NOBLELIFT

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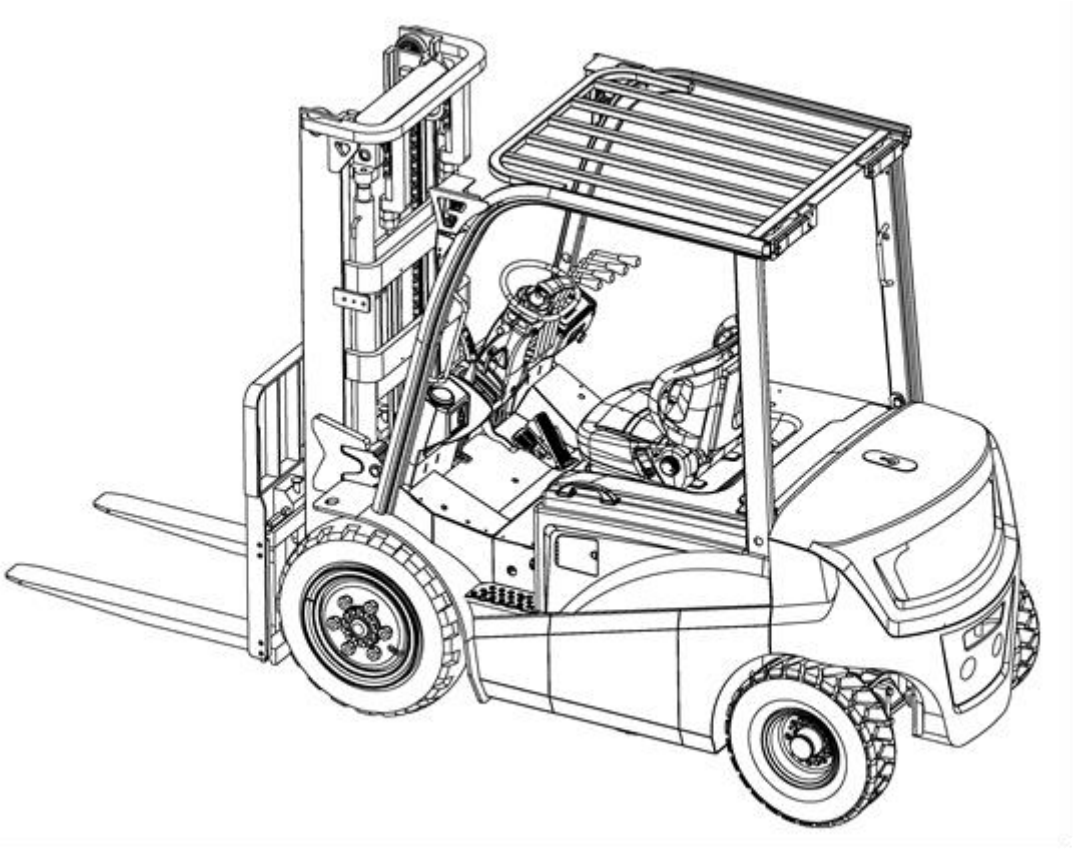
⚠ WARNING

Do not use the forklift before reading and understanding the operating instructions as well as the waring decals on the truck. Keep for future reference.



FE4P30Q-SM-002-2023-EN

Service Manual

FE4P30Q battery balanced forklift

Noblelift Intelligent Equipment Co., Ltd

1.In General

1-1 How to use this manual

1-1-1 Composition of this manual

This service manual mainly provides engineers and technicians service information for forklift repair and maintenance, which excludes vehicle operation instructions.

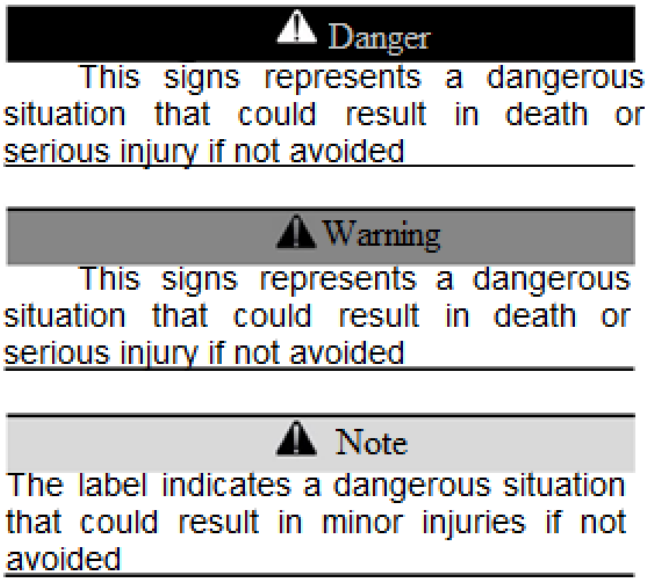
The introduction section of this manual introduces the functions of the vehicle with attention to its different components. More detailed specific information is available in the main body of this manual for you, including the schematic diagram of the vehicle components, the principle they work, the check lists, the maintenance procedures as well as the data and information as needed for maintenance and repair.

To facilitate a quick and easy access to the services and training information as required by the readers, the sections of this manual are categorized as per different systems of the vehicle (Please refer to the table below).

