V truck, voltage is lower than 18V; to 48V truck, voltage is lower than 24V; to 80V truck, voltage is lower than 60V    |
| 410  | Pump alarm | Pump ACS use default parameter                    | Pump ACS use default parameter, the error will disappear after restart                                                       |
| 411  | Pump alarm | Pump power is reduced                             | ACS output power is reduced                                                                                                  |
| 412  | Pump alarm | Pump calibration parameter error                  | Calibration parameter error                                                                                                  |
| 416  | Pump alarm | Pump current sensor error                         | Current sensor use default parameter                                                                                         |
| 417  | Pump alarm | Pump outlet error                                 | Outlet is disconnected or short                                                                                              |
| 418  | Pump alarm | Pump other error                                  | Other error                                                                                                                  |
| 451  | Pump error | Pump ACS short or motor short                     | ACS short or motor U,V,W short                                                                                               |
| 452  | Pump error | Too high pump ACS temperature                     | ACS temperature is higher than 125℃                                                                                          |
| 453  | Pump error | Too high pump motor temperature                   | Motor temperature is higher than 180℃                                                                                        |
| 454  | Pump error | Pump current sensor error                         | ACS current sensor error                                                                                                     |
| 455  | Pump error | No charging after power on the pump ACS capacitor | Within 10-second power on the ACS, the voltage is lower than 85% of the nominal voltage                                      |
| 456  | Pump error | Pump ACS no response                              | ACS no response, check the wiring, if the wiring is correct, it means ACS is damaged                                         |
| 457  | Pump error | Slave node ACS communication                      | Slave node ACS communication                                                                                                 |

| Code | Type       | Fault                                 | Reason                                                                                                                                                       |
|------|------------|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      |            | timeout                               | timeout                                                                                                                                                      |
| 458  | Pump error | ACS communication SDO error           | ACS communication SDO error                                                                                                                                  |
| 459  | Pump error | Master node ACS communication timeout | Master node ACS communication timeout                                                                                                                        |
| 460  | Pump error | Too low pump ACS voltage              | To 24V truck, ACS voltage is less than 18V; to 48V truck, ACS voltage is less than 18V; to 80V truck, ACS voltage is less than 40V                           |
| 461  | Pump error | Too high pump ACS voltage(software)   | To 24V truck, ACS voltage is higher than 36V; to 48V truck, ACS voltage is higher than 68V; to 80V truck, ACS voltage is higher than 106V (software testing) |
| 462  | Pump error | Too high pump ACS voltage(hardware)   | To 24V truck, ACS voltage is higher than 36V; to 48V truck, ACS voltage is higher than 68V; to 80V truck, ACS voltage is higher than 106V (hardware testing) |
| 463  | Pump error | Too high pump temperature             |                                                                                                                                                              |
| 464  | Pump error | Other error                           | Other error                                                                                                                                                  |

## IX Tire check and replacement

Turn tire valve cap counter clock-wise and remove it. Using a tire pressure gauge, measure the inflation pressure, and adjust it to the specified pressure, if needed. After confirming leakage free, screw the nut cap, check if the ground surface or side of the tire damaged, and rim transformed.

### Warning

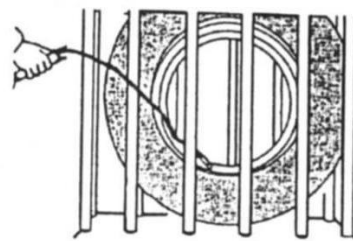
- Since the forklift truck needs tires that have a high inflation pressure to carry heavy loads, even a small bending of rims or damage at the tread surface could cause an accident.
- When using an air compressor, first adjust the air pressure of the compressor. Failure to do so will cause a serious accident, since the compressor delivers the maximum pressure.
- To ensure safety, you should place the tires in a protective frame when inflation.

### New implementation standard for tire

inflation pressure: GB/T2982-2001

Front tire: 7.2 bar

Rear tire: 7.2 bar

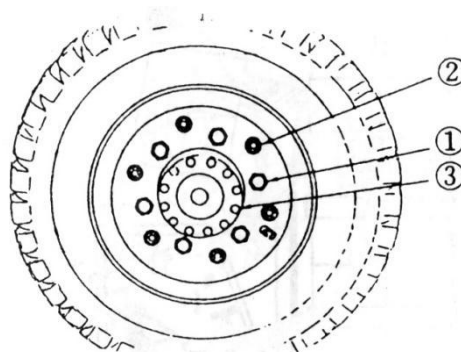


### Wheel nut torque check

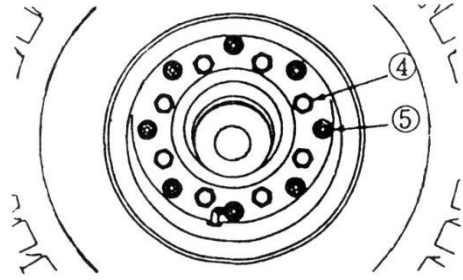
Check if the tightening torque of the hub nut meets the requirements.

- ① Hub nut
- ② Divided rim bolt
- ③ Drive shaft bolt
- ④ Rear hub nut
- ⑤ Divided rim bolt

Driving wheel (rear wheel)



Steering wheel (front wheel)



### **⚠Warning**

After assembling tires and rims, all the bolts and nuts should be fastened to specified torque value, then inflate the tires. Tires have expanding power after inflation, and the tire pressure should not exceed specified value.

### **Tire replacement**

When the tire is damaged, you should replace it in time. Put a jack under the truck make the tire just beyond ground and put a wood block under the chassis. Loosen nut ① or ④, replace new tire.

Tighten the nut crossly and symmetrically.

The value of tighten torque shown in Table for bolt's tight torque.

**Note:** For the replaced tire, do not remove rim bolts before releasing air, or else it may cause something accident.

## Maintenance record

[illegible]



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