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 Instructions

HANGCHA GROUP CO., LTD.

November 2022

Preface

Please thoroughly read this Manual to familiarize yourself with the necessary technical knowledge for operating the tractor in a safe manner. The operation and maintenance instructions in this Manual are described in a concise and coherent way.

This vehicle is designed with an attractive appearance with a rounded streamlined shape. The battery is set at the bottom of the frame, providing good vehicle stability. The front and rear axles of this vehicle are fitted with suspension for reduced vibration and more comfort. It is easy to get on and off the vehicle with the low-position wide-opening step. All operating pedals, instruments, the steering wheel and switches are configured according to ergonomic requirements for comfortable and flexible operation. The standard battery side replacement design makes battery replacement faster, safer and more efficient, suitable for continuous working conditions. The optional fully enclosed cab accommodates all weather. The main electrical components of this tractor, including the motor controller, contactor, power plug, power-off switch, etc., are sourced from well-known foreign brands. The major stressed components including the frame, drive axle and steering axle are all designed for maximum strength to meet corresponding working conditions. The emergency power-off switch is a standard configuration meeting European safety standard. The AC power system features high efficiency, complete protection functions, significantly improved reliability, and extended service life. The front and rear wheels are equipped with brakes for flexible and reliable braking. An electromagnetic brake is adopted as the parking brake for this vehicle, replacing the traditional mechanical hand brake and realizing intelligent parking brake functionality, which is more convenient for the operator and improves safety. A large LCD display with a fault word diagnostic table is adopted, providing accurate information in harsh environments. The newly configured AC control system provides efficient and precise tuning performance, extending the running hours after a single charge. The entire vehicle is equipped with LED configurations in which the latest flowing water blinker technology is applied for the front turn signals light. This vehicle is easy to maintain, the brushless AC motor requires minimal maintenance, greatly reducing operating costs; the easily detachable rear platform cover facilitates the debugging and maintenance of the electronic control system; the side removable battery makes battery maintenance very convenient; the electronic control and electrical components are placed together, enabling a high level of integration.

Our company will continue to carry out further research and development. Therefore, we reserve the right to modify the design, equipment and technology.

Contents

I. Safety rules

1. Only trained and certificated operators can operate the vehicle.

2. Obey the traffic rules.

3. Maintain a safe operating distance between vehicles.

4. Oil/fluid leakage, deformation and looseness should be regularly checked; otherwise, the service life of the truck will be reduced; in severe cases, it may cause an accident.

- Ensure that “safety critical parts” are replaced in regular checks.
- Wipe off oil, grease and water on the pedal and control lever.
- No smoking, sparks or flames near to the lithium-ion battery during inspection.
- Take care to avoid burning yourself when checking the motor or controller. ·
- The controller is equipped with an accumulator. Do not touch the position between B+ and B- to prevent an electric shock. In order to check or clean the controller, a load device (such as contactor coil or horn) should be installed between B+ and B- to discharge the capacitor inside the controller.
- Keep the electrical appliances, controllers and motors away from water and rain.

5. In the event of any faults, the operator should stop the vehicle immediately, hang the “Danger” or “Fault” sign, pull out the key and report to the management. The vehicle should not be used until all faults are eliminated.

- In case of a sudden fault when driving on gradients, causing leakage of storage battery electrolyte and brake fluid, personnel should be organized for repair immediately.
- Operators must wear helmets, work shoes and clothes.

6. Explosive gas will be generated in the lithium-ion battery, so no flames should be close to the battery. Carefully wash the truck with water after charging the battery and replenish it with electrolyte.

- Keep tools away from the poles of the lithium-ion battery, to prevent sparks or short circuits.

7. The driving route for the vehicle must be a solid and flat concrete road or similar roads suitable for forklift operation. Pre-inspect the ground conditions of the work site. Tidy up the workplace, remove obstacles, sweep away debris and sand, and wipe off oil and water stains.

- The climate conditions the vehicle is designed for: temperature: -20℃ to 50℃; wind speed: no more than 10m/s; relative air humidity: no more than 90% (temperature: 20℃).
- Altitude ≤ 2000m.

8. The vehicle is not suitable for use in flammable and explosive working places. This vehicle is not equipped with a fire extinguisher. Fire extinguishers should be stored for easy access. Staff should be familiar with the location and usage of fire extinguishers.

9. Before starting, sound the horn and make sure no one is around the tractor. Overloading is strictly prohibited.

10. Do not drive fast, and avoid sudden turning or braking. The maximum turning speed is limited to one-third of the maximum operating speed.

11. Do not use the vehicle in sandstorms, snow, lightning, rain, typhoons and other bad weather conditions. In particular, when the wind speed is more than 5m/s, it is better not to use the vehicle.

12. Uneven ground and wheel damage will cause vehicle vibration and noise. Pneumatic tires must be inflated according to the requirements, air pressure must not be too high or too low.

13. Do not modify or refit the truck without the manufacturer's permission. Only the manufacturer or qualified personnel assigned by the manufacturer can carry out wiring on the truck and can mount head lights, work lights and signal lights into the truck.

14. In the event of a breakdown, the vehicle should first be moved to a place where it does not obstruct traffic. If the breakdown is caused by the brake system or steering system, the truck should be carried away with a proper carrier loader (see the vehicle handling content); otherwise, the truck should be towed with an appropriate vehicle; the rope should be fixed outside the truck body when towing. The power plug must be removed when towing. Obey traffic rules when towing a tractor on the highway.

15. There are warnings and operation methods on the truck labels. Please operate the tractor according to the instructions in this manual and the signs on the tractor. Check labels, signs and marks, and replace them if they are damaged or missing.

16. When charging the battery, disconnect the electric switch first, and then disconnect the controller from the battery, otherwise the controller will be damaged.

17. The tires are mounted on split-rim wheels.

18. Do not go diagonally or turn on ramps, otherwise there is a risk of rollover.

19. The vehicle should turn at speeds below 5km/h. Do not jump out of the vehicle if it starts to roll over. The vehicle will roll over much faster than you can jump out; you should extend your feet and keep your hands on the steering wheel firmly to hold you in the vehicle. Please fasten the safety belt securely.

20. Noise and vibration will be generated during installation and assembly processes; please

choose proper tools and assembly methods to reduce the impact of noise pollution on the environment.

21. The work surface of the tractor should be a solid and flat cement pavement, asphalt pavement or concrete pavement. When there is snow, ice, water or other foreign matter on the road, the truck can only be used after it has been fully cleared away; otherwise, the truck is likely to lose control, resulting in an accident.

22. There should be sufficient lighting in the tractor working area. Turn on the head lights when working at night, there should be sufficient lighting in the work area.

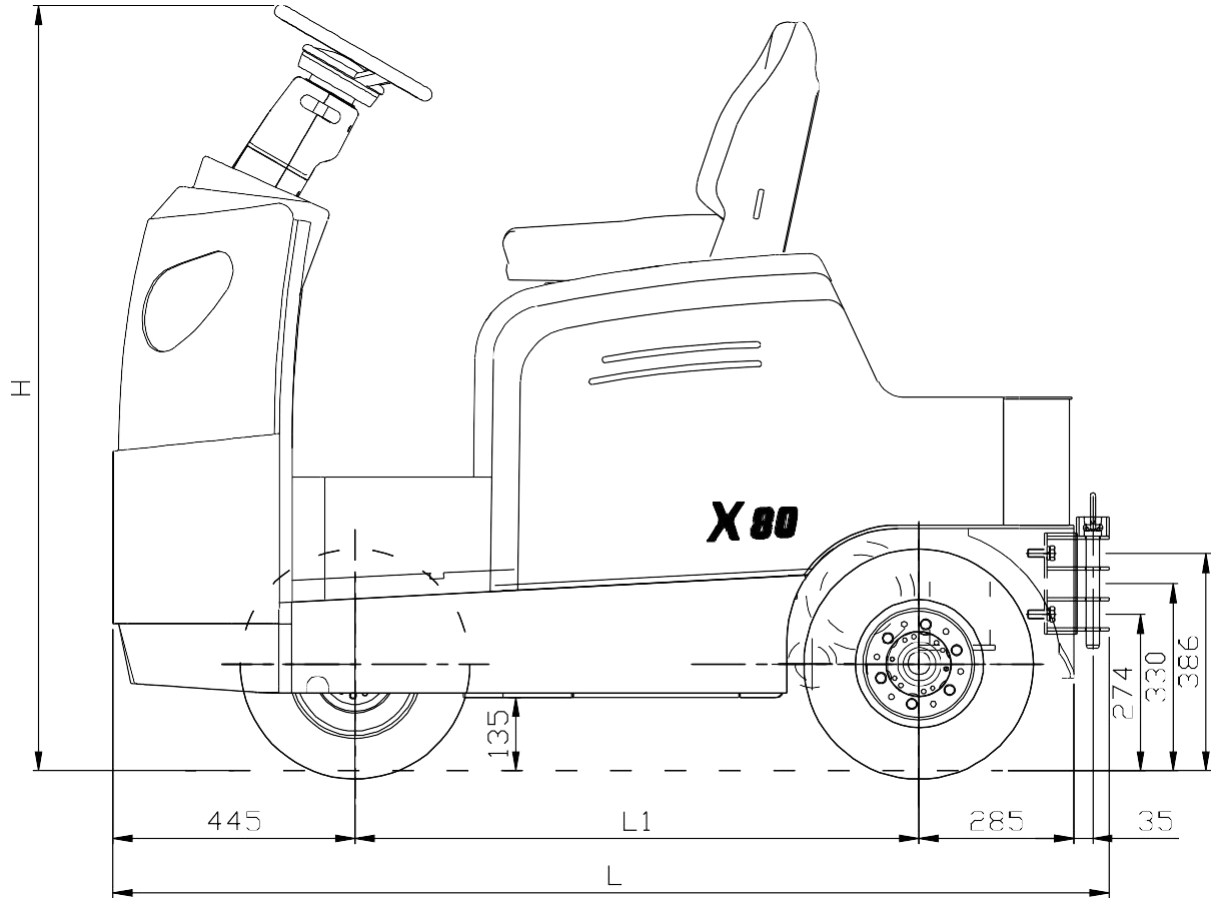
II. Main technical performance parameters

Product model		QDD60-XD2 QDD60-XD3	QDD70-XD2 QDD70-XD3	QDD80-XD2 QDD80-XD3
clutch	Hook traction force 1 hour x N	1500	1750	2000
	Max. hook traction force N(5 min)	4500	5250	6000
	Traction weight on dry concrete road kg	6000	7000	8000
	Max traveling speed no-load km/h	18	18	18
	Steering radius(outside) mm	1650	1650	1650
	Gradeability (no-load) %	25	25	25
	Gradeability (full-load) %	5	5	5
Weight	Gross weight kg	1200	1250	1300
	Axle Load-front wheel kg	570	570	57
	Axle Load-rear wheel kg	630	680	730
Motor	model	HPQ4.5-48HC	HPQ4.5-48HC	HPQ4.5-48HC
	Rated power kW	4.5	4.5	4.5
	Rated Voltage V	33	33	33
	Rated current A	100	100	100
	Rated RPM r/min	1780	1780	1780
	Excitation mode	AC	AC	AC
	Rated duration	S2-60 minutes	S2-60 minutes	S2-60 minutes
	Insulation class	H	H	H
Dimensions	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
	Wheel track-front wheel mm	/	/	/
	Wheel track-rear wheel mm	870	870	870
	Ground clearance mm	135	135	135
	Towing bar center height mm	274/330/386	274/330/386	274/330/386
Battery voltage/Capacitance V/Ah		48/300	48/300	48/360
Electric control model		Inmotion	Inmotion	Inmotion
Tires	Front wheel/number	4.00- 8/ 1	4.00- 8/ 1	4.00- 8/ 1
	Rear wheel/number	4.00- 8/ 2	4.00- 8/ 2	4.00- 8/ 2

Product model		QDD90-XD2 QDD90-XD3	QDD100-XD2 QDD100-XD3	QDD60-XD2-I QDD60-XD3-I
clutch	Hook traction force 1 hour x N	2250	2500	1500
	Max. hook traction force N(5 min)	6750	7500	4500
	Traction weight on dry concrete road kg	9000	10000	6000
	Max. traveling speed no load km/h	18	18	18
	Steering radius(outside) mm	1650	1865	1650
	Gradeability (no-load) %	25	25	25
	Gradeability (full-load) %	5	5	5
Weight	Gross weight kg	1380	1550	1150
	Axle load-front wheel kg	590	700	530
	Axle load-rear wheel kg	790	850	620
Motor	model	HPQ4.5-48HC	HPQ4.5-48HC	HPQ4.5-48HC
	Rated power kW	4.5	4.5	4.5
	Rated voltage V	33	33	33
	Rated current A	100	100	100
	Rated RPM r/min	1780	1780	1780
	Excitation mode	AC	AC	AC
	Rated duration	S2-60 minutes	S2-60 minutes	S2-60 minutes
	Insulation class	H	H	H
Dimensions	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
	Wheel track-front wheel mm	/	/	/
	Wheel track-rear wheel mm	870	870	870
	Ground clearance mm	135	135	135
	Towing bar center height mm	274/330/386	274/330/386	274/330/386
Battery voltage/Capacitance V/Ah		48/420	48/420	48/271
Electric control model		Inmotion	Inmotion	Inmotion
Tires	Front wheel/number	16X6-8/1	16X6-8/1	4.00- 8/ 1
	Rear wheel/number	4.00- 8/ 2	4.00- 8/ 2	4.00- 8/ 2

Product model		QDD70-XD2-I QDD70-XD3-I	QDD80-XD2-I QDD80-XD3-I	QDD90-XD2-I QDD90-XD3-I	QDD100-XD2-I QDD100-XD3-I
clutch	Hook traction force 1 hour x N	1750	2000	2250	2500
	Max. hook traction force N(5 min)	5250	6000	6750	7500
	Traction weight on dry concrete road kg	7000	8000	9000	10000
	Max. traveling speed km/h	18	18	18	18
	Steering radius(outside) mm	1650	1650	1650	1650
	Gradeability (no-load) %	25	25	25	25
	Gradeability (full-load) %	5	5	5	5
Weight	Gross weight kg	1200	1250	1300	1385
	Axle load-front wheel kg	530	530	530	570
	Axle load-rear wheel kg	670	720	770	815
Motor	Model	HPQ4.5-48HC	HPQ4.5-48HC	HPQ4.5-48HC	HPQ4.5-48HC
	Rated power kW	4.5	4.5	4.5	4.5
	Rated voltage V	33	33	33	33
	Rated current A	100	100	100	100
	Rated RPM r/min	1780	1780	1780	1780
	Excitation mode	AC	AC	AC	AC
	Rated duration	S2-60 min	S2-60 min	S2-60 min	S2-60 min
	Insulation class	H	H	H	H
Dimensions	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
	Wheel track-front wheel mm	/	/	/	/
	Wheel track-rear wheel mm	870	870	870	870
	Ground clearance mm	135	135	135	135
	Towing bar center height mm	274/330/386	274/330/386	274/330/386	274/330/386
Battery voltage/Capacitance V/Ah		48/271	48/271	48/271	48/404
Electric control model		Inmotion	Inmotion	Inmotion	Inmotion
Tires	Front wheel/number	4.00- 8/ 1	4.00- 8/ 1	16X6-8/1	16X6-8/1
	Rear wheel/number	4.00- 8/ 2	4.00- 8/ 2	4.00- 8/ 2	4.00- 8/ 2

Product model		QDD70-XD2-L QDD70-XD3-L	QDD80-XD2-L QDD80-XD3-L	QDD90-XD2-L QDD90-XD3-L
clutch	Hook traction force 1 hour x N	1750	2000	2250
	Max. hook traction force N(5 min)	5250	6000	6750
	Traction weight on dry concrete road kg	7000	8000	9000
	Max. traveling speed no-load/full-load km/h	18	18	18
	Steering radius(outside) mm	1865	1865	1865
	Gradeability (no-load) %	25	25	25
	Gradeability (full-load) %	5	5	5
Weight	Gross weight kg	1450	1450	1500
	Axle load-front wheel kg	700	700	700
	Axle load-rear wheel kg	750	750	800
Motor	Model	HPQ4.5-48HC	HPQ4.5-48HC	HPQ4.5-48HC
	Rated power kW	4.5	4.5	4.5
	Rated voltage V	33	33	33
	Rated current A	100	100	100
	Rated RPM r/min	1780	1780	1780
	Excitation mode	AC	AC	AC
	Rated duration	60 min	60 min	60 min
	Insulation class	H	H	H
Dimensions	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
	Wheel track-front wheel mm	/	/	/
	Wheel track-rear wheel mm	870	870	870
	Ground clearance mm	135	135	135
	Towing bar center height mm	274/330/386	274/330/386	274/330/386
Battery voltage/Capacitance V/Ah		48/420	48/420	48/420
Electric control model		Inmotion	Inmotion	Inmotion
Tires	Front wheel/number	16X6-8/2	16X6-8/2	16X6-8/2
	Rear wheel/number	4.00- 8/ 2	4.00- 8/ 2	4.00- 8/ 2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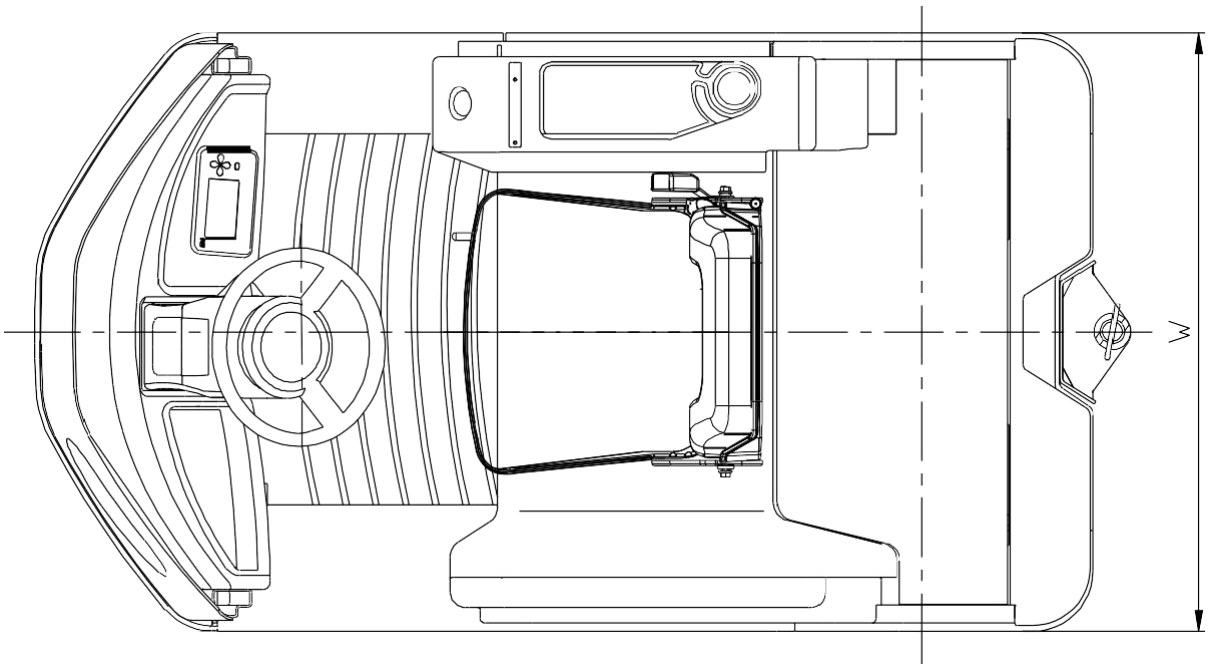
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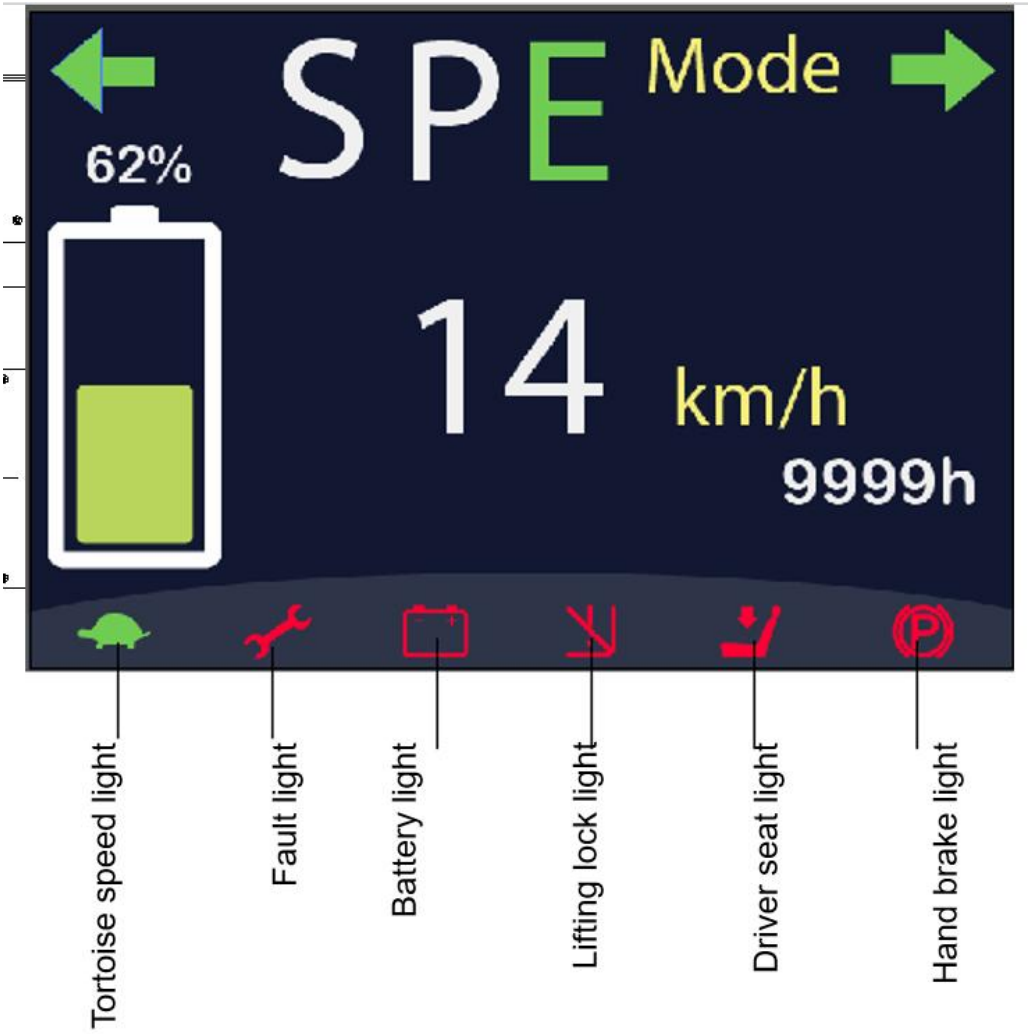
III. Operating Devices and Usage