Section	Headings
1	Commonly
2	Electronic System
3	Driving/Braking System
4	Hydraulic System
5	Lift/Tilt/Auxiliary System
6	Steering System
7	Schematic Diagram
8	Miscellaneous
9	Battery Charger

1-1-2 Definitions of Warning Signs

The following three warning signs are applicable to this Manual: "Danger", "Warning" and "Caution". Each label is intended to indicate the severity and nature of the potential hazard, the consequences, as well as preventive measures against hazards. You will find these signs throughout this manual. Please ensure your careful attention to such signs, as they are included for your safety intensively.



1-2 Glossary

The terms referred in this service manual and their descriptions are as follows.

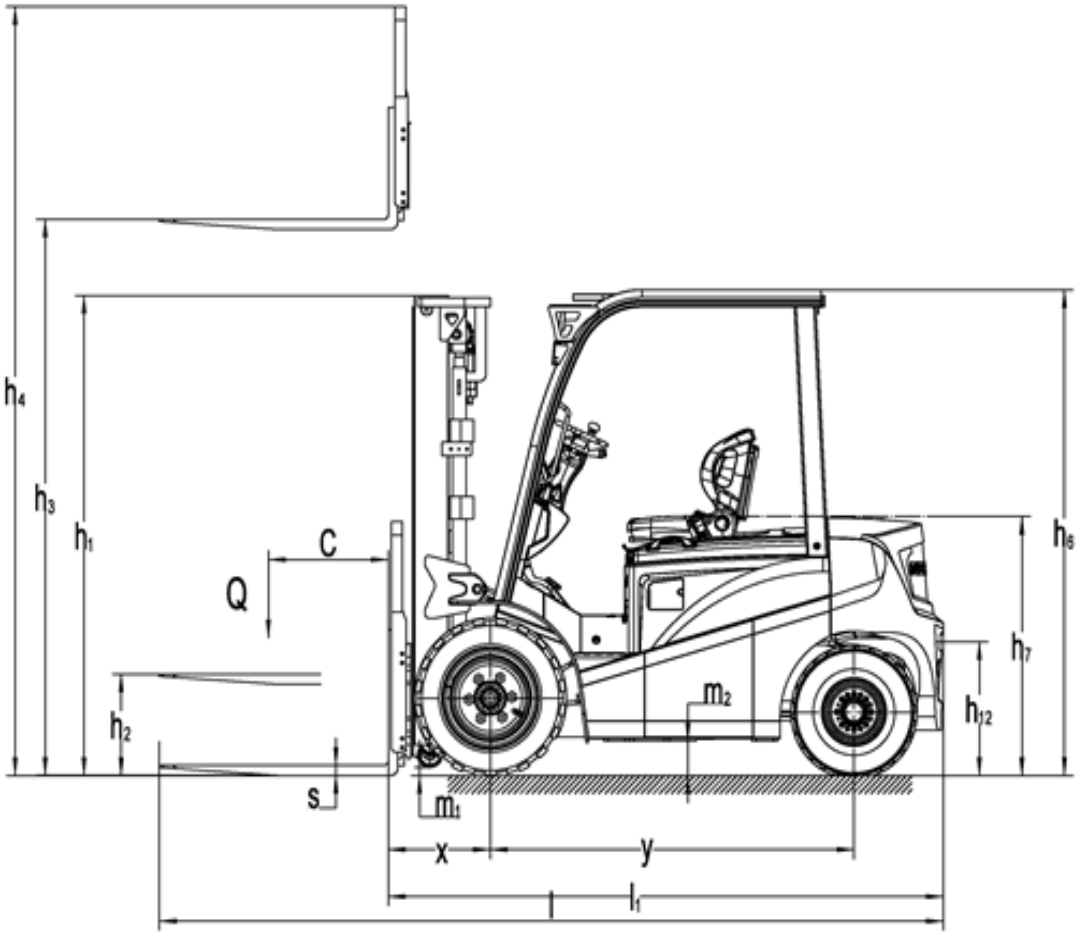
Item	Descriptions
Accelerator	A device that converts mechanical motion to an analog voltage mode and transmit to a controller to control the speed at which a vehicle is driven.
Actuator	A device (e.g. a hydraulic cylinder and motor) that converts hydraulic power into mechanical force and motion.
Ampere (A)	A measurement unit of current. The current of a voltage passing through an ohmic resistor.
Battery	Two or more batteries, which are inter-connected with each other to provide current.
Coulomb meter	(Battery Discharge Indicator) an electrically controlled display that shows the operator the current charge of a battery.
Busbar	A re-conducting conductor that wired to other smaller conductors.
Communication Modes	CAN (Controller Area Network) is the standard for communication among microcontrollers and/or devices.
Condenser	A device for short-time electrical energy storage.
Goods Holder	A supporting structure on which a fork is mounted.
Check Valve	A valve that allows oil to flow in one direction rather than in the other.

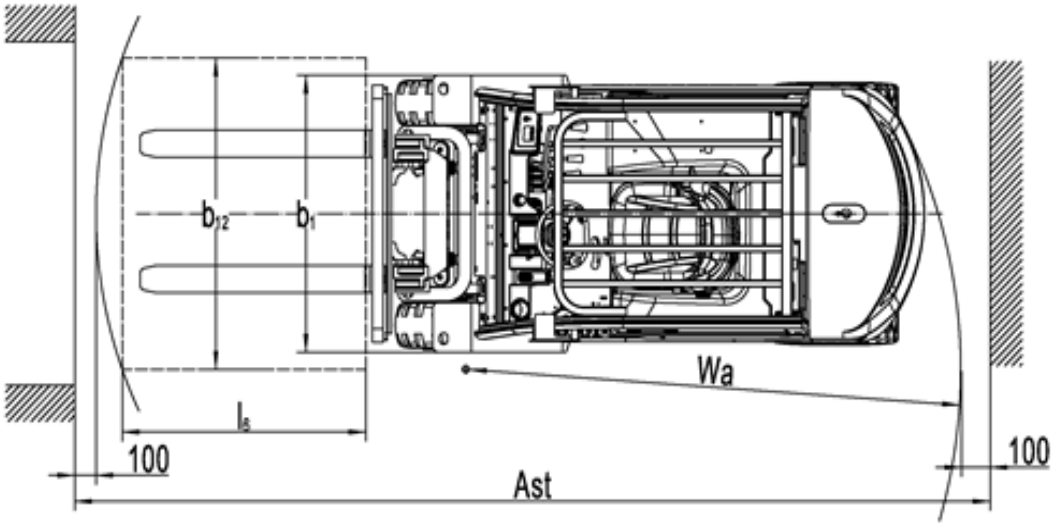
Circuit	A path along which current can travel from the positive (+) side of the source to the negative (-) side. This can be obtained with wires and electrical components.
Connector	A part of a wire assembly or harness wired to another wire assembly or harness to for an easier Disassembly and Assembly operation.
Co-contactor	A switch, relay, or part of a contactor that opens or closes a circuit.
Components of Co-contactor	An electrical element consisting of an electromagnetic coil and a set of heavy contact tips, which controls current flow through the coil, create a magnetic field, and close or open contact tips.
Coil of Co-contactor	An electromagnet used to open or close contact tips in a contactor component.
Control Valve	A valve unit includes multiple directional blocks, each of which has a corresponding actuator.
Counterweight	The weight mounted on the back of the forklift to ensure a stable status, especially when lifting heavy loads.
Current Limiting	The maximum permissible armature current of the stopped drive motor during the pulse.
Oil Cylinder	A container that maintains pressurized oil and converts hydraulic power into rectilinear motion.
DC-DC Convertor	A device that converts a high-voltage DC onto a low-voltage DC.
Digital Signal	A signal in which the element can be either of two different values, e.g. high voltage and low voltage.
Diode	A semiconductor device that allows current to flow from the anode to the cathode in one direction.
Directional Valve	A valve that directs the flow of oil according to the position of the valve element.
display	An electrical device that converts voltage input into a visual output.
Drive Axle	A device that receives power from a driving motor.
Driving Controller	A control device to drive an electric motor, which includes an inverter and a logic circuit.
Handheld Programmer	A maintenance tool program to calibrate and diagnose CURTIS controllers of trucks.
Parking Brake	A pair of brakes that electromagnetically activate their respective motors upon the stationary of the vehicle.
Encoder	A device that detects the direction and speed of a motor to produce a pulse signal.
Fan	A device that generates an airflow to cool an electric motor and a controller.
Filter	A mechanical device used to accommodate a filter element, or a filter device used to prevent contamination flow through a system.
Flow Protector	A valve that prevents the hydraulic oil extraction of the control valve from the lifting cylinder when the hydraulic line breaks unexpectedly, which prevents the mast from dropping suddenly.
Flow Regulator	A valve that reduces the pressure by limiting the flow of a hydraulic line.
Pallet Fork	Two claw objects.
Friction Plate	When meshing with helical gears, the friction disc stops the drive shaft movement when it is compressed by the steel plate.

Fuse	A component of a circuit that opens upon an overlarged current flowing through a given part of the circuit.
Fixture	A fitting o secure an assembly consisting of two or more wires.
Radiator	A mounting frame for cooling semiconductors.
Hydraulic System	A hydraulic element circuit to convey oil pressure.
Hydraulic Oil Tank	A chamber for the oil storage in a hydraulic system.
Mandatory Sign	A symbol indicating the state of a vehicle when it is on or flashing.
Seat Switch	A switch to disable the vehicle movement when the operator leaves the seat.
Main Hydraulic Pump	A gear pump uses mechanical power from an electric motor to pressurize the oil stored in a tank and distribute to various actuators.
Portal	The front vertical structure of the forklift extends and retracts to lift and lower the load.
Master Cylinder	The hydraulic cylinder which is responsible for the start-up of the driving brake.
Needle Valve	A valve to lower the backstay manually when the lifting lever is not available.
Normal State	A term used with switches or relays. Their "normal state" means that they are not under any control of stress, temperature, pressure or electricity.
Ohm (Ω)	A resistance unit. The resistance will be such that one volt shall push one ampere of current through it only.
Timely	The time it takes for a current to flow through a transistor.
Open Circuit	A connection or component of a circuit without continuity.
Hole	A limited passage in a hydraulic circuit, including a limited flow or pressure generation in a given chamber (e.g. a small bore).
Top Cover	A overhead frame structure which protects the operator from falling objects
Overload	A condition that the existing voltage or current is greater than the capacity of a given circuit or component.
Piston Rod	A part that push oil into the cylinder chamber
Suffocated	The part of an electric brake in which the current generated is directed back to the armature.
Port	An input or output point on a hydraulic element
Power Socket	A connecting socket that installed on the forklift.
Pressure	a fluid force as per unit area
Proximity Detector	A sensor, which can detect the presence of objects nearby without any physical contact.
Pump Controller Unit	A control device for a hydraulic motor, which includes an inverter and a logic circuit.
Safety Valve	A valve that limits the pressure of the hydraulic system by releasing excess oil
Resistance	A component made of a material with a specific current impedance.
Return Filter	A filter to collect contaminants in oil returned to a hydraulic tank
Rotor	A part of rotating motor.
Outline	A bar chart of an electrical or electronic component that uses symbols to show the individual components as well as how the wires and connectors work electrically
Serial Port	A port that communicates one-to-one with the controller.
Service Brake	A pair of brakes built into the drive shaft to enable the vehicle when the