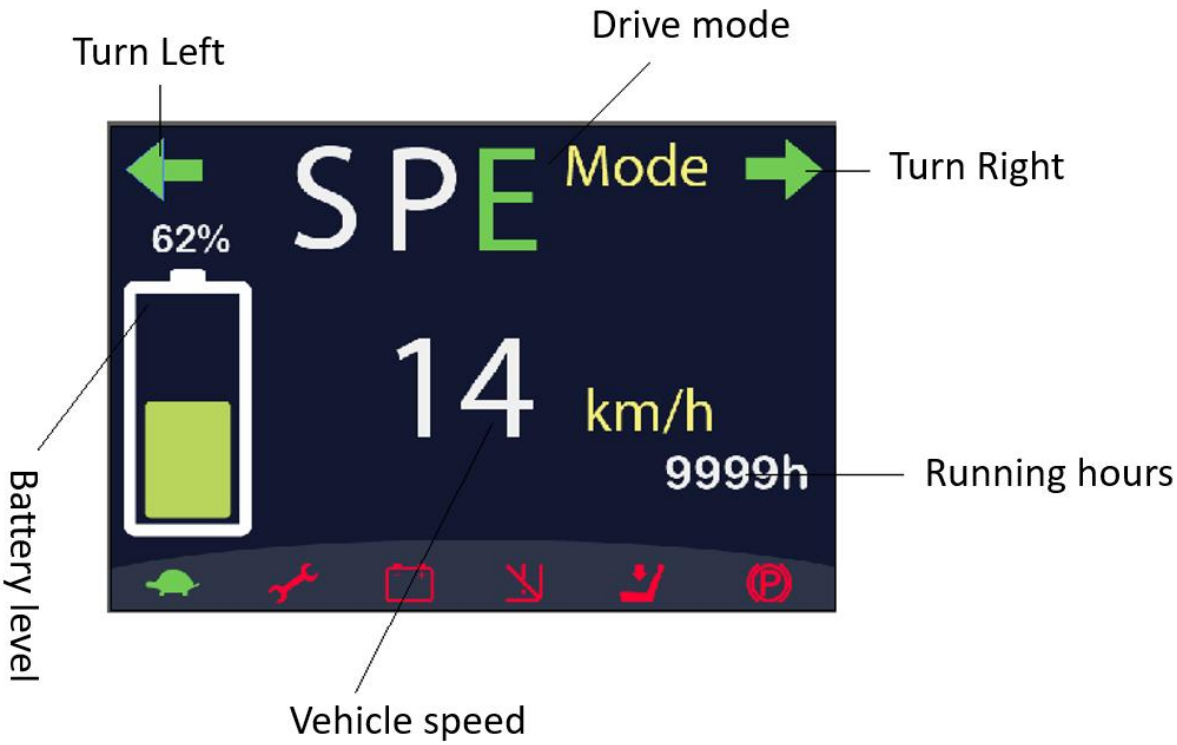
1. Instruments

The multi-function display is used to display the battery level, running hours, running mode, running speed, fault information, and various warning information in the form of icons. Check the fault code and conduct parameter setting using the buttons on the right of the display.

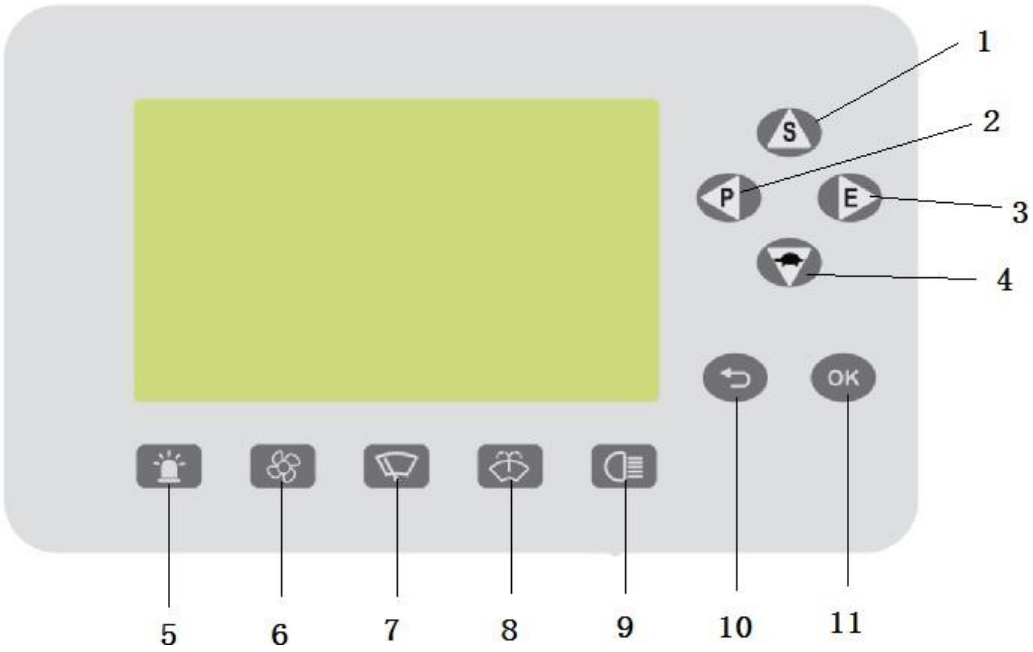


S/N	Parameter	Description	Rem arks
1	Tortoise speed light	It will light up when the truck is running in tortoise speed mode.	
2	Fault light	It will light up when there is a fault in one controller.	
3	Battery light	It will light up when the battery level is no more than 20% of the battery capacity.	
4	Lifting lock light	When the battery level is no more than 10% of the battery capacity, the lifting lock light will light up.	
5	Driver seat light	It will light up when the driver leaves the seat.	0: lit; 1: off
6	Hand brake light	It will light up when the driver engages the hand brake.	

Homepage



Parameter	Description	Remarks
Drive mode	Indicate current running mode including: Mode S, Mode P, Mode E and Mode SPE.	
Vehicle speed	Displays the current vehicle speed, unit: KM/h	
Battery level	Displays the current battery level icon;	
Running hours	Tractor accumulated running hours	
Turn left	Display left turn signal indicator light	Optional
Turn right	Display right turn signal indicator light	Optional



S/N	Name	Function	Remarks
1	Mode S switch	Switch to Mode S	
2	Mode P switch	Switch to Mode P	
3	Mode E switch	Switch to Mode E	
4	Tortoise speed mode switch	Switch to Mode SPE;	
5	Alarm light switch	Switch the alarm light on/off	
6	Fan switch	Switch the fan on/off	Optional
7	Wiper switch	Switch the wiper on/off	Optional
8	Washer switch	Switch the washer on/off	Optional
9	High beam switch	Switch the high beam on/off	Optional
10	Back key		
11	OK key		

Drive mode introduction:

There are four running modes including Mode S, Mode P, Mode E and Mode SPE, and the corresponding keys are Key “S”, Key “P”, Key “E” and Key “Tortoise speed” respectively. When the “Running Mode” value has not been modified, Mode E is the default running mode.

Mode S: Super mode, in this mode the vehicle's acceleration, deceleration, maximum gradeability and other values are high, the tractor is suitable for carrying a large amount of cargo in a short time and climbing a relatively steep slope, but along with a high-power consumption, therefore, do not operate the truck in this mode except in special cases.

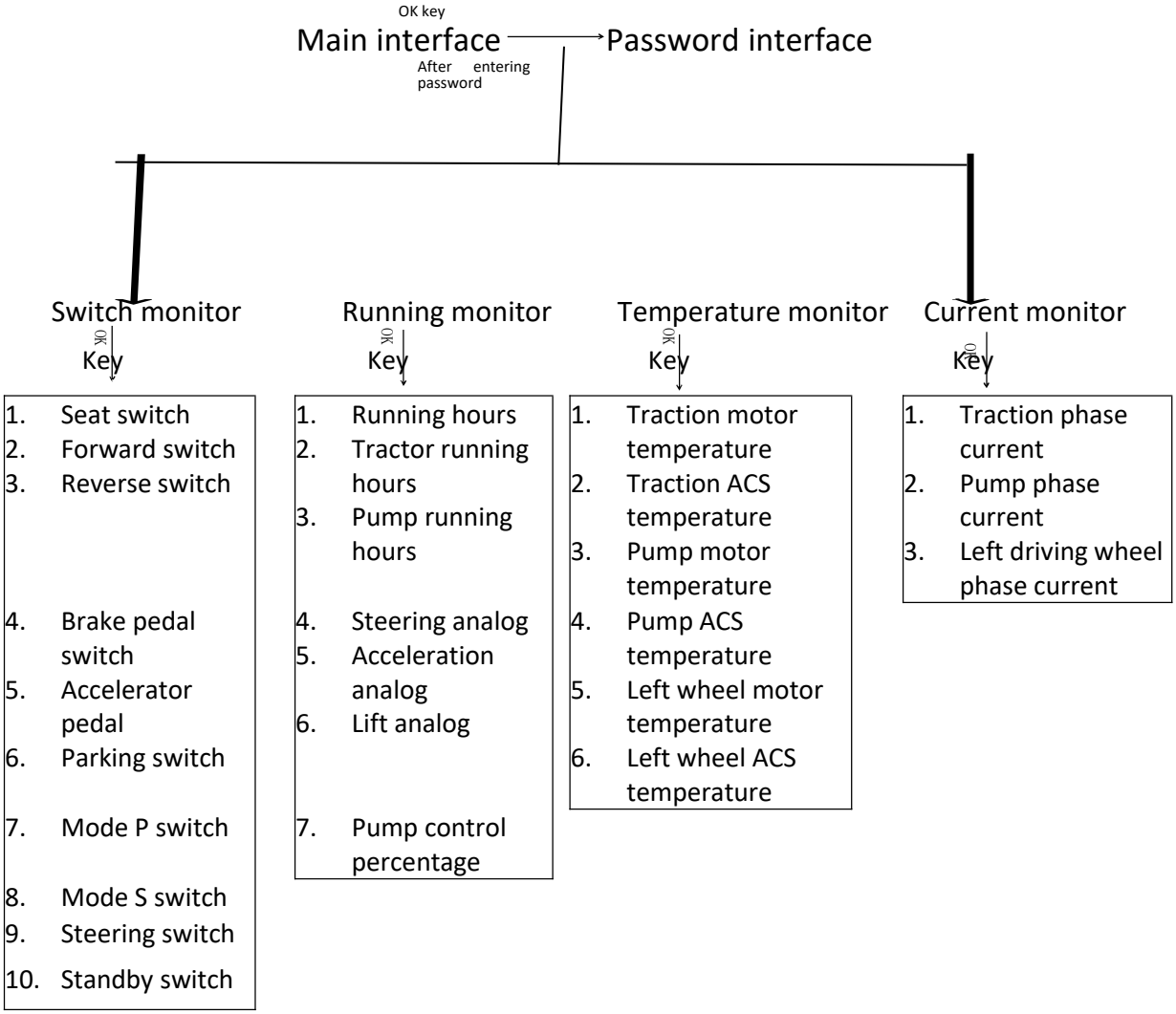
Mode P: Power mode, in this mode the indexes are slightly lower than the high-speed mode, the tractor is suitable for long-distance handling, and working at high power or speed.

Mode E: Economy mode, in this mode all parameters are optimized and the battery life is extended. In this mode, the tractor can work for a long time after the battery is fully charged. It is recommended that the truck should work in this mode in normal conditions.

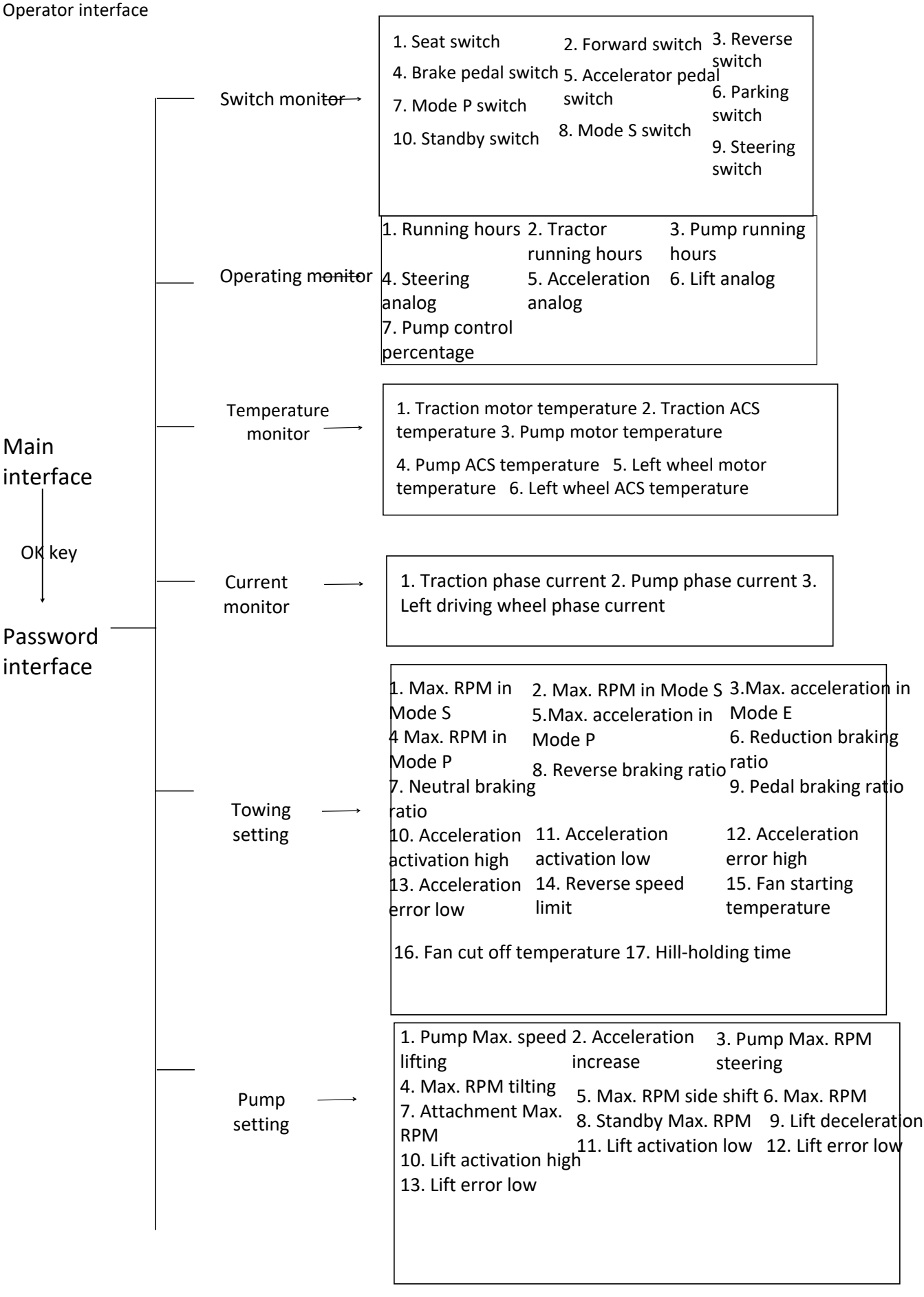
Mode SPE: Safe mode, in this mode the maximum speed is limited to about 7km/h, and the tractor is suitable for working in crowded warehouses and narrow spaces. Select Mode SPE, the tortoise speed icon will light up.