	operator applies the pedal for stationary
Short Circuit	An unwanted electrical connection between two or more components.
Side Shifter	An accessory that moves the fork and its load to the left and right
Socket	The male contact of the connector which slides over the male contact of the other connector (pin).
Magnetic Valve	A directional valve that moves the valve element when the magnetic coil is equipped with a magnetic valve.
Solid State	A term that refers to semiconductor components or circuits that wired without moving parts, e.g. diodes and transistors.
Stator	a fixing part in the motor
Steering Shaft	A column that connects the steering wheel to the steering gear to allow the operator to use steering wheel controller
Jociey Stick	A hydraulic component that deliver oil to the right or left side of the steering cylinder as required by the operator
Steering System	Hydraulic element loop, including steering unit, circuit and actuator
Steering Gear	A axle mounted on the rear wheel of a vehicle
Switch（SW）	The component to control a circuit by opening or closing the circuit.
System	Electrical components, circuits, and connections that provide power for specific tasks.
Thermal Sensor	A sensor activated at a pre-conditioned temperature.
USB	A connecting device providing a power supply of 5V.
Valve	A component that controls the pressure, direction, or velocity of a hydraulic system
Voltage	A measurement unit of electrodynamic force. A volt is the force that required for an ampere of current to pass through an ohmic resistor in a circuit.
Watt	A unit of power measurement. The power for one volt to push one ampere of current through an ohmic resistor. The outcomes of amperage (current) multiplied by volts (voltage) is watts (power).
Wire	A path of conductors to provide for current flow in and out of different electrical components.
Wiring Diagram	A visualized figure that represents a component in the way it actually looks. Which is used to show the locations of components, and the connections between them.
Zener Diode	A special diode to regulate voltage or protect a system from overvoltage.

1-3 Performance and Specifications





Model FE4P25-35Q Parameter Table

Model	FEXQ			
Manufacturer`s type designation	FE4P25Q/FE4P25Q2	FE4P28Q/ FE4P28Q2	FE4P30Q/FE4P30Q2	FE4P35Q/FE4P35Q2
Drive Mode	Electric			
Operating Mode	Ride-on			
Rated Capacity of Load Q(kg)	2500	2800	3000	3500
Center Distance of Load C(mm)	500			
Front Overhang x(mm)	478	483	487	492
Wheel Base y(mm)	1620	1700	1800	1800
Self weight with battery kg	3600	3860	4070	4480
Bridge load of full load, front/rear kg	5500/600	6010/650	6390/680	7140/840
Bridge load of empty load, front/rear kg	1540/2060	1680/2180	1750/2320	1960/2520
Front Wheel Size	7.00-12-12PR	7.00-12-16PR	28×9-15-14PR	28×9-15-14PR
Rear Wheel Size	6.00-9-10PR	6.00-9-12PR	6.50-10-10PR	6.50-10-10PR
Front wheel tread b10(mm)	973	973	1004	1004
Rear wheel tread b11(mm)	982	982	982	982
Portal inclination (forward/backwarding)α/β (°)	6/10	6/10	6/10	6/10
Retraction Height of Portal h1(mm)	2070	2070	2070	2185
Retraction height of free lifting h2(mm)	135	135	135	140

Lifting height h3(mm)	3000	3000	3000	3000
Extension height of Portal h4(mm)	4045	4045	4115	4115
Height of overhead guard h6(mm)	2150	2150	2150	2150
Height of seat h7(mm)	1130	1130	1130	1130
Height of traction pin h10(mm)	580	580	580	580
Total length l1(mm)	3568	3663	3773	3818
Length of body(to pallet fork end) l2(mm)	2498	2593	2703	2748
Total width b1(mm)	1150	1150	1226	1226
Size of pallet fork s/e/l(mm)	40/120/1070	45/125/1070	45/125/1070	50/125/1070
Width of fork arm carrier b3(mm)	1040	1040	1100	1100
Wheelbase centre clearance from ground m2(mm)	150	150	150	150
Radius of turning Wa(mm)	2200	2300	2400	2440
Running speed(full/empty) Km/hr	11/12	10/11	11/12	10/11
Lifting speed(full/empty) m/s	0.26/0.34	0.25/0.33	0.26/0.34	0.25/0.34
Lower speed(full/empty) m/s	< 0.6			
Gradeability(full/empty) S2 5mins %	15/15	15/15	15/15	13/15
Drive motor S2 60min kilowatt	10	10	11	11
Lifting motor power S3 15% kilowatt	12	12	12	12

Battery voltage/capacity K5 V/Ann	Lithium battery 80/200 (optional 300/400/554)	Lithium battery 80/200 (optional 300/400/554)
	Lead acid 80/360 (optional 400)	Lead acid (80/400)
Weight of Battery kg	215	215
Working pressure of accessory MPa	17.5	
Oil mass of accessory Litres/minute	36	

1-4 Safety Notes

The following safety sections contains the following subsections: general, personal safety, maintenance safety, compressed air hazards, hydraulic oil hazards, mechanical hazards, electrical hazards, and fire & burning hazards. Each heading are attached with the precautions you should take for your safety while working in your vehicle.

Readers are advised with responsibility to read this manual thoroughly, and understand and follow all the following precautions. Please also note that the safety instructions listed below are not only for the safety of the readers, but also for those around them. Therefore, please be sure to read the following instructions carefully for the purpose of your own personal safety and the safety of those around you:

General

Safety Instructions

Please be familiar with the visible safety instructions on the vehicle, which includes warning signs, stickers, carvings, etc. Make sure to read them before operating, lubricating, or repairing the vehicles (Please refer to the safety section of the Operations and Maintenance Manual).

Make sure that all safety rules, regulations and instructions are followed when performing maintenance tasks. Special attention is required to the danger warning in this manual, which will detail you the potential dangerous conditions.

Do not assume that you can replace the steps outlined in this manual with your previous maintenance experience of similar models. Weight and specifications vary from different models and care is required to avoid any dangerous condition, injury and/or component damage.

Personal Safety

Do not operate or service a vehicle without authorization or training.

Do not operate or service a vehicle after alcohol or drugs taking which will impair your judgement.

If you have any disease or condition that restricts physical activity, please do not operate or service the vehicle.

Working Garment

If you are wearing baggy clothes or have long hair that is not handled safely, please do not operate the vehicle or carry out maintenance.

Both can be caught by any moving part and cause serious injuries

Appropriate protective equipment is required when performing maintenance tasks. Protective gear may include a hard helmet, glasses/visor, ear protectors, gloves and protective shoes.

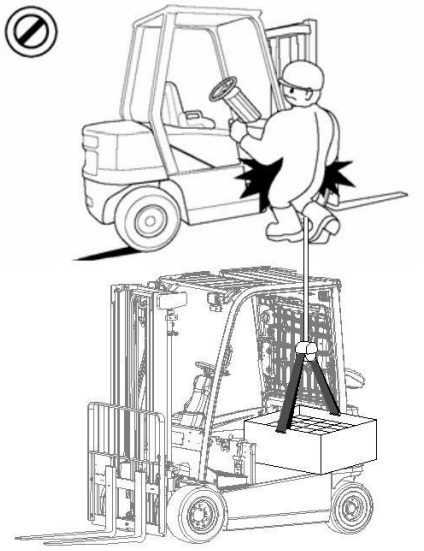
Masks are required when polishing the body and an air breathing device is advised when painting.

Welder gloves, welding masks/goggles, aprons and other suitable welding clothing are required when welding.

Security of Service

Pre-service

Make sure that the vehicle is kept in a clean, open environment, and is free from any traffic and personnel.



Please ensure that the vehicle is parked safely and will not move suddenly.

Place the wooden props in front and back of the wheels and make sure that the parking brakes will mesh correctly.

Make sure that the vehicle is empty and unoccupied, the cargo forks are lowered, all the hydraulic controls are in neutral position and the key is switched to OFF. Place a "do not operate" or similar warning signs to the start switch or the controller before repairing or servicing the forklift.

Make sure the tools are in good condition.

Disassembly and Installation

Make sure the working environment is clean, clean and dry before installing the vehicle.

When using steps, ladders or walkways for installation or removal, please face the vehicle.

Please follow these steps and grab the handle to install or remove parts.

When you are unable to follow these steps, please use a ladder, scaffold, or work platform to perform maintenance operations safely.

Work platform is advised to perform maintenance for safe operations.

Lifting

Check the weight of each component before removal. Partial components of the vehicle may so heavy that it may cause serious injuries

When removing any components, please use appropriate lifting procedures

A hoist is required avoid back injuries when lifting parts weighing 23kg (50lbs) or more.

Ensure all chains, hooks, slings and the like are in good condition and in correct capacity. Make sure the hook is positioned correctly. Lifting ring bolts should not be loaded laterally during lifting operation.

Disassembly/Assembly

Make sure that the assembly/disassembly site is kept clean and dry and that hand tools are kept clean.

When tightening/loosening bolts and nuts, please use a properly sized wrench and always pull towards the body. A wrench with the wrong size or pushing off the body to loosen/tighten the bolt or nut may cause an accident as the handle slips.

If two or more people are working together, signs or signals are required for communication so that the work is done in an agile manner as if it were done by one person.

Be careful when removing the cover. Slowly loosen the last bolt or two opposite direction nuts from the cover plate unit, twist the cover plate to loosen tension or other pressure, and then completely remove the last bolt or two nuts.

Re-install all fasteners with the same numbered part. If any fasteners need to be replaced, please use qualified fasteners and be careful to not use metric system fasteners with British fasteners together.

Hazards of Compressed Air

Please wear protective mask, protective clothing and protective shoes in cleaning operation.

The maximum air pressure for cleaning must be less than 205 kPa (30 psi).

Hazard of Hydraulic Oil

Please follow the following safety instructions for hydraulic system maintenance carefully.

Oil removal under pressure, even if the pinhole size leaks, can penetrate the body elements and cause serious damage and possibly death.

Please wear gloves, goggles, and make sure that your arms and legs are completely covered.