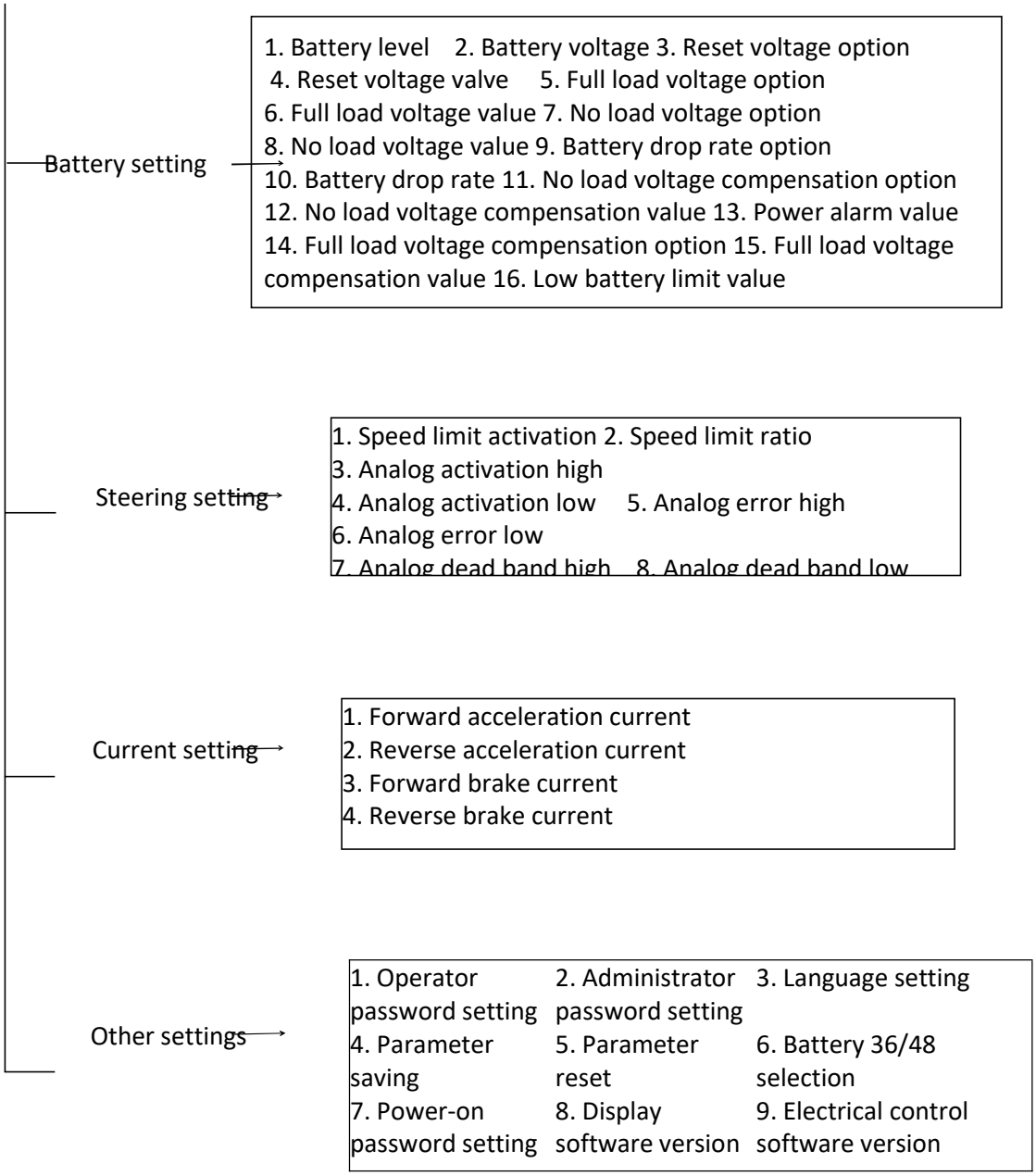
Instrument Menu Structure

Operator interface



Operator interface




Battery setting
1. Battery level 2. Battery voltage 3. Reset voltage option
4. Reset voltage valve 5. Full load voltage option
6. Full load voltage value 7. No load voltage option
8. No load voltage value 9. Battery drop rate option
10. Battery drop rate 11. No load voltage compensation option
12. No load voltage compensation value 13. Power alarm value
14. Full load voltage compensation option 15. Full load voltage compensation value 16. Low battery limit value
Steering setting
1. Speed limit activation 2. Speed limit ratio
3. Analog activation high
4. Analog activation low 5. Analog error high
6. Analog error low
7. Analog dead band high 8. Analog dead band low
Current setting
1. Forward acceleration current
2. Reverse acceleration current
3. Forward brake current
4. Reverse brake current
Other settings
1. Operator password setting
2. Administrator password setting
3. Language setting
4. Parameter saving
5. Parameter reset
6. Battery 36/48 selection
7. Power-on password setting
8. Display software version
9. Electrical control software version

2 . Display and control parts

S/N	Name	S/N	Name
1	Steering wheel	6	Instruments
2	Horn button	7	Steering wheel holder
3	Turn signal/Front headlight switch	8	Brake pedal
4	Direction switch	9	Accelerator pedal
5	Key switch	10	Emergency power-off button
11	Electric switch		

Steering wheel [1]

Controls the left/right direction of the truck. Turn the steering wheel counterclockwise and the truck will turn left; turn it clockwise and the truck will turn right.

Horn [2]

Located in the center of the steering wheel, beeps when pressed.

Turn signal and front headlight switch [3]

Located on the left side of the steering column under the steering wheel, it is a push/pull and turn combination switch. Push forward, the right turn light turns on, and pull backward, the left turn light turns on. The lighting switch is a three-position knob switch, Position 1-all lights off, Position 2-rear signal lights on, Position 3-front headlights and rear signal lights on.

Direction switch [4]

Located on the right side of the steering column under the steering wheel, it controls the front and rear direction of the vehicle, push forward - travel forward, pull backward - travel backward.

Key switch [5]

The key switch is located on the right side of the dashboard and is used to control the circuits of the current of electrical system. Insert the key and turn clockwise to turn on. Turn to the original position to cut off. Do not turn off the key switch when the truck is moving.

Steering wheel holder [7]

To adjust the position and secure the steering wheel.

Brake pedal [8]

Press the brake pedal, the truck slows down. Do not make sudden stops except in emergencies.

When the brake shoe friction pads are worn, the automatic adjustment mechanism fails, and the gap between the brake shoes and the brake drum increases, manual adjustment is required, the method is as follows:

1) Support the wheel that needs to be adjusted;
2) Remove the rubber plug from the rim;
3) Insert a screwdriver into the adjustment hole, toggle and adjust the teeth of the ratchet downward to open the brake shoes, and rotate the wheel by hand until it cannot be turned;
4) Press the ratchet upwards to adjust by 2 to 3 teeth, the wheel should rotate freely but with slight friction between the brake drum and brake shoes.
5) Insert the rubber plug.

The automatic adjustment mechanism consists of an upper pull rod, rocker arm, lower pull rod, and ratchet. When the gap between the brake shoe and drum increases and the braking performance is not satisfactory, move the vehicle backward and then step on the brake pedal. Step repeatedly 2 to 3 times to achieve automatic adjustment.

Press down on the brake pedal during braking, the lighting control circuit is connected by a micro switch to turn the rear brake lights on. The brake shoe is pressed against the brake drum by the brake cylinder to brake the vehicle. Release the brake pedal, the switch control circuit is connected, causing the brake shoes to retract. If you press down on the accelerator pedal, the vehicle can move forward.

Replacement of brake shoes

When the wear clearance between the brake shoe and the rivet head is greater than 0.3mm, the brake shoe should be replaced.

Accelerator pedal [9]

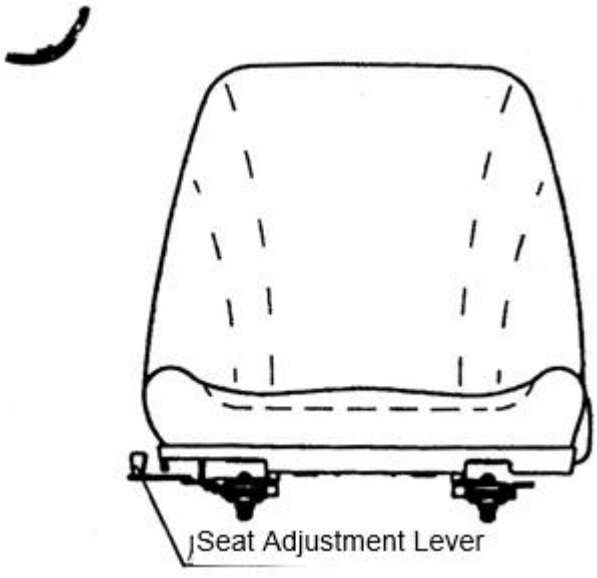
Located on the right side of the front floor, push the direction switch forward and then step on the accelerator pedal, the current supplied to the motor increases, and the vehicle forward speed increases. Pull the direction switch backward, then step on the accelerator pedal to move the vehicle backward.

Emergency power-off button [10]

Press the red button located on the right side of the driver to disconnect the main circuit and apply the parking brake. Press this button for parking and pull it up for starting. Just turn it clockwise and it will pop up. Note: In general, when the truck is running, it is strictly prohibited from pressing the button to prevent the wire from burning out.

3. Body

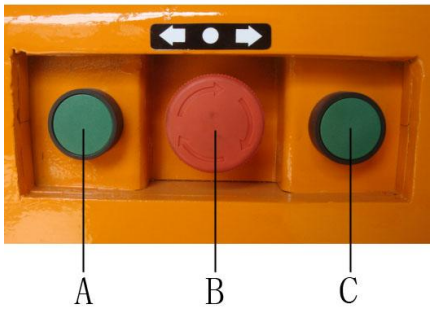
Driver's seat



The driver's seat can move forward or backward by adjustment and is equipped with a safety belt.
The driver’s seat adjustment lever is located on the right side of the seat.
Push the lever backward and hold it, and then slide the seat forward or backward to the desired position.

Release the lever and the seat will be locked in the desired position.
Before using the truck, make sure the seat is locked in place. a. The ignition key switch must be turned off before adjusting the driver's seat. b. The seat position can be adjusted only when the vehicle has stopped.

Toggle switch [13]



Forward tap button [A]

With each press, the vehicle moves forward at low speed; if the button is released, then the vehicle stops moving.

Emergency power-off button[B]

Press the vehicle's main power switch to cut off the power supply, at this time pressing the switches A and B will have no effect.

To make the toggle switch work again, it is necessary to turn it clockwise first to make it pop out and reconnect the power.

Backward tap button [C]

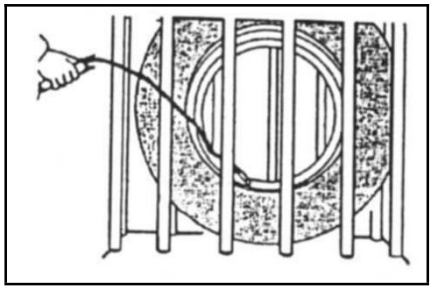
With each press, the vehicle moves reverse at low speed; if the button is released, then the vehicle stops moving.

Safety belt

Your back and waist should be as close to the driver's seat as possible when fastening the safety belt. Do not tilt the backrest too much; otherwise, the safety belt will not be extended correctly.
Frequently check the bolt of the safety belt for any looseness, check whether the buckle and retractor work normally, and check the belt for any seam failure. Do not knot the belt. Do not press the safety belt on hard or fragile objects and do not rub the safety belt with sharp objects to avoid damage.
Do not disassemble components on the safety belt without permission. Visual inspections should be routinely conducted for belts that have been used frequently,
if any abnormality is found, a new belt should be fitted immediately. The service life of the safety belt is 3-5 years, and if any abnormality is found, the safety belt should be replaced in advance.

Tire replacement

Warning
• When using an air compressor, as the maximum output pressure of the air compressor is higher than the specified pressure of tire, the pressure setting should be adjusted first; otherwise, it may cause a serious accident.
• In order to ensure safety, the tire should be placed in a protective frame during air inflation.



Rear wheel tires

1) Park the tractor on level and solid ground.

2) Tighten the hand brake and place wooden blocks behind the front wheels to prevent the tractor from moving.

3) Place the jack at the bottom cutout of the counterweight as shown in the diagram.

Note: Make sure the minimum bearing weight of the jack is 2/3 of the total weight of the tractor.

4) Loosen the nuts on the wheel 1-2 turns counterclockwise.

> ⚠ Warning
> Do not remove the nuts until the rear wheels are lifted off the ground.

5) Slowly lift the tractor with a jack until the rear wheels are completely off the ground. Place wooden blocks on each rear side of the frame to support the tractor as shown in the diagram.

6) Remove the wheel nuts and replace the rear wheels.

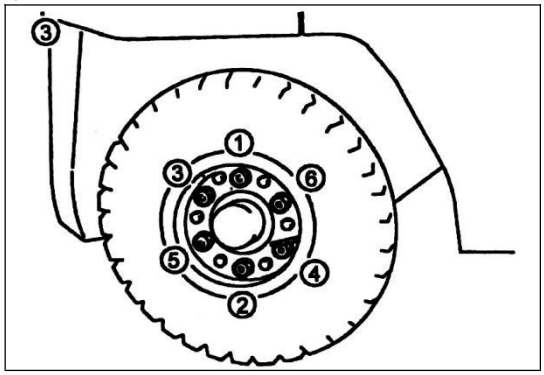
> ⚠ Warning
> a. When removing the tire from the hub, the rim bolts and nuts should not be removed until deflating.
> b. Make sure that the wooden blocks used to support the forklift are solid and strong enough.
> c. When the tractor is only supported with wooden blocks, do not lay underneath it.

7) Put on the nuts in sequence as shown in the diagram and lock them temporarily.

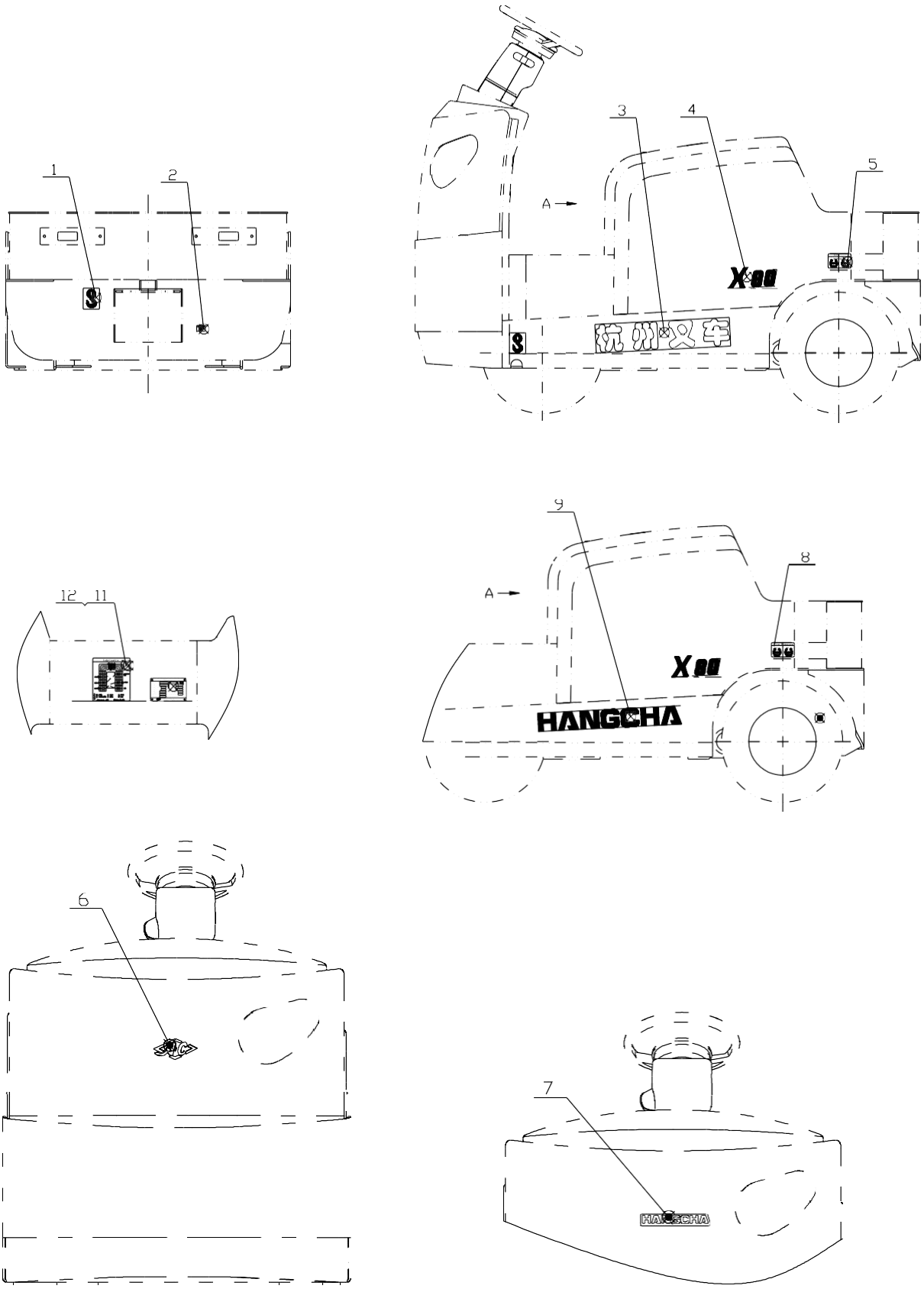
8) Remove the wooden blocks under the frame, lower the tractor slowly to the ground and remove the wooden blocks and jack behind the front wheels.

9) Tighten the nuts to the specified torque in a crosswise manner. Please refer to the Tightening Torque Table.

10) Adjust the tire pressure to the specified value.



4. Product nameplate and safety label



S/N	Name	Remarks
1	Lifting label	Tie-down points for handling the device with a crane
2	Tie-down point label	Tie-down points for towing the vehicle.
3	Logo label	
4	Tonnage label	
5	Tire pressure label	Domestic sales pneumatic tires
6	“HC” Plate	China:
7	Logo label	Export:
8	Tire pressure label	Export pneumatic tires
9	Logo label	Export
10	Product nameplate	The rated lifting capacity shown on the nameplate is the maximum weight of the load that can be handled by the tractor under the conditions on the nameplate. Any changes to the tractor or its devices will change the rated lifting capacity.
11	Lubrication System Diagram	China
12	Lubrication System Diagram	Export

IV. Operation:

1. Checks for a new vehicle

New vehicles from the factory are subjected to strict inspections, but during storage and transportation, various parts and components may be accidentally damaged or loosened. Therefore, upon receipt, it is recommended that the user checks the following items:

— Check whether the technical documentation - instructions, certificate of conformity, packing list - is complete.

— Check whether the joints are fastened and pay special attention to the transmission, steering, brake, wheels, etc.

— Check whether the motor, controller, electrical appliances, display, wiring and connectors are intact and firm, and check whether the electrical equipment and instruments are intact and work normally.

— Check whether the battery is complete and intact and in particular, check the battery case for any breakage.

— Check the working condition of the motor, gearbox, brake, and steering system.

— Check whether all tools for the truck are provided.

2. Breaking-in of the new truck

The new vehicle should be operated under low load in the initial stages after it is put into use, especially within the first 100h, and the following requirements should be met.

— Over-discharge of new batteries during initial use must be prevented (new batteries can only reach 80% of their actual capacity within the first 10 charge-discharge cycles).

— The prescribed preventive maintenance should be performed.

— Fast running, sudden stops and sharp turns should be avoided.

— Oil change or lubrication should be done in advance according to the requirements.

— The actual load capacity should be 70% to 80% of the rated load capacity.

3. Operation instructions

3.1 Pre-start inspection

— Check whether the battery electrolyte level and specific gravity are within the range of the specified values, the **liquid filling cap** is tightly closed, the vent hole is blocked, and the battery is wired securely. Then replace the machine hood.

— Check whether the dashboard works normally and is wired securely. Turn on the electric lock and check whether the dashboard is normal.

— Check whether the driving mechanism and the connections are intact and wired securely.

— Check whether the steering mechanism works normally.

— Check the wheel nuts for any looseness.

— Check for any leakage of gear oil in the rear axle.

Note: When getting on and off the vehicle, hold the steering wheel or handle with your left hand and hold the seat with your right hand to get in and out of the vehicle.

3.2 Starting

— Pull up (just turn clockwise to pop up) the emergency power-off button.

— Open the electric lock with the key, at this time the meter head light comes on and the running time will be displayed first. Then the battery capacity is displayed. The timer starts timing.

— Release the hand brake.

— Turn the direction handle forward/backward.

— Before depressing the accelerator pedal, the driver should look around and confirm that there are no obstacles around the truck, and then slowly depress the accelerator pedal to make the vehicle start smoothly and accelerate gradually. Do not depress the accelerator pedal quickly.

3.3 Driving

— During driving, the speed is controlled by the angle of the accelerator pedal.

— Do not turn off the power lock during driving.

— Under normal driving conditions, the accelerator pedal can be released completely when decelerating, without depressing the brake pedal. When it necessary to use the brake pedal, the driver should first release the accelerator pedal, and then gradually depress the brake pedal, so that the truck slows down and comes to a stop. Sudden braking will not only accelerate the wear and tear of the brake pads, brake drums and tires, but also damage the rear axle box gear backlash and shafts, and motors. In addition, sudden braking also damages the steering system.

— Check for any abnormal sound or smell during driving and check for any abnormalities during braking and steering.

— Reduce the driving speed in advance before steering based on the turning radius and the width of the working aisles. Do not make a turn at maximum speed to avoid accidents. **The turning speed is limited to one-third of the maximum operating speed.**

3.4. Reversing

Stop the vehicle, check the driving direction, make sure there are no obstacles around, depress the accelerator pedal or accelerator knob, control the speed and reverse the vehicle.

3.5 Parking

— Release the accelerator pedal and the truck will stop gradually. Depress the brake pedal if necessary.

— Set the direction shift lever to neutral.

— The electromagnetic brake acts as a parking brake and applies the parking brake itself after power failure

3.6 Towing

— With the vehicle running in reverse, approach the trailer slowly.

— Operate the hook handle, pull up the towing pin, after the trailer tow bar enters the hook, insert the towing pin.

— Ensure the towing pin is inserted.

3.7 Returning the truck after work

— Make a record of the day's driving operation and submit it to the supervisor for inspection and signature.

— Put the direction lever into the neutral position.

— Turn off the power lock and pull out the key.

— Press emergency power-off button.

— Wipe the truck clean inside and out, and clear away any debris embedded in the tires. Give a report on the truck to the person in charge, and then leave after acceptance.

V. Maintenance and lubrication

While operating, due to the influence of various factors, natural loosening, wear and tear and accidental mechanical damage are bound to appear on the vehicle structure and parts. If the necessary maintenance and lubrication is not carried out, the performance of the entire vehicle will deteriorate, the reliability of the components will also be reduced and may even cause accidents. Therefore, it is very important to carry out regular maintenance and lubrication according to the vehicle mileage. Due to the different usage conditions of vehicles around the world, maintenance and lubrication intervals based on the mileage or time should also be adjusted to suit the conditions. The recommended maintenance and lubrication intervals (time) are for typical conditions, and the user is recommended to carry out this process according to their actual situation.

Caution

- It is necessary to perform regular checks and maintenance to keep the truck performance at optimum.
- Checks and maintenance are often neglected, so it is better to find the problems early and solve them in time.
- Use the spare parts from Hangcha.
- When changing or adding oil, do not use oil which is not the same as the original.
- The used oil/fluid and used battery should be recycled according to the local environmental protection laws and regulations to prevent pollution of the environment, rather than poured away or disposed of at will.
- Develop a comprehensive maintenance and repair plan.
- Complete records should be made after each maintenance and repair.
- Only trained and approved service personnel can repair the vehicle.

1. Maintenance

Mileage (time) between maintenance

Routine maintenance is performed daily before and after driving

First class maintenance for every 1000km to 2000km (300h)

Second class maintenance for every 5000km to 8000km(1000h)

Routine maintenance operations (daily):

Take the cleaning as the basic maintenance item and focus on the fastening

— Check whether the reported items have been repaired.

— Check whether the battery is fully charged, whether the electrolyte level and specific gravity are within the specified values, whether the filling cap is intact, whether the battery cable is burnt or loose, whether the vent hole is blocked, and check the battery case for any breakage or leakage.

— Check battery connecting wires for burns, loose connection, and whether they are clean.

Check whether the dashboard, lights and horn are normal and whether the terminals are properly connected.

— Check each component for any leakage.

— Check whether the brake components are intact, whether the connection is reliable, whether the brake is sensitive and reliable and check the free play of the pedal.

— Check whether the steering wheel can automatically return to the center easily and whether it works freely.

— Check the drive shaft and wheel bolts for any looseness.

— Listen to the motor, drive mechanism and frame in motion to check for noise in operation, and whether the instrumentation is normal.

— Check the rear axle support, frame, and battery box for damage or breakage and cracked welds.

— Maintain daily cleaning, wipe the interior and exterior surfaces of the vehicle, regularly remove the battery, rinse off the acid stains of the inside and outside the surface of battery and the battery case.

— Check whether the parking brake is normal.

Level 1 Maintenance (monthly)

Lubrication and tightening is emphasized, and the vehicle should be thoroughly cleaned.

— Remove the battery and perform a thorough clean and inspection of the battery and charge it. Clean the battery connectors and repair or renew them if corroded.

— Remove the battery case and thoroughly brush off the acid stains inside and out.

— Clean the frame and remove acid and mud from its components.

— Check and tighten the bolts of the rear axle of the gearbox, check the lubricating surfaces and apply more lubricating oil if necessary.

— Check the drive shaft sleeve base and the fastening bolts.

— Check and fasten the bolts of the steering mechanism. Check the automatic centering function of the steering wheel.

— Check and tighten the tire nuts and drive shaft bolts.

— Check the brake pads for wear.

— Check and tighten the brake wheel bolts and brake base bolts.

— Check or replace the cylindrical pins and cotter pins of the brake mechanism.

— Check the free play of the brake pedal.

— Check the front and rear tires, wheel hubs, fastening bolts and nuts.

— Clean the motor, check and tighten its bolts.

— Check the working condition of dashboard, lights, horn, fuse and switches, and the insulation degree with the frame, and then tighten the mounting screws. Check the insulation of the terminals in the terminal box and the body.

— Check the wires for any damage and fasten their terminals.

— Check the wear condition on the contact points of the contactors and replace them if they are too hard or worn out.

Secondary maintenance(semi-annually) Take the cleaning as the basic maintenance item and focus on the adjustment. Add the following items in addition to all operations in Level 1 Maintenance:

— Check the axle housing, clean the case and change the oil.

— Check wheel lubrication and add grease.

— Check the rubber seals of the wheel hubs, and determine whether to replace them depending on the degree of wear.

— Check the wear of the tire treads, and promptly retread or replace them.

— Check the automatic centering function of the steering wheel and the steering sprocket device, and replenish or change the lubricating grease.

— Check the steering axle for cracks or cracked welds.

— Check the steering sprocket and chain tightness and adjust as appropriate.

— Check the brake pads, replace depending on the degree of wear.

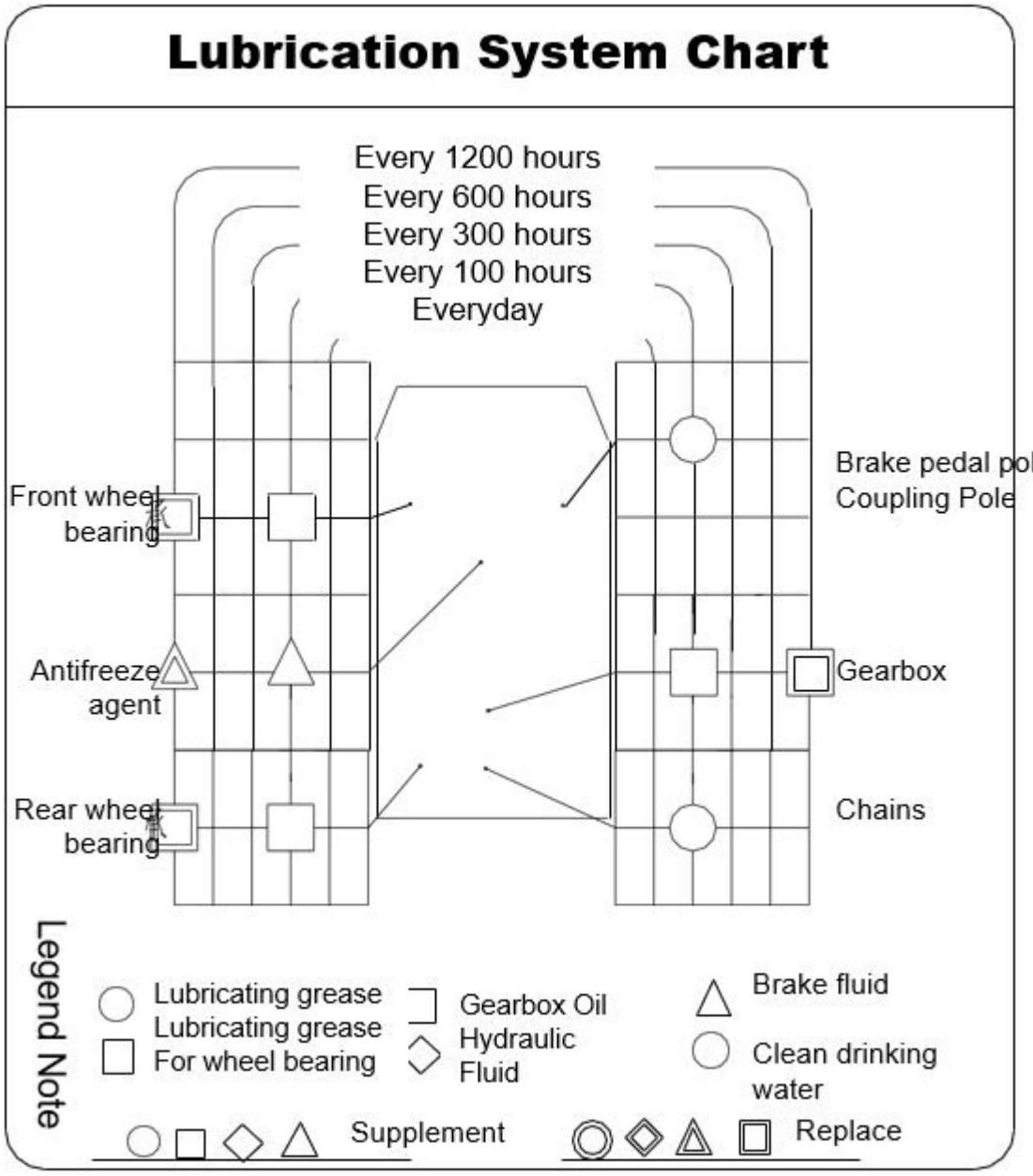
— Check the pins of the braking system for any wear or deformation, and repair or replace them as appropriate.

— Adjust the free play of the brake pedal.

— Check and repair the electrical system

— Every two years: Check the controller safety system by pressing the “Fault codes of the controller” to preset a fault and check whether the fault code on the display is correct.

2. Lubrication



Lubrication is one of the most important factors affecting the performance and life of the vehicle. During use, maintenance should be conducted along with lubrication operations in designated parts with the specified lubrication cycle and prescribed lubricants or grease. Caution: Clean the surface to be lubricated before operation. Generally, add the lubricating oil up to the specified scale line and add the lubricating grease until it spills out to prevent dust and dirt.

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

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

Rear axle housing wheel bearing: 2# General automotive lithium-based grease.

Brake fluid reservoir DOT4 Brake fluid.

3. Regular replacement of key safety parts

It is difficult to find damage to certain parts through regular maintenance, thus in order to improve safety, the user should regularly replace the parts listed in the table below.

If the replacement time is not reached and any abnormality is found in these parts, the defective parts should be replaced immediately.

Key Safety Part Name	**Service life(years)**
Brake hose or rigid pipe	1-2
Brake fluid reservoir	2-4
Brake master cylinder, wheel cylinder cover and dust cap	1

4. Bolts Tightening Torque Table

Unit: N·m

Nominal Diameter	class			
	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: • All key joints use bolts in 8.8 Grade.

- The bolt grade can be found in the head, if not, it is Grade 8.8

VI. Storage and lifting

1. Long-term storage

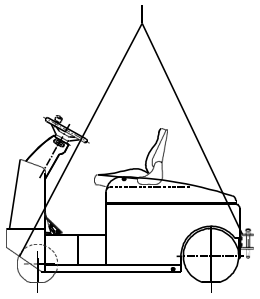
Make the following maintenance and checks in addition to the operation procedures as stated above:

- Unplug the battery to prevent discharge and store it in a dark place.
- Apply anti-rust oil to exposed parts and the shafts that may rust.
- Cover the ventilation holes and other places where water can enter.
- Cover the whole truck.
- Fill all lubrication points with oil (grease).
- Support the truck with wooden wedges to reduce the tire load.

Operations after long-term storage

- Remove the anti-rust oil on exposed parts.
- Drain the gear oil from the drive axle, clean the inside and add new oil.
- Clear the foreign matter and water in the hydraulic oil reservoir, fill it with new hydraulic oil.
- Charge the battery, mount it on the truck and connect the battery leads.
- Conduct an overall check and inspection on the tractor before starting.
- Start to perform forward, reverse, steering, and parking operations to check the vehicle for proper functioning.

2. Vehicle lifting



Tractors are generally used as short-distance tractor trailers, and are not suitable for long-distance transportation. If you want to transport the tractor trailer over long distances, you must use a vehicle or ship with a load capacity over 1.5 tons.

When lifting the tractor, hang the hooks in three places (see the lifting signs "Lift here"): the left and right lifting holes on the lower part of the front body; and the rear towing hooks. Take care to prevent the hook from slipping off, then slowly lift the vehicle with the lifting device.

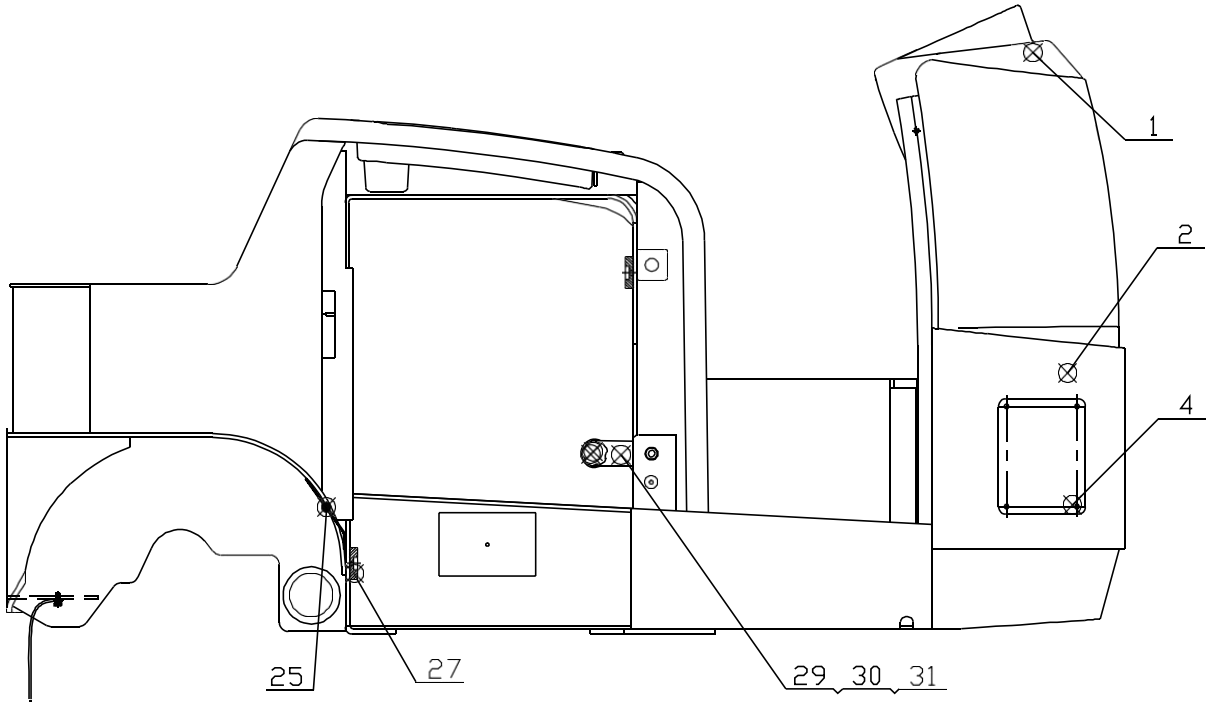
VII. Introduction of main components

The electric tractor with front-wheel steering and rear-wheel drive is composed of five main parts: the truck body, drive system, steering system, operation system and electrical system.

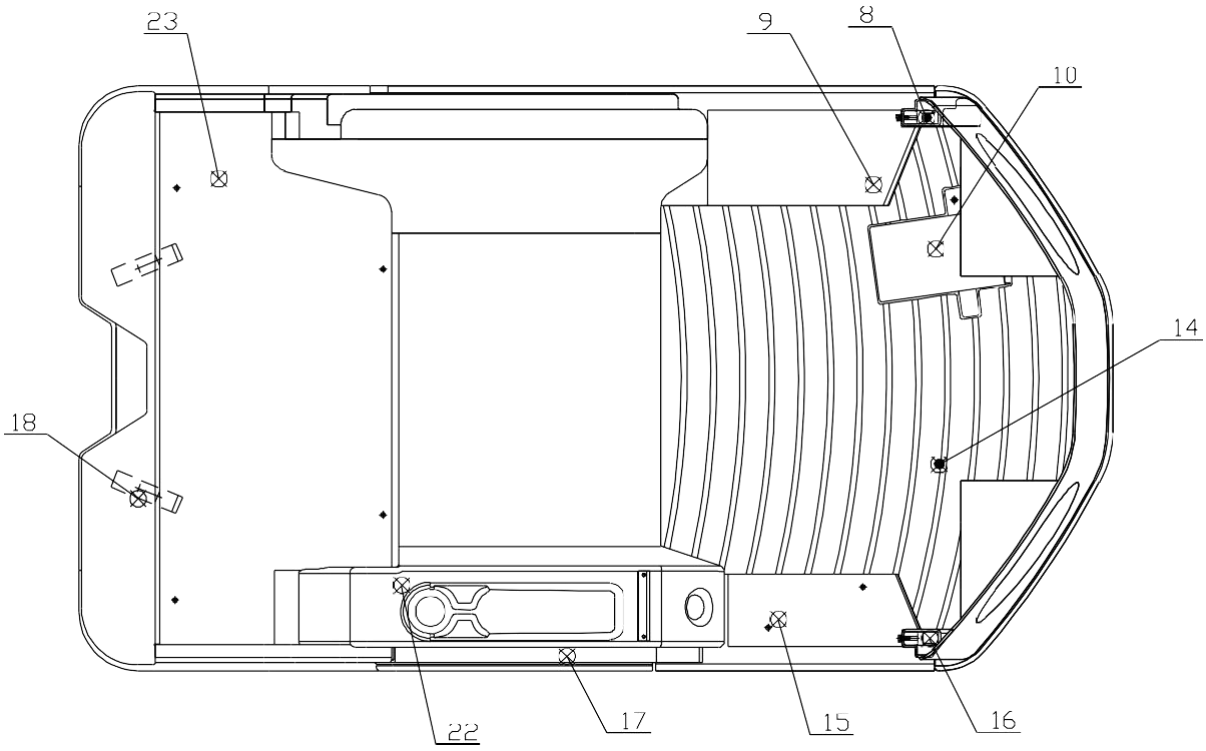
1. Truck body

The truck body is composed of the frame, dashboard assembly, tow pins, front and rear floorboard, etc.

The frame is welded with steel plates, the dashboard is welded with steel plates and bolted to the frame, and is fitted with display meters, key switches, etc. The controller is mounted



at the rear of the frame, it is strictly prohibited to flush this area with water.



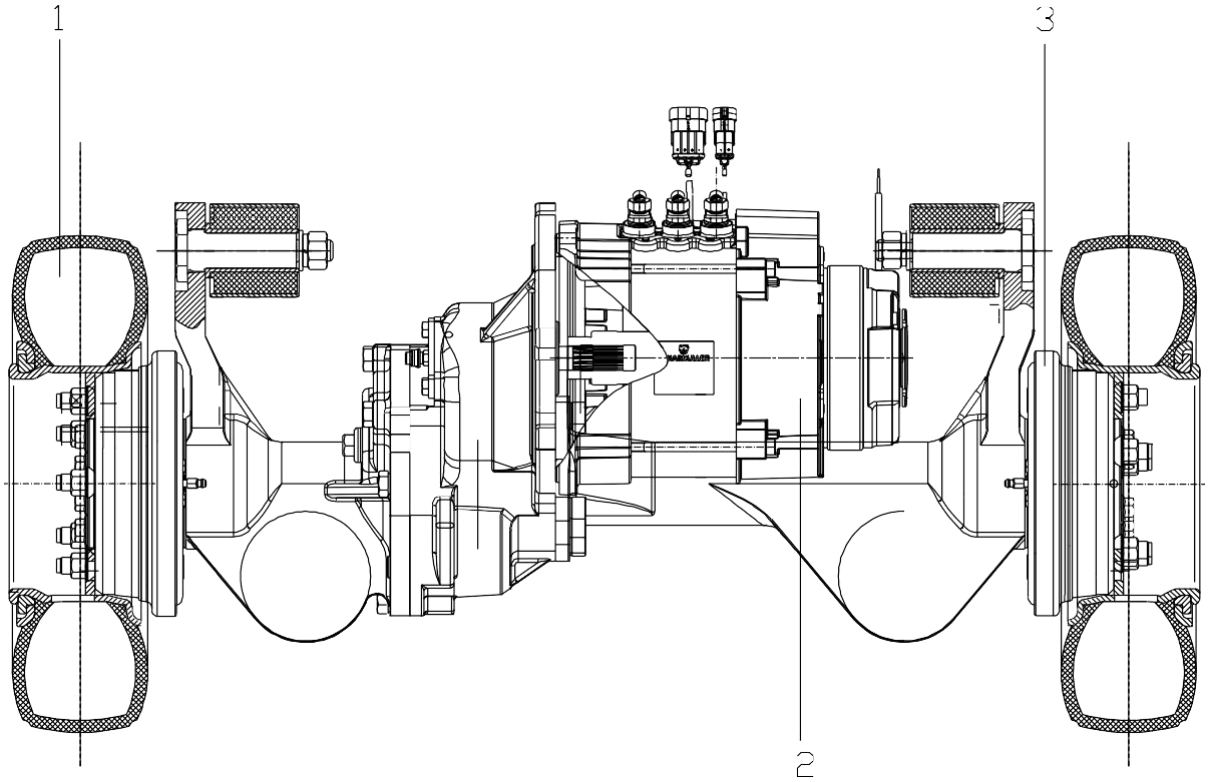
1. Instrument cover	14. Floor mat	23. Rear cover
2. Frame	15. Left pedal	25. Rubber mat
4. Cover	16. Left front support leg plug	27. Conductor plate
8. Right front support leg plug	17. Door components	29. Rocker arm
9. Left pedal	18. Stop plate	30. Tightening bolt
10. Pedal	22. Plastic cover	31. Stop block

Truck body

2. Driving system

The drive system consists of AC traction motors, drive axles, wheels, etc., see the figure below.