Release all pressure from the hydraulic system before disconnecting or removing any piping, fittings or related item, and wait for the runner system to cool down.

Do not touch the pressurized hose by hand, or bending or striking.

Do not check pinhole leakage by hand, which is the most common method of oil-related injury! Please use cardboard or other solid surfaces instead.

When removing the filler cover, vent and plug, please place the cloth on the port to prevent pressured liquid spraying or splashing

A container shall be prepared to capture any hydraulic fluid that may flow from the hose/port.

Make sure that all raised components are properly locked.

When reinstalling lines, make sure tighten them to the correct torque, and ensure that all heat shields, fixtures and guards are properly installed to avoid overheating, vibration or friction with other components during operation.

Lines must be installed correctly to prevent oil from being sprayed into the shield on the hot exhaust components in case of any pipe or seal failure.

Mechanical Hazards

Keep all the objects away from the fan blades, or they will throw or cut any object or tool that falls or is pushed in.

Do not operate the machine when any rotating parts are damaged and do not touch any other parts during the operation. Please check the balance of any damaged or changed high-speed rotating part before re-use.

The equipment shall be properly supported and the component shall be installed when working under the vehicle.

Do not expect the hydraulic cylinder to be always mounted. If the control lever is moved or the hydraulic line breaks, any accessories may fall off.

Debris or other debris will fly away from the object upon impact.

Make sure the flying debris doesn't hurt anyone before hitting the object.

Electrical Hazards

Do not damage any wire during disassembly operation. When re-installing wiring, make sure it is installed correctly

Do not wire to any oily cable.

Do not smoke or expose batteries to any spark or flame when checking, charging or repairing the batteries.

The chain and metal tools shall be kept away from the top of the battery.

Electrolyte is an acid that can cause injury if it comes into contact with the skin or eyes.

Fire and Burning Hazards

Attention shall be paid to the hot parts on the machine that has just stopped and to the hot oil in the pipes and compartments to avoid scalding.

All hydraulic oils, many lubricants and some coolant mixtures are flammable. If the pipe is loose or damaged, there may be a fire.

All hydraulic oils and lubricants shall be stored in appropriately marked containers and be away from unauthorized personnel.

All oily rags or other flammable materials shall be stored in a protective container and kept in a safe place.

Do not weld or flame cut pipes or pipe containing easy fuel.

Before welding or flame cutting, please clean them thoroughly with a nonflammable solvent.

Remove all residual flammable materials from the forklift and then collect, like fuel and oil

1-5 Maintenance

The following provides the key items and replaceable components to be checked during maintenance intervals.

Note: all maintenance and repair should be carried out by a qualified authorized engineer except for the routine inspection of the vehicle driver.

Note: careless disposal of waste oil is not only harmful to the environment, but also to human health. Waste oil should always be kept in containers and disposed of by authorized personnel at a designated locations.

Necessary Check as Required

Item	Inspection Standard and Method
display Board	Press Enter You can access diagnostic mode by pressing this button while driving
Idler Wheel of Goods Holder	Measure the distance from the bottom of the inner frame to the bottom of the sliding frame bearing to ensure an upright inner frame and then adjust the squeezed roller.
The power module	Must be fully discharged before contact with any electrical components.
Fuse Holders	Check the removed components fuses and replace if necessary. 5A：Backup/parking light, relay/power supply, fan, strobe, flash, rear/headlight 10 A：key switch 20 A：DC-DC Convertor and Horn 500 A：main fuse
Operator's Seat	Check that the operator's seat for proper working and gently lubricate the slider track.
Wheel bolting	Make sure that the wheel bolts and nuts are fixed as follows: Tightening torque of rear wheel : 430 Nm Tightening torque of drive wheel：600±75 N m（442.5±55 lb ft）
Drive axle gear box	Check gear box for lubricant Refill the lube oil into the plug opening for shell level inspection.

Check per 10 service hours or daily

ITEM	Inspection Standards and Methods
Travel system	Check for loose parts and fasteners. Check the dashboard indicator light for abnormalities. Check that the horn and other alarms are functioning properly. Check mast and hoist chains for wear and abnormal pins/rollers. Check the gear rack, forks and attachments for damage and abnormalities. Check tires, valves and wheels for abnormalities. Inspect the roof guard for damage and abnormalities. Check the hydraulic system for oil leaks and damage. Check the transaxle for oil leaks. After adjusting the driver's seat and placing the control lever in neutral, turn the key switch on and check the overall operation of the system.
Mast	Lubricate the beam where the rollers are located.
Batteries (Lead Acid)	Check the battery case for loose connections, frayed cables and properly seated batteries. Clean the top of the battery. If necessary, use 0.5 kg (1 lb) of baking soda and 4 liters (1 gallon) Hot water solution to clean the top of the battery. Check the specific gravity of the battery. If the specific gravity reading is below 1.150, the battery must be charged. Check the electrolyte levels of all cells. Keep the electrolyte level approximately 13 mm above the plate (50 inch). Add water as needed. Use distilled water only. Water should be added after charging the battery
LED Indicator	Check that the parking brake light is working and that the indicator lights
tires and wheels	Check tires and wheels for wear, cuts, grooves and contamination..