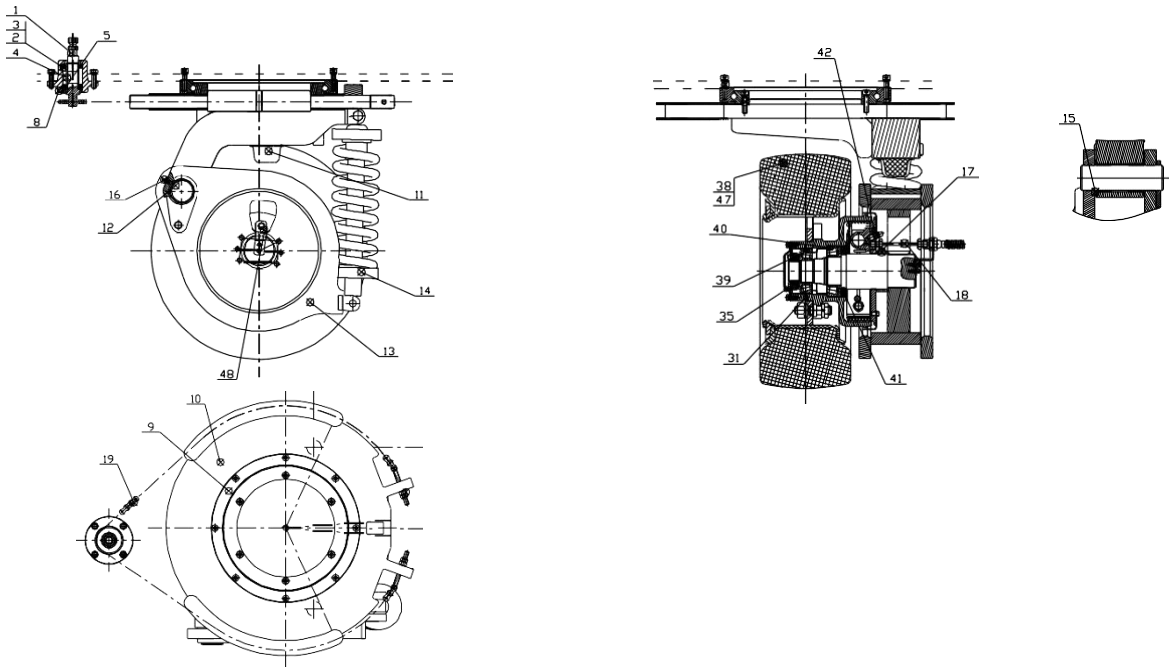
Splash lubrication is adopted on the drive axle gear and bearing, the lubricating oil type is GL-5 85W/140 truck gear oil.



1. Wheel 2. AC motor 3. Drive axle

3. Steering system

The steering system is composed of the steering wheel, steering column, universal joint and steering wheel assembly, etc. Electric steering is optional.



1. Small chain wheel	2. Bearing	3. Check ring	4. Spacer	5. Check ring
8. Small chain wheel base	9. Steering bearing	10. Big chain wheel assembly	11. Cushion	12. Shaft pin assembly
13. Steering column assembly	14. Vibration damper	15. Bushing	16. Oil cup	17. Backing plate
18. Front brake pipe	19. Chain	31. Hub	35. End cap	38. Tire
39. Bearing	40. Bearing	41. Oil seal	42. Brake	48. Bracket

Steering wheel assembly

The steering wheel assembly features low steering resistance, low kickback, large angular transmission ratio, agile steering, and is lightweight and easy to install and debug.

Replace the steering wheel bearing grease regularly, disassemble and clean the bearings, add general automotive lithium-based grease to the hub in the appropriate amount, and adjust the bearing tightness. The adjustment method is to tighten the fastening nut until the front wheel can not be rotated, and then loosen the fastening nut by 1/6-1/8 turns. The steering sprocket chain should be cleaned regularly and filled with oil for lubrication, and general automotive lithium-based grease should be added to all moving joints.

Different steering tires are used when the tractor is rated for different towing weights. When the rated traction weight of the tractor is 6t~8t, pneumatic tires are adopted as the steering tires; when the towing weight of the tractor is 9t~10t, the steering tires are solid tires.

4. Electrical system

The electrical system of this tractor is a two-wire system, and the circuits are not connected to the battery negative (Ground).

The electrical system consists of equipment including the battery, motor, controller, accelerator, display console, headlight, turn signal, brake light, and horn.

4.1 Lead-acid battery

This battery mainly consists of the positive plate, negative plate, isolation plate, battery container and battery cover. The positive plate is a tube type and the negative plate is a paste coated type. A micro-porous rubber gasket is adopted, and the battery cover is heat sealed to the battery container. The battery units are welded to each other and there are 24 units in total.

Battery weight and size

Model / Weight(kg)	QDD60/70-XD2 QDD60/70-XD3	QDD80/90-XD2 QDD80/90-XD3	QDD100-XD2 QDD100-XD3	QDD70/80/90-XD2-L QDD70/80/90-XD3-L
Allowable min. weight	500	560	685	685
Allowable max. weight	525	588	720	720
Dimensions(mm)	830×414×627	830×414×627	830×630×627	830×630×627

Precautions for use of the battery

1. Battery maintenance

It is very important to charge the battery correctly and on time, as it will affect the truck performance and the battery service life.

Over-discharging and over-charging will reduce the battery service life.

In case of any abnormalities, such as unpleasant odor, fast dropping of the electrolyte level and high electrolyte temperature, please contact the agent or Hangcha after-sales service center promptly.

1.1 Maintenance precautions

(1) Maintenance staff must be fully trained.

(2) Reverse connection of battery positive and negative terminals must be avoided as it will cause sparking, burning or explosions. Smoke and fire, cell phones and electronic products are strictly prohibited in the maintenance area.

(3) Battery maintenance, replacement and charging should be conducted in designated well-ventilated places, with visible fire and electricity warning signs.

(4) Check the electrolyte level daily, do not use the truck when the electrolyte level is low. Replenish distilled water (after charging) and always keep the electrolyte level at the specified line.

(5) Check the specific gravity of the electrolyte every week.

(6) Keep the battery clean and make sure its upper surface is dry and clean. The wiring terminals should also be kept dry and clean. Any water and dirt on the surface will cause automatic discharging.

(7) Tighten the vent cap and unclog the small holes on it to prevent dust from dropping into the electrolyte.

(8) Measures in cold seasons: maintain a good charging environment; do not park the truck outdoors in the cold or in cold storage warehouses for a long time; especially after the battery has been used, do not park the truck at temperatures below 0℃.

⚠Warning

1. The battery has high voltage and electrical current, and should be kept away from metal components and other objects, reverse connection of the two terminals must be avoided to prevent a short circuit, sparks, or even an explosion. Do not directly touch the battery with your body to avoid an electric shock.
2. Battery electrolyte contains sulfuric acid, which is highly corrosive and may cause burns when it splashes on the skin. Please wear goggles, rubber shoes and gloves during operations. If any electrolyte splashes on your clothing, please take it off immediately; if it splashes on skin or eyes, please flush with water for 15-20 minutes and seek medical attention. If any electrolyte is swallowed by mistake, please drink a lot of water and milk and seek medical attention immediately.
3. Explosive gas may be generated in the battery. Thus, smoking, flames and sparks are prohibited around it, do not use cell phones and other electronic products or it may cause a battery explosion.
4. Use a wet cloth when cleaning (rather than a dry cloth or fiber fabric) to prevent static electricity build up.

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

Cycle	Content
Daily	1. Charge the battery promptly after it is discharged. 2. Check the electrolyte level, if the level is low, add distilled water to the specified line (carry out after charging). Draw out the excessive electrolyte if its level is higher than the specified line. 3. Check whether the vent cap is broken. 4. Keep the battery surface clean and tidy. 5. Check the battery for any deformation, oxidation and paint removal of its surface, offset mounting, or any damage to the battery case, etc.
Weekly	1. Check and record the specific gravity of the electrolyte. 2. Check whether the small vent cap holes are blocked and unclog them if necessary to prevent dust from falling into the battery. 3. Check the battery post bolts for any looseness (tighten it using a wrench with a torque of 25Nm). 4. Check for any liquid in the battery case and then clear it away.
Monthly	1. Check the battery post bolts for any oxidation and check the battery socket for any damage, deformation or foreign objects.

	2、An equalization charge should be made monthly.
Long-term storage and maintenance	The battery should be stored in a dry and ventilated place. Before storing the battery, it should be fully charged, and after that, an equalization charge should be made every 30 days or so.

2. Specific gravity test and conversion

Test the electrolyte specific gravity at least once a week.

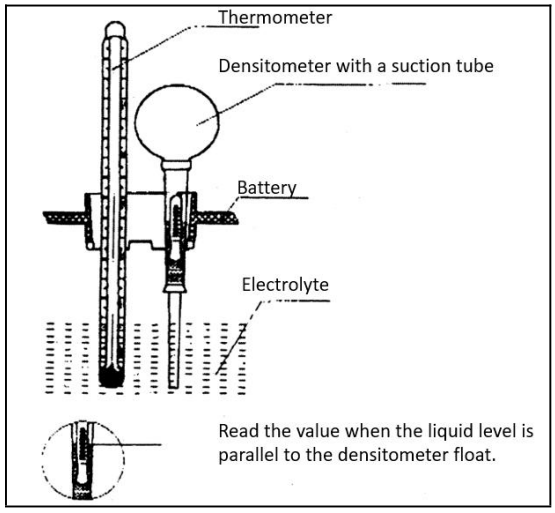
2.1 Specific gravity measurement

(1) Use a thermometer to measure the electrolyte temperature.

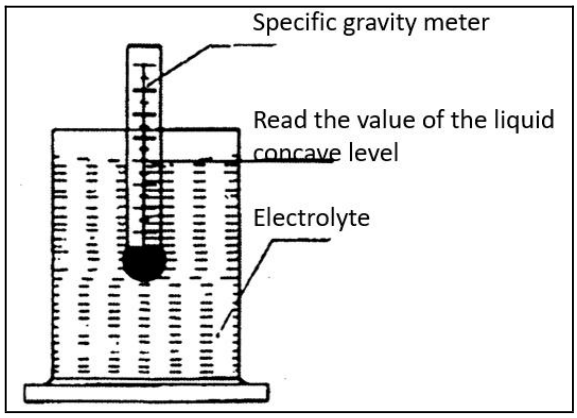
(2) Insert the suction tube of the densitometer into the electrolyte vertically, squeeze the rubber tube with your fingers so that the electrolyte will be sucked into the glass tube and the densitometer float rises up.

(3) Check and record the densitometer reading.

> ⚠ Caution
>
> The densitometer float must float vertically and must not be leaning on the glass tube.



Use the specific gravity meter to measure the specific gravity of the electrolyte.



2.2 Specific gravity conversion

The electrolyte specific gravity at standard temperature (30°C) should be converted based on the following formula:

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

Where: D_{30} - The electrolyte specific gravity at 30℃.

D_t - The actual measured electrolyte specific gravity at t℃.

T - The electrolyte temperature when its specific gravity is measured.

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

The specific gravity of electrolyte will change with temperature.

The electrolyte specific gravity after full charge: 1.28 g/cm3

The electrolyte specific gravity after 80% discharge: 1.14g/cm3

3. Check the electrolyte level and replenish distilled water

Do not use the truck when the electrolyte level is low.

Check the electrolyte level every day, and if the level is low, add distilled water to the specified line (carry out after charging).

> ⚠ Warning
>
> 1. If the battery is used when the electrolyte level is low, it will lead to overheating and shorten its service life.
> 2. When the electrolyte level is not appropriate, it will lead to overheating of the

battery and even burning of the battery and components of the electrical system.

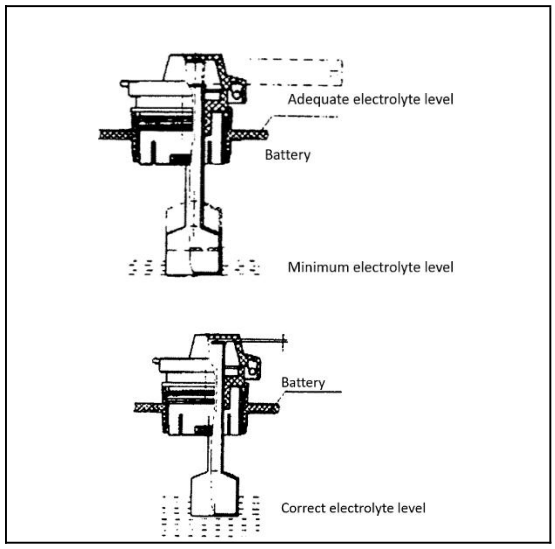
3.1 Check the electrolyte specific gravity

Batteries without a float

The electrolyte level should be 15mm-20mm higher than the protective net.

Batteries with a float

Read the electrolyte level with the float in the vent cap.



3.2 Replenish distilled water

After charging, replenish distilled water so that the electrolyte level is 15mm-20mm higher than the protective net (that is, up to the center of the protective net). Excessive replenishing must be avoided.

Steps:

(1) Wear goggles, rubber shoes and gloves.

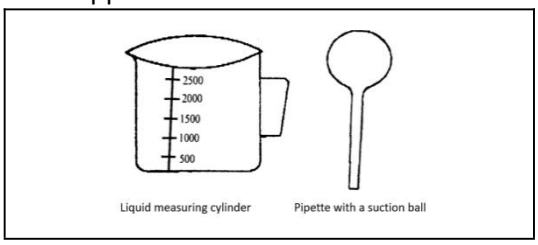
(2) Take a certain amount of distilled water with a liquid measuring cylinder.

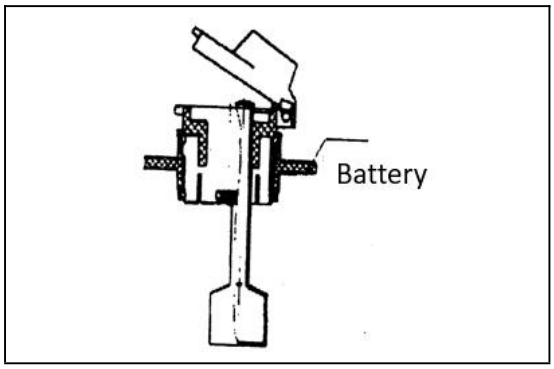
(3) Open the vent cap or filling cap of all battery units.

(4) Use a pipette with a suction ball to draw distilled water and then add it into the battery.

Batteries with a float

Stop replenishing when the red float floats up and a white line appears.





Batteries without a float

Stop replenishing when the electrolyte is 15mm - 20mm higher than the protective net.

(5) After replenishment, cover the vent cap or filling cap tightly.

(6) Wipe and clean the upper surface of each battery unit with a wet cloth.

(7) In case of excessive replenishment, use a pipette with a suction ball to draw it out.

⚠ Warning

1. Do not add excessive distilled water to above the specified maximum level. Excessive replenishment will cause electrolyte leakage, which will damage the truck during charging or discharging.
2. Do not use a dry cloth or fiber fabric to wipe the battery surface to prevent explosions caused by static electricity build up.

4. Battery charging

⚠ Warning

1. The truck should be charged as soon as possible after use, and the battery must be charged before the battery capacity drops

below 20%. Excessive discharge will shorten the battery service life.

2. Battery charging should be conducted in designated well-ventilated places and kept away from flammable and combustible objects, with visible fire and electricity warning signs.

3. Open the hood and battery vent cap when charging to completely release hydrogen gas. When the battery is charging, do not use open flames, cell phones or other electronic products to prevent explosions. Do not charge during thunderstorms.

4. During charging, do not turn off the power switch or unplug the battery suddenly, otherwise it will cause sparks or damage the plug and electrical components. The battery will be fully charged automatically in general.

5. After charging, add distilled water until the electrolyte level is 15mm-20mm higher than the protective net (that is, up to the center of the protective net). Excessive replenishing must be avoided.

4.1 Charger requirements and selection

4.1.1 Charger

(1) When the charger is in use, its housing needs to be reliably grounded.

(2) Disconnect the input and output circuit before replacing the fuse.

(3) Untrained personnel must not open the cover to check and repair.

(4) Do not modify or disassemble the charger.

(5) In high temperature seasons, the charger should be protected from overheating as it may damage the charger. If necessary, the charger can be unplugged for a short period of time.

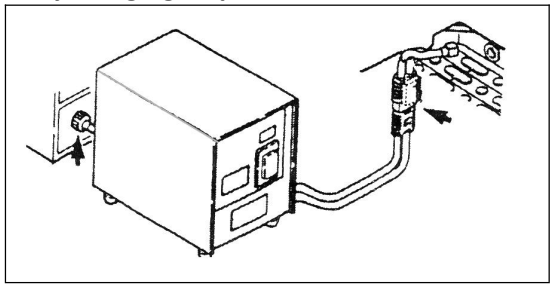
(6) Do not continuously charge several batteries, as it will cause overheating or even damage to the charger. The charger should stop working for one hour after charging before being put into use again.

4.1.2 Charger selection

Select the charger based on the battery voltage and capacity (see parameter table). Generally, select the charger current based on the intermediate value of the battery capacity (1/10 - 1/7), that is, the current = (1/10 - 1/7) battery capacity. For example, the battery capacity is 630Ah, the charger current = (1/10 - 1/7) 630 = 63A - 90A, the most suitable charger current is 70A-80A.

Please use the original charger from Hangcha.

4.2 Daily charging steps



(1) Charge the battery in time before the remaining battery level drops to 20% of the capacity shown on the display.

(2) Turn off the key switch and press the red emergency switch button. (3) Open the hood and unplug from the battery socket.

(4) Open the vent cap of the battery to release the explosive gas and measure the electrolyte temperature. If it exceeds 45℃, cool it down naturally to below 45℃ before charging. The electrolyte temperature should not exceed 55℃ during charging.

(5) Check whether the charger plug and battery socket are damaged, and then plug the battery into the charger if there is no damage. Reverse connection of the positive and negative terminals is prohibited.

(6) Plug the charger into the power supply, press the charger switch to charge the battery.

(7) After charging is completed, the charger will automatically power off. At this time, disconnect the charger first, and then unplug the charger.

(8) Check the electrolyte level as required in the manual, if it is insufficient, please add distilled water

(from Hangcha).
(9) For trucks equipped with an automatic water replenishment system, add distilled water according to the requirements of the Operation and Maintenance Manual (battery automatic water replenishment system (optional)).
(10) Cover the vent cap tightly, clean the battery surface and close the battery cover. Plug the battery and finish charging.

4.3 Equalization charge

4.3.1 Reasons for an equalization charge

When the battery is in use, unbalanced voltage, specific gravity and capacity may occur. During charging, the voltage and electrolyte specific gravity of some batteries rises slowly compared with most batteries, and during discharging, the voltage and electrolyte specific gravity drops faster.
An equalization charge should be provided in the following cases:

1) The discharge voltage often drops below the cut-off voltage;
2) The discharge current is often excessive;
3) The batteries are not charged in time after discharging;
4) The batteries are often undercharged or not used for a long time.

4.3.2 Operation instructions for an equalization charge

Please operate according to the charger operation instructions.
Set to the equalization charge mode and then start to charging.
An equalization charge should be made monthly.

4.2 Lithium-ion battery

1 Safety warning

1.1 Under no circumstances should the positive and negative terminals of the battery be short-circuited, and the battery must not be heated or thrown into water.

1.2 New battery packs need to be fully charged first before use.

1.3 Batteries of different brands, different types or different capacities, or old and new batteries, should not be used together.

1.4 The battery pack should not be used when the batteries in the pack have different charge levels to avoid over-charging or over-discharging of each cell.

1.5 Professional charging devices should be used for charging the battery, do not use unsuitable charging devices.

1.6 If the battery emits any odor or smoke, or exhibits any deformation or abnormal phenomenon during use, storage or charging, the battery should be immediately removed from the device or charger and kept out of service. Please contact our relevant technical department or after-sales service department for treatment.

2. Strictly prohibited operations

2.1 Do not use or place the battery next to high temperature sources, hazardous or dangerous materials, such as fires, heaters, corrosive chemicals, dangerous machinery and equipment, etc. When the battery is stored and not in service, it should be placed in a cool and dry environment.

2.2 Do not immerse the battery in water or other conductive liquids, to avoid personal injury or property loss.

2.3 Do not short circuit the positive and negative terminals of the battery, which should be kept away from metals and other conductive objects to avoid personal injury or property loss.

2.4 Do not transport or store the battery together with metal objects, such as tools and cables, etc.

2.5 Do not knock, throw or step on the battery.

2.6 Do not use this type of battery together with other models or types of batteries in series or parallel, to avoid personal injury or property loss.

2.7 Do not connect the complete power system containing the lithium-ion battery protection circuit board or battery management system in series or parallel, to avoid personal injury or property loss. If this is required, please contact the relevant technical department of our company to obtain the correct technical support.

2.8 Children and other people who are not familiar with the safe use of lithium-ion batteries should not use them, to avoid personal injury or property loss.

2.9 Do not disassemble, extrude, puncture or store the battery at high temperature. Protect the battery from any severe vibration, external impact or falling, to avoid potential safety hazards.

2.10 Do not use the batteries in high-intensity electrostatic fields or magnetic fields, otherwise the battery safety protection device may be damaged, causing safety hazards.

2.11 Do not charge the battery without a reasonable charging protection device (e.g. lithium-ion battery protection circuit board, battery management system) or using charging devices (e.g. charger, DC power supply) not approved by the battery manufacturer, to avoid personal injury or property loss.

3 Common terms and application environment for lithium-ion batteries

3.1 Basic terms and definitions

3.1.1 Rated voltage

It is an approximate value used to indicate the battery voltage.

3.1.2 Rated capacity

It is the value of electric capacity provided by the fully charged battery under the specified conditions, which is indicated by the manufacturer.

3.1.3 Actual capacity

It is the value of actual discharge capacity of a fully charged single cell when discharged at a specified current under specified conditions.

3.1.4 Over-discharge

It can be regarded as the over-discharge state when the battery voltage is below the discharge cutoff voltage, and it usually refers to the state when the battery voltage is 0V or even an negative value.

3.1.5 Max. charging voltage

Maximum charging voltage recommended by the manufacturer.

3.1.6 Overcharge

It can be usually regarded as the overcharge state when the battery voltage is higher than the maximum charging voltage.

3.1.7 Over-current

It can be usually regarded as the over-current state when the working/charging current of the battery is higher than the maximum working/charging current recommended by the manufacturer.

3.1.8 Charge retention and capacity recovery at ambient temperature

The battery is discharged at 0.3C after 28 days of storage at 20℃±5℃, and the ratio of discharged capacity to rated capacity is called the charge retention capability at ambient temperature.

Then charge the battery at 0.3C at 20℃±5℃ and discharge to the cut-off voltage, and the ratio of discharge capacity to rated capacity is called the capacity recovery capability.

3.1.9 Charge cut-off current

It refers to the current at the termination of battery charging at the specified constant voltage.

3.1.10 State of charge

The current electrical power in the battery is generally expressed as a percentage, e.g. 30% SOC means 30% of the rated capacity, the SOC is an abbreviation of “State Of Charge” and refers to the state of charge for the battery (pack).

3.1.11 Explosion

The battery case is broken and solid material is forced out of the battery with an explosive sound.

3.1.12

Fire: Open fire comes out of the battery case.

3.1.13

Leakage: The internal composition of the battery (electrolyte or other substances) leak out of the battery.

3.1.14 Battery management system (BMS)

It refers to an electronic system that can monitor the battery voltage, current, temperature and communicate with the charger, load, thermal management system and other systems through a series of control actions to enable the battery to achieve optimal performance. BMS is an abbreviation of “Battery Management System”.

3.1.15 CAN: Control Area Network.

3.1.16 Charging mode CC/CV: CC mode refers to constant current charging mode and CV mode refers to constant voltage charging mode.

3.2 Basic application environment

3.2.1 Charging temperature: 0℃ to 45℃; discharging temperature: -20℃ to 50℃; optimal application temperature:15℃ to 35℃.

3.2.2 Ambient humidity: HR≤85%, the battery should be used in dry conditions as far as possible.

3.2.3 Shallow charge/discharge increases the service life of the battery.

4 Precautions for use and maintenance of lithium-ion batteries

4.1 Basic requirements for use of lithium-ion batteries

4.1.2 Under all circumstances, the terminal voltage of each battery cell must be tested in real time when the battery is used or tested, do not conduct series charging and discharging tests on the battery pack without the management system or protection board to avoid overcharging or over-discharging of the battery.

4.1.3 New batteries generally have only 50% capacity, so they should not be used for long periods before the debugging of BMS and charger is completed, to avoid truck shutdown caused by low battery pack capacity during operation.

4.1.4 Battery management system: In order to ensure the safe and effective use of the battery and

optimize its service life, lithium-ion battery products should be equipped with a special lithium-ion battery management system (BMS) and a special lithium-ion battery charger. When a small number of small-capacity batteries are used in series in a pack, a lithium-ion battery protection board with reliable performance can be used. Battery management system (BMS):

BMS Parameter Settings	Over-charge protection voltage	3.75V
	Max. charge current	200A
	Over-charge drop-out voltage	3.67V
	Under-voltage drop-out voltage	2.8V
	Under-voltage protection voltage	2.7V
	Over-discharge protection voltage	2.2V
	Over-temperature protection temperature	60℃
	Over-discharge drop-out voltage	2.6V

4.1.5 When using the battery, it is strongly recommended to adhere to a policy of shallow charge/discharge because the most cost-effective performance will be achieved when the battery level is within the range of 30% to 100% capacity. The actual battery level is below 10% capacity when the battery cell’s open-circuit voltage drops to 3.0V, and at this time it is required charge the battery pack promptly.

4.1.6 The operator should always observe the remaining battery level when he/she is testing or using the truck. It must not be discharged until the battery is fully depleted. When towing, the vehicle/ mounted DC/DC (which supplies power to the lights, windscreen wiper), steering assist system, brake assist system and other auxiliary systems are still consuming power, and the battery will discharge further when the towing distance is relatively long.

4.1.7 High-voltage safety protection must be provided for the battery pack. The main drive power circuit and low-voltage electrical circuit (including the forklift body) must be properly isolated, and a reliable DC air circuit breaker and fast DC fuse must be used.

4.1.8 It is strictly forbidden to separately draw power from any individual battery cell in the battery pack to supply power to the forklift's low-voltage appliances, to prevent the consistency of the entire battery pack from being affected.

4.2 Basic requirements for installation of lithium-ion batteries

4.2.1 The battery pack must be installed in the correct direction, rather than upside down or in reverse.

4.2.2 Please do not disassemble or install the battery roughly to avoid any personal or property damage.

4.3 Basic requirements for connection of lithium-ion batteries

4.3.1 Make sure the battery terminals are connected correctly during the operation.

4.3.2 Be careful during the battery connection operation, reverse connection and short circuits must be avoided.

4.4 Basic requirements for storage and maintenance of lithium-ion batteries

The battery pack should be stored in a low charge state, generally its level should be 40% capacity. Requirements for storage environment:

4.4.1 Storage temperature: storage period < 3 months, storage temperature: -40℃ to 60 ℃, 40% SOC conditions; storage period > 3 months, storage temperature: 0 to 25 ℃, 40% SOC conditions.

4.4.2 Storage humidity: 2% RH to 90% RH, it is recommended to be stored below 85% RH.

4.4.3 Storage environment: the product should be stored in a clean, ventilated and cool environment and kept away from direct sunlight, high temperature, corrosive gases, severe vibration, mechanical shock, heavy pressure and heat sources, etc. at an altitude of less than 1500 meters, and under an atmospheric pressure of 86kPa-106kPa.

4.5 Basic requirements for transportation of lithium-ion batteries

4.5.1 During the transportation, the battery should not be exposed to sunlight for a long time or exposed to rain.

4.5.2 During the loading and unloading, the battery should be handled gently and protected from being dropped, shaken and pressed.

4.5.3 During transfer and application, the battery should be protected from impacts and excessive pressure, to avoid any damage to the battery shell or internal structure.

4.5.4 During transfer and application, it is necessary to take necessary protection for the positive and negative poles of the battery to avoid short circuits or fire.

4.6 Preparation before lithium-ion battery installation

4.6.1 Please carefully read the user's manual including the battery instruction manual and the battery installation and maintenance manual provided by our company.

4.6.2 The socket wrenches, fixed wrenches, screwdrivers and other tools used in the installation process must be fully insulated.

4.6.3 During the installation, the operator must wear crush-proof shoes and insulated gloves, it is

strictly prohibited to wear watches, metal bracelets, necklaces and other jewelry.

4.7 Daily maintenance

1) The battery charging process should always be monitored and the plug and socket should be properly connected to each other during charging to ensure that the charging device works normally. If there is any abnormality, it must be repaired before charging.

2) Check the forklift dashboard before charging and discharging to ensure that all values are within the normal range.

3) Keep the battery connectors free from water or other conductive objects during charging and discharging, for example, when the truck is used in heavy rain; before using, the operator should carefully read the product specification, instruction manual and precautions for use in order to be familiar with the product application scope. If the product is used incorrectly, the circuit is not connected correctly or the input power, load function and other parameters are not consistent with the performance parameters indicated in the product specification, our company is not responsible for any damage to the product, load and surrounding connectors.

Precautions:

1. The lithium-ion battery should be charged immediately after each discharge to prevent low battery level.
2. Do not place the battery pack next to high temperature heat sources, such as fires, heaters and other heating equipment.
3. Do not use the battery in high-intensity electrostatic fields or magnetic fields, as this may damage the battery safety protection device and cause safety hazards.
4. Do not use the battery pack under high temperature (direct sunlight) for a long time, otherwise it may cause battery overheating, functional failure or shortened service life.
5. Do not operate trucks equipped with lithium-ion batteries in an environment where the ambient temperature exceeds 55℃. When the ambient temperature is below -25℃, the truck should not be operated until the battery system is heated to above -10℃.
6. Do not disassemble the battery case under any circumstances.
7. Do not drop or knock the battery pack.
8. Do not short circuit the positive and negative poles of the battery pack or place any foreign objects and tools on the lithium-ion battery to prevent short circuits.
9. To prevent water ingress and ensure the safety of the battery pack, do not directly wash the battery case. Do not use battery packs of different brands, different capacities or different types together.
10. The battery pack should be stored in a cool and dry place without direct sunlight.

Maintenance instructions:

1. Without the manufacturer's permission, do not change the battery’s ex-factory parameter settings.

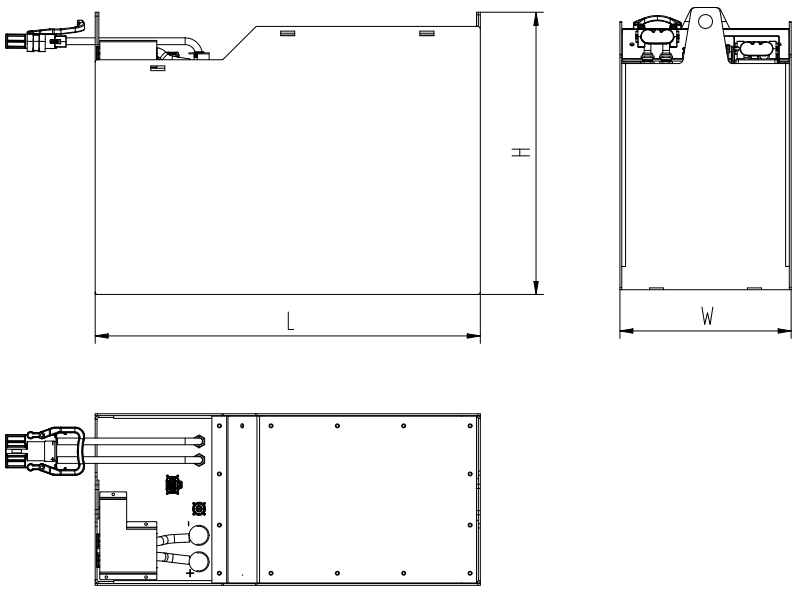
2. Do not plug or unplug the electricity supply if it is necessary to interrupt or suspend the charging process, to avoid arcing or any damage to the charging socket.

3. The charging process takes longer at temperatures below 0℃ compared to normal temperatures.

4. If the battery is not used for a long time, it needs to be charged and discharged once a month.

5 Size/Weight

Item	Length (L) (mm)	Width (W) (mm)	Height (H) (mm)
QDD60-XD2-I **QDD60-XD3-I**	830	369	607
QDD70-XD2-I **QDD70-XD3-I**	830	369	607
QDD80-XD2-I **QDD80-XD3-I**	830	369	607
QDD90-XD2-I **QDD90-XD3-I**	830	369	607
QDD100-XD2-I **QDD100-XD3-I**	830	369	607



WARNINGS

The weight and size of the battery have a great influence on the stability and load-bearing capacity of the tractor operation.

When installing or replacing the battery, attention should be paid to the fixed position of the battery on the tractor.

6 Charger

This lithium battery tractor is equipped with a Titan intelligent charger.
6t~9t equipped with SLC-48100 intelligent charger, 10t equipped with SLC-48200 intelligent charger

Touch screen display interface

Power on interface

Homepage interface

Click the icon: to enter the help interface.

Click the icon: or to switch the alarm sound on/off, indicates the “ON” state, indicates the “OFF” state.

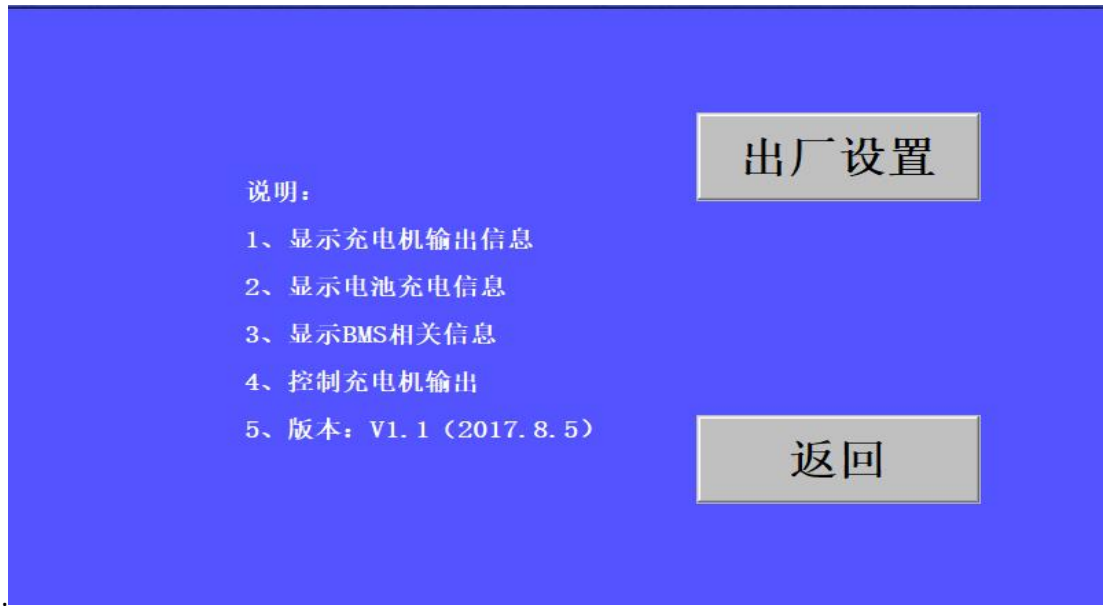
The control operation needs password permission, the default password is 123456.

Click the start icon: to start or stop charging.

Click the charging status bar (in purple) to enter the single charging module information display bar.

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

Click the mode switch icon to switch between the common mode and booking

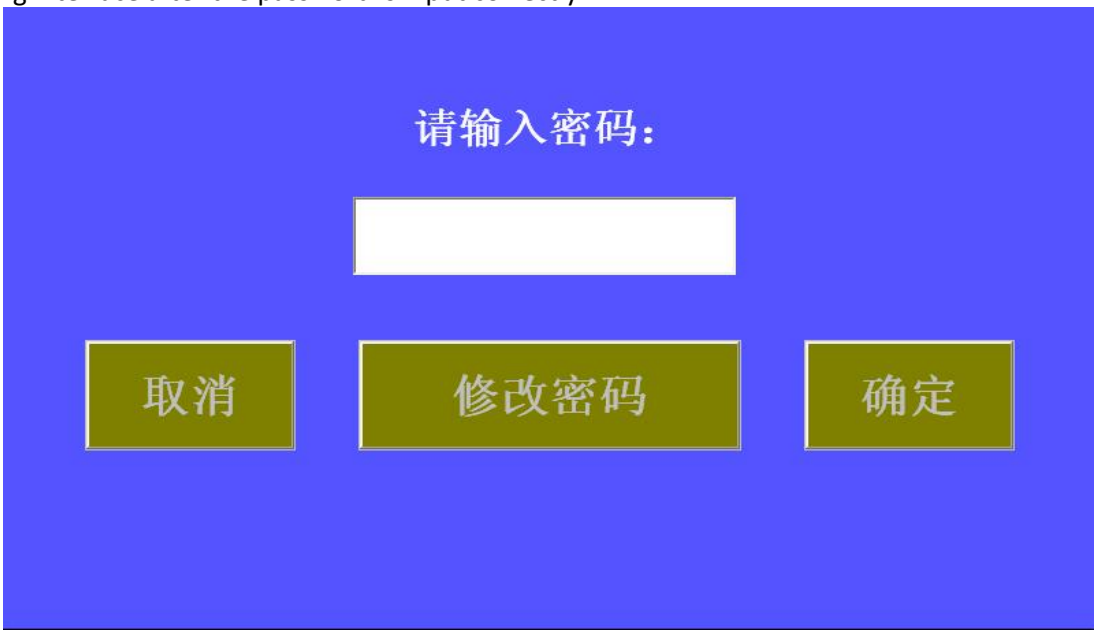
mode. 

Help interface

Click the icon:返回to return to the homepage interface.

Click the booking icon to set the time for charging in booking mode, password: 123456.

Click the icon:出厂设置to enter the password input interface, and enter the ex-factory parameter setting interface after the password is input correctly.



Password interface

Enter the correct password in the password input field, the default password is 888888.

Click the icon:取消to return to the help interface.

Click the icon:修改密码to enter the password change interface.

Click the icon:确定to enter the parameter setting interface if the password is correct, otherwise there will be a prompt, i.e. password input error, please input again.