First check 50-100 hours or after a week

Item	Inspection Standards and Methods
Drive axle	Change gear oil

Inspection per 500 service hours or 3 months

Item	Inspection Standards and Methods
tilt cylinder	Lubricate chassis and mast pivot bolt fittings. Check the pins for loose retaining bolts or wear. Measure and adjust cylinder rod extension (max. 3.18 mm / 0.13 in) Standard bolt tightening torque: 95±15 N m (70±11 lb ft)
Cross head roller	Check the crosshead roller guard and retainer for damage.
Masts, chains and accessories	Check controls for lift cylinders, tilt cylinders and attachments for proper operation. Check for loose rack bolts and nuts and remove contamination if found. Check forks and attachments for proper operation. Lubricate all chains with a brush and inspect their anchor points for abnormalities.
Steering axis	Fittings for lubricating steering shafts.
Drive axle	Change gear oil.
control Panel	Clean the control panel. Maximum allowable air pressure: 205 kPa (29.7 psi)
F/R switch	Check tightness of F/R switch mounting bracket and adjust as necessary.

	Check for loose wiring and secure if necessary.
Parking brake	Check the parking brake to ensure the vehicle is stationary on a 15% grade and repair or replace if necessary.
Hydraulic oil	Check hydraulic oil level and refill as necessary.

Inspection per 1,000 service hours or 6 months once

Item	Inspection Standards and Methods
Drive and hydraulic pump motors	Dust and inspect the drive motor and end shield area. Maximum allowable air pressure: 205kPa (29.7 psi)
hydraulic oil return filter	Replace the return filter in the hydraulic tank.
tires and wheels	Check tires for wear, cuts, grooves, contaminants, and more. Check the wheel components for cracks, wear, damage, corrosion, etc. Drive Wheel Standard Torque: 180 N m (133 lb ft)
lifting chain	Lift chain wear testing is performed by measuring the wear of the links and pins.

Per 2,000 service hours or annually once

Item	Inspection Standards and Methods
Hydraulic system	Replace hydraulic oil and filter.
rear wheel	Disassemble and assemble the rear wheel to reassemble the bearings.
Basic maintenance	Under normal circumstances, regular inspections are performed at least per 12 months. Regular 6-month inspections if working long hours or under heavy load. Replace if any of the following are found: Crack healing on forks, welding, brackets, etc.

1-6 Lube

The following is a detailed description of the lubricant as required and the parts to be lubricated.

Lubricating Oil Specification

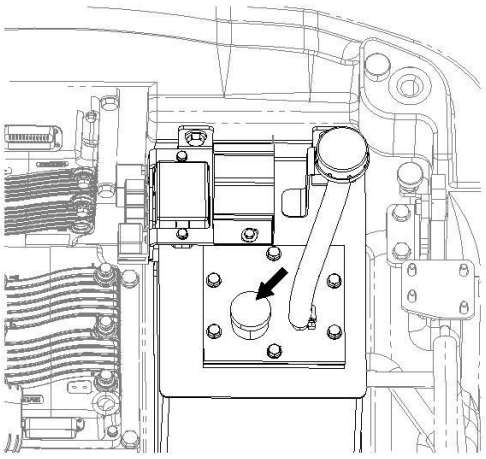
The following lubricants are recommended for chains and connecting rods:

Item	Specification
1	DIN 51825 Standard Oil and Grease

Hydraulic Oil（HYDO）

Hydraulic oils shall be qualified with anti-wear, anti-foam, anti-rust and anti-oxidation additives for heavy duty use as described by the oil supplier. ISO viscosity grade 46 is usually preferred.

Note: the correct hydraulic oil should be used to for the maximum service life and performance of hydraulic system components. The above hydraulic oils are recommended for most hydraulic and hydrostatic systems.



If the hydraulic fluid becomes cloudy, it is evidenced that the water or air has entered the system. Water or air in the system will cause pump failure.

Drain all hydraulic oil, re-tighten all hydraulic suction clamps, and then clean and refill the system.

Gear oil

Failure to comply with recommendations will result in excessive wear of gears leading to shortened service life.

API GL-4 or SAE 80W oil is acceptable

Note: Noblelift does not mix multi-stage oils for transmissions. Multistage oils with high molecular weight polymers as vi improvers lose their viscosity effectiveness due to the permanent and temporary shear of vi improvers and hence are not recommended for use in drives and compartments of drive system

Brake oil

Heavy duty hydraulic brake oil that certified by qualified supplier is required

1-7 Instructions of Disassembly/Assembly

The following parts of Disassembly/Assembly include the following sections: the preparation before disassembly, the inspection and test before disassembly, the matters to be attended during disassembly, the matters to be attended after disassembly, the matters to be attended during assembly, the handling of common parts and hydraulic piping fittings.

The precautions to be taken for proper disassembly/assembly operations are listed in each heading.

Preparation before disassembly

Remove dust and contaminants from the vehicle before transferring to the maintenance centre. Dust or contaminants that enter the maintenance centre may contaminate parts and enter inside to introduce scratches. The electric forklift are operating on an electrical system.

No water shall be allowed inside the system.

To avoid unnecessary disassembly, please prepare necessary tools and place parts inside boxes with priority to site cleaning

Check and test before disassembly

Be sure to record any problems before starting the disassembly, which can prevents unnecessary disassembly, loss of replacement parts, and repeated failures as caused by the same problem.

To prevent failures, record failures and replace required parts are required.

The following information shall be also checked and recorded:

Vehicle model number, serial number and operation hours

Reasons of the vehicle needs to be dismantled

Check for symptoms, locations and causes of failures (repeat the same failure if needed)

Check any part which is not suitable.