Password change interface

Follow the prompts to enter in order: enter the user's previous password, enter a new password first and then re-enter the aforementioned new password.

Click on the icon: 确定, it will prompt password change is successful if the previous password was input correctly and the new input passwords for the first time and second time were the same as each other, otherwise it will prompt that the password change failed, please input the password again. Click the icon: 取消 to return to the password input interface.

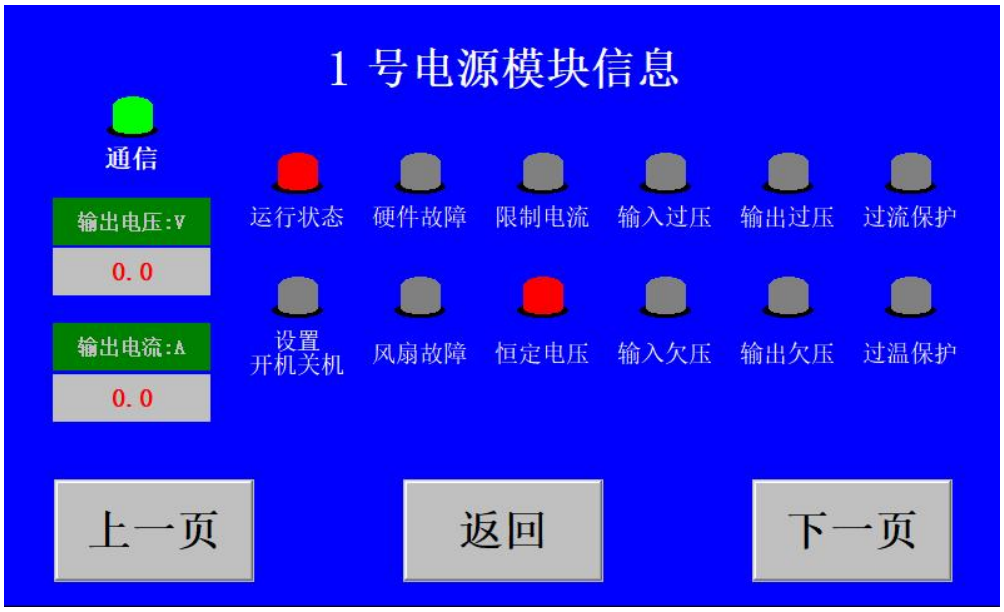
Parameter setting interface

Click the icon: 返回 to return to the help interface.

Parameter setting information: The rated voltage, rated current and shunt range are related to the hardware of the tractor and cannot be modified after delivery.

If the above parameters need to be modified, please consult the manufacturer. The charger number is set only for identification by the user, so it can be set as required. The debugging

interface is set for the manufacturer's debugging, and the user is not allowed to set the parameters in this interface.



Power module information display interface

Click the icon: 上一页 to switch module information forward.

Click the icon: 返回 to return to the homepage interface.

Click the icon: 下一页 to switch module information backward.

This interface displays the output voltage, output current, and various operation parameters of the single power module.

Instructions on charging process

Charging steps:

1. Select "ON" charging control mode. The "CAN" and "485" indicator lights are green.
2. The DC charger is connected to the battery normally.
3. The charging process can be started only if the "Remaining Capacity" is less than the "Allowable Charging SOC Limit".
4. The "Battery" indicator light turns green (it will light up when the charger detects the battery

voltage), and the "BMS" indicator light turns green.
5. "Working" indicator light turns green. When the "Output Voltage" and "Battery Pack Voltage" are similar to each other, the charger output relay is activated, and the charger starts working. At this time, the "Output Current" and "Output Voltage" will be consistent with the "Current Demand", "Voltage Demand".
6. When BMS charging is complete it sends a charging termination command, and the charger ends the charging process.
7. The charging process will be terminated if there are any charger faults (it indicates there is a fault when the "Overheat" and "Abnormal" indicator lights of the charger turn on), or the BMS charging is completed, the "Charging Permission" failed, or the charging process was manually "Stopped".

User wiring instructions

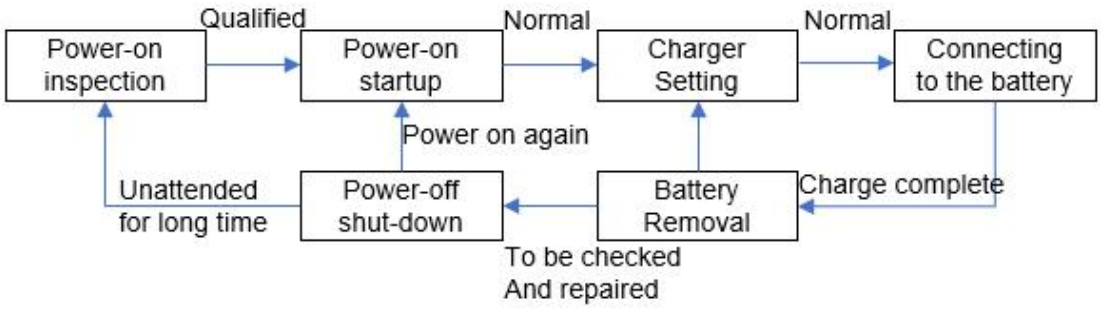
The truck's power supply is controlled by the AC input air switch. The input terminal is a YEEDA plug and the output terminal is the charger.

Warning: PE grounding must be provided to guarantee personnel safety.

Operation instructions

1. Precautions:

a. Before the charger is powered on, check whether the battery wiring is correct, and check whether a short circuit will occur or the positive and negative terminals are reversed. Avoid overloading the charger as this may burn out the components or wiring.
b. The charger should be put into use only after it is powered on without abnormal, overheating or other warning prompts.
c. For the safety of the charger and equipment operation, do not disconnect the battery switch directly when there is output current, except in an emergency.



Operation flow chart

Checks before power-on: Make sure that the AC input live/neutral wire and DC output positive/negative terminal is connected correctly; there is no short circuit between input/output; the input voltage and frequency are normal in the power-on state at all times. The offline and online charging circuits cannot be connected at the same time.
Power on: Check whether the air flow direction of the AC fan is correct and check whether the touch screen can be turned on normally, and communication with the charger is normal.
Connect the battery: The battery voltage and current level meet the charger requirements, with no reverse connection. The battery is in good condition with no abnormality.
Power off: Power the battery off after the charging current and voltage drop to 0 and then turn off the AC input air switch.

Charging steps:

1. Park the truck, turn off the key switch, i.e. Power off the truck.
2. Pull the pedals on the four wheels of the charger tray upward, pull the charger to the proper charging position, and depress the four pedals to prevent the charger from moving.

3. Turn off the charger input master switch, make sure the emergency stop switch is disconnected, the charger starts automatically, the power indicator light turns on and the display interface shows automatically.

	Input master switch
	Emergency stop switch
	Display interface

4. Press and release the button buckle to take out the charger. Check the charger to ensure that there is no water or foreign objects in each port and that the metal terminals are not damaged or affected by rust or corrosion.

5. Open the charging covers on the truck and battery respectively. Check the lithium-ion battery charging socket to ensure that there is no water or foreign objects in each port and that the metal terminals are not damaged or affected by rust or corrosion.

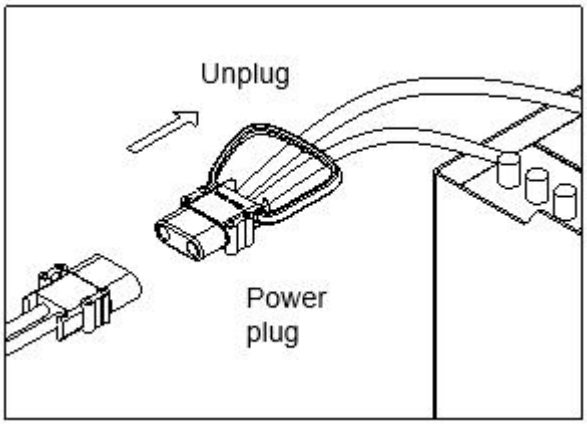
6. Connect the charger to the charging socket of the lithium-ion battery, the charger will check automatically and communicate with the lithium-ion battery; when the whole system is fault-free, after about 15s, the internal relay of the charger will be activated and charging will start, at this time, the charging indicator light will be on, and the charging voltage, charging current, charging time and charging fault information will be displayed on the touch screen.

7. When the lithium-ion battery is fully charged, the charger will automatically stop charging, at this time, the output voltage and output current on the touch screen is 0. Press the pause key, and then unlock the charging gun and pull it out at the same time. If it is necessary to stop charging the lithium-ion battery before it is fully charged, please press the pause key on the screen first, wait for the charging current to drop to 0A and then press and release the button buckle to take out the charger.
8. Replace the charging gun on the charger and turn off the charger input master switch.
9. Replace the charging covers for the battery and truck.

4.3 Battery replacement

The battery case is welded from sheet steel and secured with tightening bolts. The battery case is removed from the side when the battery needs to be replaced:

① Stop the vehicle on flat and solid ground, cut the power off;
② Open the machine hood, pull the battery plug out；



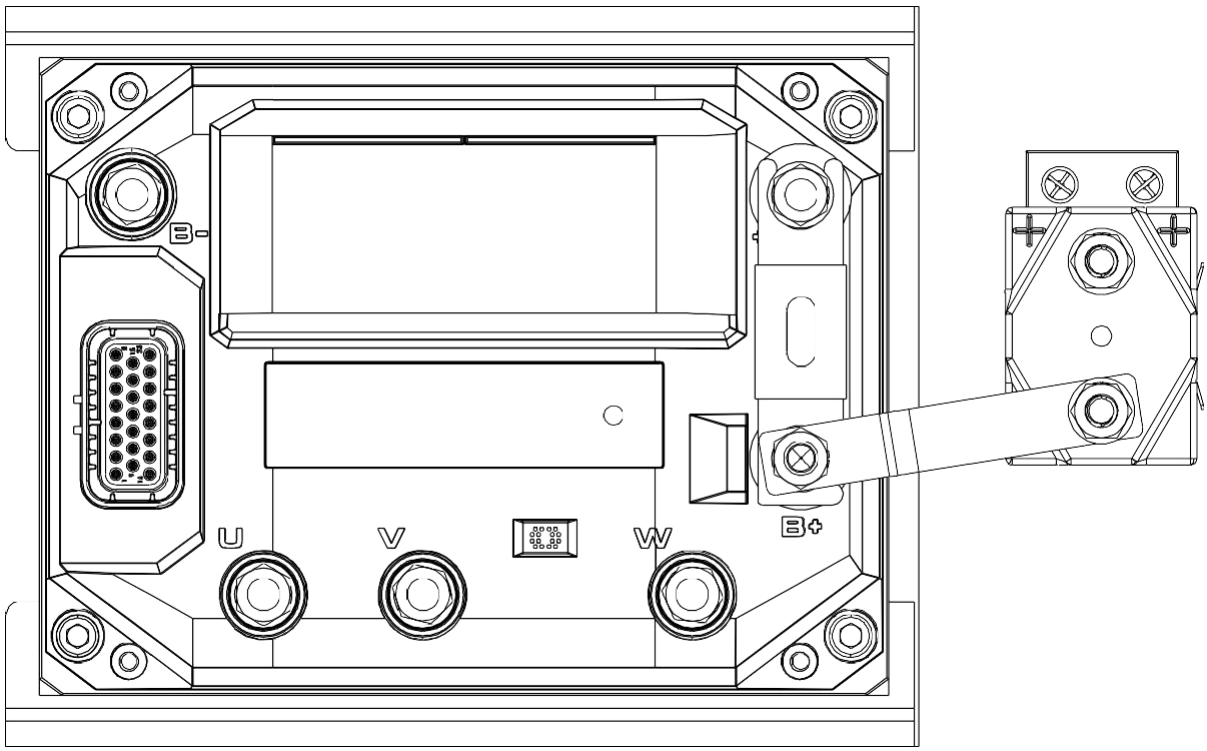
③ Loosen the bolt and turn the limit block and rocker arm clockwise to move them to the state shown in Fig. 2 below:

Fig. 1

Fig. 2

④ Remove the battery from the side；
⑤ Install the new battery on the vehicle, turn the limit block and rocker arm counterclockwise to move them to the position shown in Fig. 1 above, tighten the bolts, plug in the battery plug, and close the machine cover.

4.4 Controller



Overview:

The controller adopts the international advanced AC closed-loop system and control technology. The faults are displayed as codes and text, which improves the maintenance efficiency. Peripheral components can also be detected through the instrument, and the functions of the handheld unit can be realized through the instrument.

（1） Driving motor

A three-phase AC variable-frequency motor is used as the driving motor for the truck, it features high electrical energy conversion efficiency and no commutator or brushes, thus it is maintenance-free.

（2） Safety and protection

① Battery polarity protection

② Circuit wiring protection

③ Protection for all input connection faults

④ Overcurrent protection

⑤ Current monitor unit for limiting maximum current

⑥ Overtemp protection

If the controller temperature exceeds 85℃, the overtemp protection will be enabled; the maximum current decays with the temperature rise; and the truck will automatically stop

working and give an alarm when the controller temperature exceeds 115℃.

If the motor temperature exceeds 145℃, the overtemp protection will be enabled; the maximum current decays with the temperature rise; and the truck will automatically stop working and give an alarm when the motor temperature exceeds 165℃.

⑦Battery over-discharge protection

A buzzer will sound an alarm for extremely low battery level, the maximum speed and current will be greatly reduced.

⑧External protection

A fully sealed design is used for the controller assembly to protect it from dust and liquid.

⑨Starting steps protection

The truck will not start unless the correct operating steps are followed. The truck will not start unless the driving request is sent after the electric lock switch is turned off.

⑩The electrically controlled self-protection system avoids further damage when the electrical components are damaged.

（3） Operation

① With the help of the closed-loop control system, the vehicle speed depends on the accelerator position, so the truck can be easily controlled at low or high speed.

② Regeneration technology gives the truck a smoother steering action.

③ Three regenerative braking modes:

A. Regenerative braking when the

accelerator pedal is partially released B.

Regenerative braking when the driving

direction is reversed

C. Regenerative braking when rolling down a ramp

In addition to improving the driving safety, it also reclaims electric energy and extends the service time of each work shift.

④ Downhill speed control: The motor speed depends on the accelerator. If the motor speed exceeds the accelerator setting value, the controller automatically brakes the truck, which provides optimum ramp protection.

Precautions:

— When repairing the electrical controller, the operator must first cut off the power supply, then use a 10~ 100 ohm resistor to connect to the positive and negative terminals of the controller to short out the residual voltage on the capacitor, otherwise there is a risk of

electric shock.

— The electromagnetic fields and radiation in the environment can affect the inverter, and the long-term influence may damage the controller.

Therefore, it should be kept away from electromagnetic fields and radiation.

4.5 AC motor

A three-phase AC variable-frequency motor is used as the traction motor for the truck, it features high electrical energy conversion efficiency and no commutator or brushes, thus it is maintenance-free.

The motor has an encoder which feeds the working condition of the motor back to the logic card of the controller with an electric signal to achieve closed loop motor control.

4.6 Precautions

（1） When charging the battery, disconnect the electric switch first, and then disconnect the controller from the battery, otherwise the controller will be damaged.

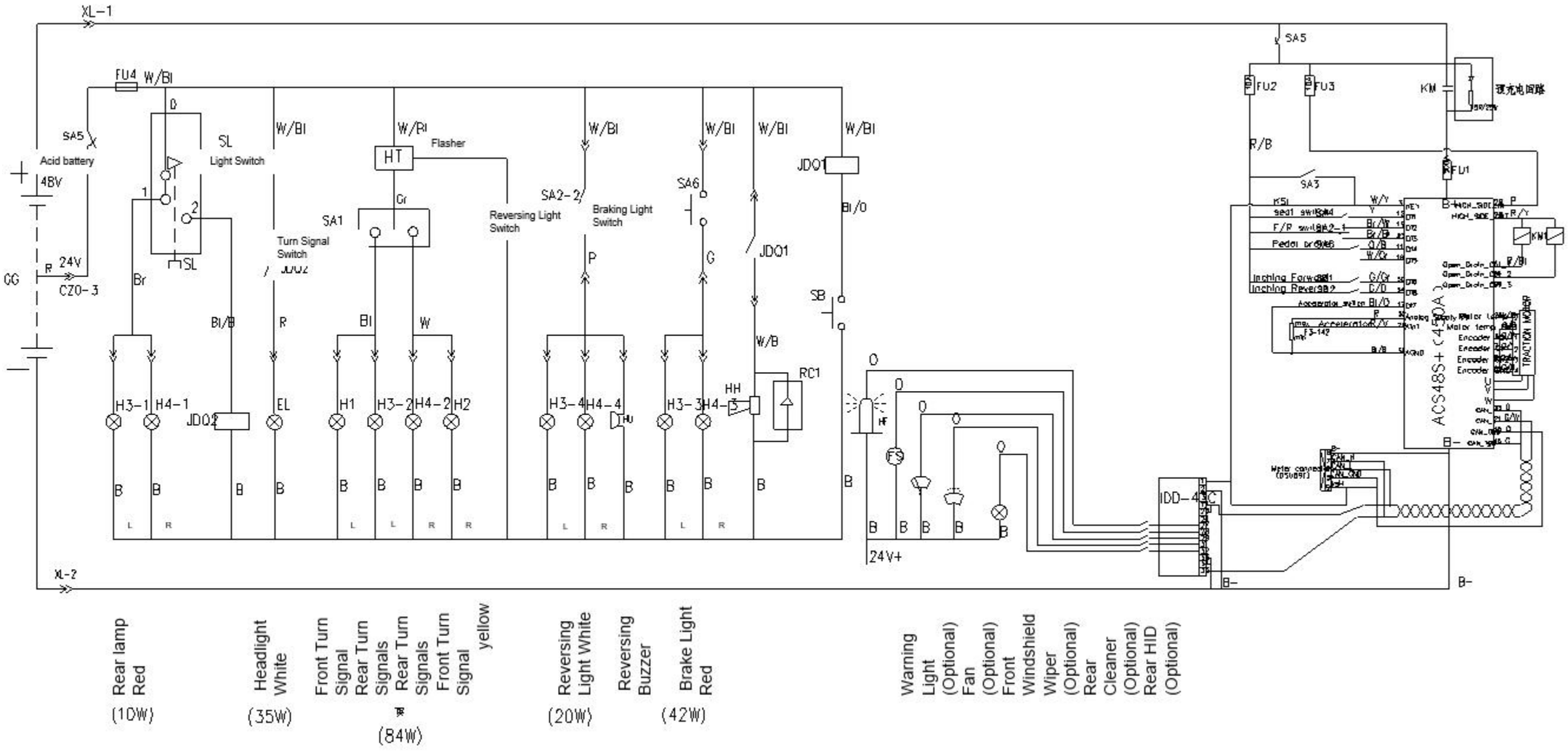
（2） When servicing the electrical controller, the operator must first cut off the power supply, then use a 10～ 100 ohm resistor to connect to the positive and negative terminals of the controller to short out the residual voltage on the capacitor, otherwise there is a risk of electric shock.

（3） The electromagnetic fields and radiation in the working environment can affect the controller, and the long-term influence may damage the controller.

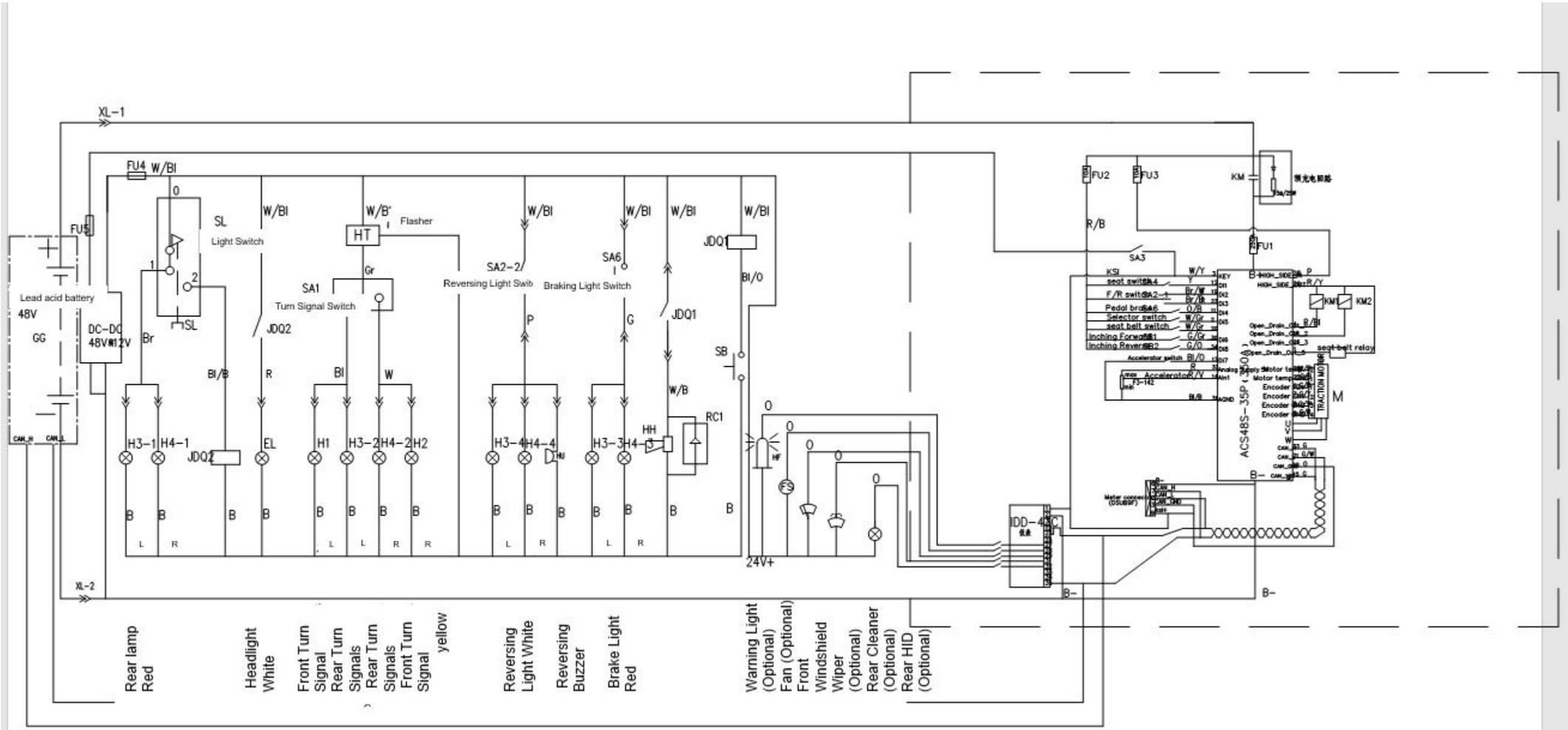
（4） Disconnecting the power supply (pulling out the power plug) is strictly prohibited in non-critical situations while the vehicle is in motion, otherwise the controller can be damaged.

（5） Replacement fuses in the circuit must be of the same rating.

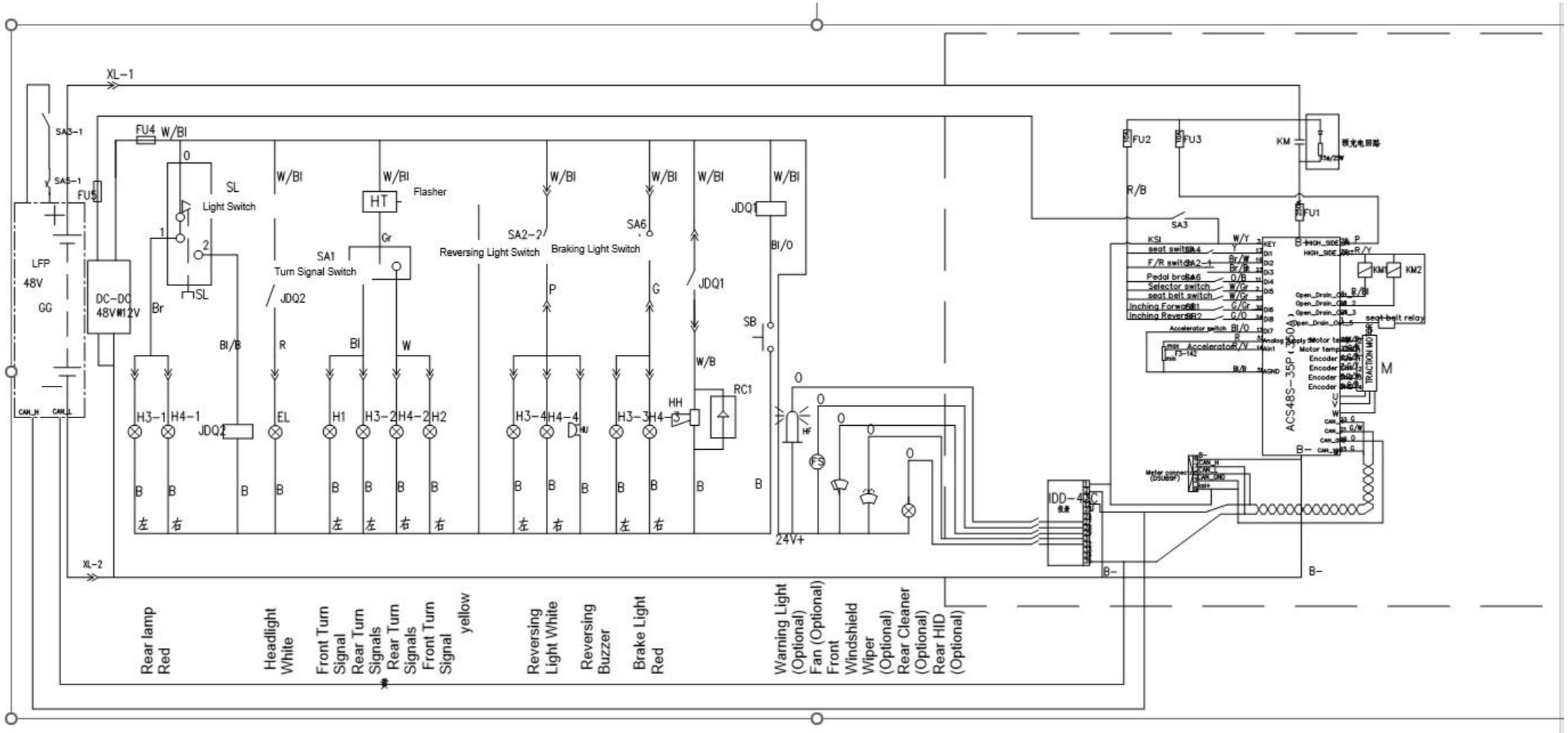
4.7 Electrical System Schematic Diagram



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



QDD60/70/80/90/100-XD3、QDD70/80/90-XD3-L Electrical Schematic Diagram



QDD60/70/80/90/100-XD3-I Electrical Schematic Diagram

VIII. Troubleshooting

1. Common mechanical faults and troubleshooting

Fault	Causes	Troublesh ooting
Rear axle noise	Slew bearing wear or loose	Repair or replace bearings that are severely worn or loose
	The gear teeth or keyway on the shaft are severely worn, causing excessive clearance	Periodic rattling is is caused by damage to individual gear teeth, and the gears should be replaced.
	Metal flaking from gear tooth surfaces or the teeth are broken	Sudden impact sounds during operation are usually caused by broken teeth, open the gearbox cover to check to prevent damage to the machine parts
	Differential gears, inner drive shaft ends or drive shaft gear keyway are severely worn and loose.	Rattling while turning is usually caused by excessive differential planetary gear meshing clearance, or drive shaft keyway wear, in serious cases, these components should be removed and repaired.
	Loose bolt	Tighten the bolts or replace
Hot rear axle	Reduction gearbox main and passive gear meshing clearance is small or bearings are too tight. It may also be caused by poor lubrication	Check the quantity and quality of the lubricant first and replenish or replace if necessary. Then check the main and passive gear meshing clearance and the active bearing tightness
Heavy steering	Steering shaft bend	Check and align the steering shaft
	Slew bearing oil insufficient or wear	Clean and grease parts, replace if damaged
	Chain too tight	Adjust the chain to achieve proper tension
	Low pressure	Inflate to the specified value
Insufficient braking force	Water or oil on friction lining	Wipe or replace
	Uneven friction lining contacting surface or uneven brake pad wear	Hone or replace
	Excessive clearance between lining and pad	Adjust the clearance
	Air bubbles in brake lines	Bleed and adjust
Brakes binding	No free play in the brake pedal	Adjust
	Brake shoes sliding incorrectly	Adjust
Brake noise	Hardened or stained brake pad surface	Repair or replace
	Deformed backing plate or loose	Repair or replace

	screws	
	Deformed and improperly mounted brake shoe	Repair or replace
	Wear of friction disc	Replace

2. Common mechanical faults and troubleshooting

Controller fault codes

Most of the faults in the electrical control system can be displayed by the multifunction display, and the fault information can be obtained from the fault code shown on the digital multifunction display. A hand-held unit is more convenient for finding the cause of the malfunction.

Controller fault diagnosis

Fault Code	Type	Fault	Causes
101	Application fault	Accelerator pedal switch activated when starting the vehicle with the key	Accelerator pedal activated at startup
102	Application error	Direction switch activated when starting the vehicle with the key	Direction switch(front/rear) activated at startup
103	Application error	Forward/rear direction switches both activated	Forward and rear direction switches both activated
104	Application fault	Traction analog voltage error	Accelerator pedal analog overrun (less than 30 or more 2800)
105	Application fault	Traction switch fault	When the accelerator pedal switch is not activated, the analog voltage > 30%
111	Application fault	CAN communication fault	CAN communication electrical failure. It may be caused by incorrect wiring, missing terminating resistors, disconnected terminals, or a broken communication unit.
114	Application fault	Low battery	Alarm when the battery level is less than 25%, travel in low speed when the battery level is less than 15%.
115	Application fault	Start-up process fault	Internal error at start-up
116	Application fault	Lifting switch activated when starting the vehicle with the key	Tilting switch activated at startup
117	Application fault	Pump switch 1 activated when starting the vehicle with the key	Pump switch 1 activated at startup
118	Application fault	Switch 2 activated when starting the vehicle with the key	Pump switch 2 activated at startup
119	Application fault	Pump switch 3 activated when starting the vehicle with the key	Pump switch 3 activated at startup
120	Application fault	Pump switch 4 activated when starting the vehicle with the key	Pump switch 4 activated at startup
121	Application fault	Pump analog voltage fault	Pump analog overrun (less than 10 or more 2800)
122	Application fault	Lifting switch and speed booster fault	When the lifting switch is not activated, the analog voltage > 30%

124	Application alarm	Direction switch activated when driver leaves the seat	Direction switch activated when driver leaves the vehicle. The error disappears after turning off the direction switch
125	Application fault	Main contactor did not close.	Main contactor did not close.
301	Traction alarm	Low temperature of traction ACS	ACS temperature below -20°C
302	Towing alarm	High temperature of traction ACS	ACS temperature above 80°C
303	Towing alarm	Traction ACS temperature sensor fault	Traction ACS temperature sensor disconnected or shorted
304	Traction alarm	Low temperature of traction motor temperature	Motor temperature below -35°C
305	Traction alarm	High temperature of traction motor	Motor temperature above 145°C
306	Traction alarm	Traction motor temperature sensor fault	Motor temperature sensor disconnected or shorted
307	Traction alarm	Traction encoder fault	Motor speed encoder disconnected or shorted
308	Traction alarm	High voltage of traction ACS	For 24V vehicles, the voltage is above 36V; for 48V vehicles, the voltage is above 68V; for 80V vehicles, the voltage is above 98V

Fault Code	Type	Fault	Causes
309	Traction alarm	Low voltage of traction ACS	For 24V vehicles, the voltage is below 18V; for 48V vehicles, the voltage is below 24V; for 80V vehicles, the voltage is below 60V
310	Traction alarm	Traction ACS adopting default parameters	Traction ACS adopting default parameters, the error disappears after reset
311	Traction alarm	Traction power is reduced	ACS output power is reduced
312	Traction alarm	Traction calibration parameter incorrect	Calibration parameter incorrect
316	Traction alarm	Traction current sensor fault	Current sensor adopting default parameters
317	Traction alarm	Traction output port fault	Output port disconnected or shorted
318	Traction alarm	Other traction fault	Other error
351	Traction fault	Traction ACS shorted or motor shorted	ACS shorted or motor U,V,W shorted
352	Traction fault	High temperature of traction ACS	ACS temperature above 125°C
353	Traction fault	High temperature of traction motor	Motor temperature above 180°C
354	Traction fault	Traction ACS current sensor fault	Traction current sensor fault
355	Traction fault	Traction ACS Capacitor not charged after power up	ACS voltage below 85% of nominal voltage within 10 seconds of power-up
356	Traction fault	Traction ACS not responding	ACS not responding, check wiring, if the wiring is correct, ACS is damaged
357	Traction fault	Slave node ACS communication timeout	Slave node ACS communication timeout
358	Traction fault	Towing ACS communication SDO fault	Towing ACS communication SDO fault
359	Traction fault	Master node ACS communication timeout	Master node ACS communication timeout
360	Traction fault	Undervoltage of traction ACS	For 24V vehicles, the ACS voltage is below 18V; for 48V vehicles, the ACS voltage is below 24V; for 80V vehicles, the ACS voltage is below 60V
361	Traction fault	Overvoltage of traction ACS(software)	For 24V vehicles, the ACS voltage is above 36V; for 48V vehicles, the ACS voltage is above 68V; for 80V vehicles, the ACS voltage is above 106V(software testing)

362	Traction fault	Overvoltage of traction ACS(hardware)	For 24V vehicles, the ACS voltage is above 36V; for 48V vehicles, the ACS voltage is above 68V; for 80V vehicles, the ACS voltage is above 106V(hardware testing)
363	Traction fault	Overtemp of traction ACS PCB plate	The temperature of ACS PCB plate is above 125°C
364	Traction fault	Other fault	Other fault
401	Oil pump alarm	Low temperature of pump ACS	ACS temperature below -20°C
402	Oil pump alarm	High temperature of pump ACS	ACS temperature above 80°C
403	Oil pump alarm	Pump ACS temperature sensor fault	Pump ACS temperature sensor disconnected or shorted
404	Oil pump alarm	Low temperature of pump motor	Motor temperature below -35°C
405	Oil pump alarm	High temperature of pump motor	Motor temperature above 145°C
406	Oil pump alarm	Pump motor temperature sensor fault	Motor temperature sensor disconnected or shorted
407	Oil pump alarm	Pump encoder fault	Motor speed encoder disconnected or shorted
408	Oil pump alarm	High voltage of pump ACS	For 24V vehicles, the voltage is above 36V; for 48V vehicles, the voltage is above 68V; for 80V vehicles, the voltage is above 98V

Fault Code	Type	Fault	Causes
409	Oil pump alarm	Low voltage of pump ACS	For 24V vehicles, the voltage is below 18V; for 48V vehicles, the voltage is below 24V; for 80V vehicles, the voltage is below 60V
410	Oil pump alarm	Pump ACS adopting default parameters	Pump ACS adopting default parameters, the error disappears after reset
411	Oil pump alarm	Pump power is reduced	ACS output power is reduced
412	Oil pump alarm	Pump calibration parameter incorrect	Calibration parameter incorrect
416	Oil pump alarm	Pump current sensor fault	Current sensor adopting default parameters
417	Oil pump alarm	Pump output port fault	Output port disconnected or shorted
418	Oil pump alarm	Other pump fault	Other error
451	Oil pump fault	Pump ACS shorted or motor shorted	ACS shorted or motor U,V,W shorted
452	Oil pump fault	Overtemp of pump ACS	ACS temperature above 125°C
453	Oil pump fault	Overtemp of pump motor	Motor temperature above 180°C
454	Oil pump fault	Pump ACS current sensor fault	ACS current sensor fault
455	Oil pump fault	Pump ACS capacitor not charged after power up	ACS voltage below 85% of nominal voltage within 10 seconds of power-up
456	Oil pump fault	Pump ACS not responding	ACS not responding, check wiring, if the wiring is correct, ACS is damaged
457	Oil pump fault	Slave node communication timeout	Slave node communication timeout
458	Oil pump fault	ACS communication SDO fault	ACS communication SDO fault
459	Oil pump fault	Master node communication timeout	Master node communication timeout
460	Oil pump fault	Undervoltage of pump ACS	For 24V vehicles, the ACS voltage is below 18V; for 48V vehicles, the ACS voltage is below 24V; for 80V vehicles, the ACS voltage is below 60V
461	Oil pump fault	Overvoltage of traction ACS (software)	For 24V vehicles, the ACS voltage is above 36V; for 48V vehicles, the ACS voltage is above 68V; for 80V vehicles, the ACS voltage is above 106V(hardware testing)

462	Oil pump fault	Overvoltage of pump ACS (hardware)	For 24V vehicles, the ACS voltage is above 36V; for 48V vehicles, the ACS voltage is above 68V; for 80V vehicles, the ACS voltage is above 106V(hardware testing)
463	Oil pump fault	Overtemp of pump	
464	Oil pump fault	Other fault	Other fault

IX. Tire check and replacement

Unscrew the cap anticlockwise and measure the tire pressure with an air pressure gauge. Increase the pressure to the specified value if it is insufficient. Screw the cap back on after confirming that there is no air leakage; check whether there is damage on the tire surfaces and sides and whether the rims are deformed.

Warning

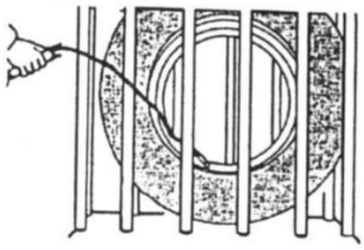
- The tires require very high pressure to bear loads; tiny deformation of the rim or surface damage to the tire may cause an accident.
- When using an air compressor, as the maximum output pressure of the air compressor is higher than the specified air pressure of the tire, the pressure setting should be adjusted first; otherwise, it may cause a serious accident.
- The tire should be placed in a secure protective frame during air inflation.

New executive standard of tire inflation pressure: GB/T2982-2001

Front wheel:

7.2 bar Rear

wheel: 7.2 bar



Driving wheel (rear wheel)

Torque check of hub nuts

Check whether the tightening torque of the hub nuts meets the requirements.

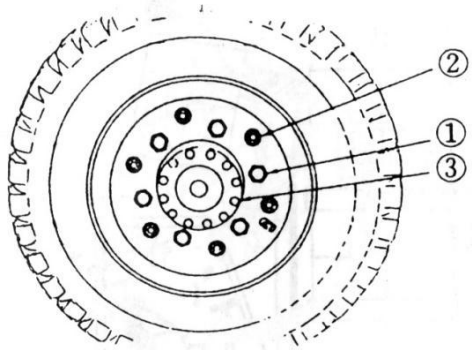
① Hub nut

② Split rim bolt

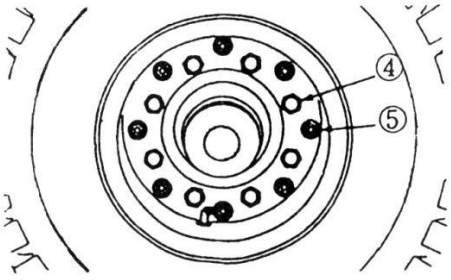
③ Drive axle bolt drive shaft

④ Rear hub nut

⑤ Split rear rim bolt.



Steering wheel (front wheel)



Warning

The tires should not be inflated until all the bolts and nuts are tightened to the specified values; the tire pressure should not exceed the specified value as the tire contains a great deal of stored energy.

Tire replacement

Worn tires should be replaced promptly. When replacing them, jack up the vehicle so that the tire is just off the ground, then put a solid wooden block under the frame. Loosen the hub nuts ① or ④, then replace the tire with a new one and cross-tighten the hub nuts symmetrically.

See the tightening torque value in the Bolts Tightening Torque Table.

Note: Only loosen the rim bolts of the replaced tires after deflating them, otherwise an accident may occur.

Maintenance Record Sheet

Cycle	Maintenance Items	Serviceman

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