Check the parts for damage or looseness.

If possible, check the maintenance condition of the vehicle.

Notes for disassembly

Disassembly：

Determine the way of parts assembly (front/rear, left/right and up/down) for the sequence of disassembly.

Before starting to disassemble parts, attention shall be paid to the join points of parts with arrow marks to avoid misplacing parts during assembly

Please use the right tools to remove specific parts.

If no part is removed, even when mounting bolts and nuts, do not use excessive force.

Do not overstrain. Check and find the causes

Put the disassembled parts on one side in the order of disassembly, and place signs or marks on similar parts.

Store bolts, nuts and other common parts in an orderly manner.

Check and test in disassembly

The cause of the fault is sometimes found in the process of disassembly. Therefore, it is important to carefully examine the condition of the friction surfaces and the contact parts.

During disassembly, gaps, deformations, projections and other factors that may cause failures shall be measured and recorded.

Keep the distance

Make sure that the installed spacers and gaskets will produce the required specific clearance.

Remove pressure fittings

Remove any dent or mark that caused by area hammering and polishing.

If any pressing part is released, please identify and eliminate the cause to avoid problems during assembly.

Bearing Disassembly

Do not remove the bearing forcibly, and a bearing puller is advised.

Notes after disassembly

Be clean

Clean disassembled parts and keep them away from contaminants.

Special attention should be paid to removing contaminants from the oiling or component lines.

When cleaning special parts, increase the number of detergent containers and clean several times.

Kerosene or neutral anhydride diesel is suitable for cleaning viscous oils in bearings.

When using dangerous chemical cleaners, be careful to avoid a skin or eye contact.

Used oil should be disposed of in designated containers at designated locations.

Dust proof

A dust cover is advised to keep cleaned parts free of dust and contaminants and to block up the ends of all pipes.

Any part you may store should be rust-proof before re-installing.

Notes for assembly

Parts installation

All parts shall be kept clean before assembly. All surfaces shall be checked for defects and repaired if necessary. Any contaminant shall not be smeared or rubbed on the surface, which may shorten the service life of the parts.

Before starting assembly, a cleaner is required to remove the rust inhibitor from the parts.

Before assembly, the markings that put the parts together shall be identified.

Bearings, bushings, and seals shall be assembled with press tools and specific parts shall be handled with specified tools.

Before pressing parts, the surface shall be lubricated with lube.

Tighten the bolts and nuts

To ensure a uniform torque of bolts and nuts, the tighten order shown in figure 1-19 shall be followed and then the other end of the other side shall be tightened. This method is known as the "template method", which gradually repeats loosening and fastening to ensure even contact.

Fix the bolts, nuts or other important fasteners that cannot be visually inspected with wires, cotter pins, lock washers or other components as shown in figure 1-20.

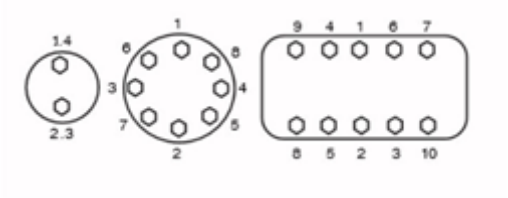


Figure 1-19

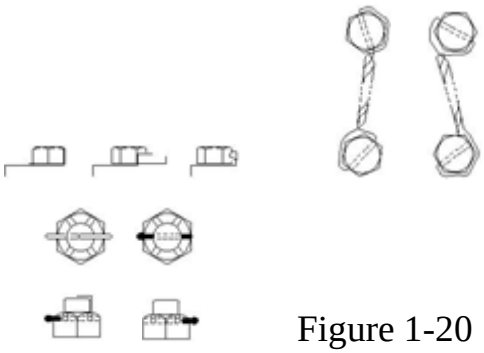


Figure 1-20

Assembly Inspection

At each step of the assembly process, each part's number shall be checked and recorded.

Reassemble the gaskets

Install the gasket and washer in the same position as before, and then check the gap for correctness.

Assembly adjustment

If no adjustments are required, assemble them to the same length as before

Assemble pressed parts

Scratches and dents shall be repaired as needed and be kept clean before insertion.

Please note that press fittings that are not adequately tightened may become loose.

Assemble keys and keyways

Check if the keyway and key are loose and in contact with the key head. If the key head touches the keyway, then the rest of the key head shall be removed.

Handling the general part.

Handling the general parts

Handling the packaging

Packing, as well as gaskets &copper packing should be replaced as instructed. After using the adhesive, please assemble the gasket specified in this maintenance manual. The followings shall be noted when applying the adhesive to the gasket:

Old adhesive, scratches, dust, paint and grease shall be thoroughly removed from the washer surface.

Apply appropriate sealant evenly to both sides of the washer and wait a few minutes until dry.

Once the sealant is dry enough to touch, it won't stick to your hand.

Assemble the parts

Please soak the leather package in oil before use.

Handling the O-rings

Please remember to check the condition of the O rings.

Hardened O-rings shall not be stored for long.

The O-rings to be used shall be the specified once in the parts list. For example, the O rings used in engine oil are made of special materials, such as silicone rubber, and are resistant to heat and aging.

Installing different types of O-rings in this situation can cause serious damage to the system and its components.

The O-rings shall be lubricated to avoid surface scratching during installation. Silicone rubber O rings are prone to damage, hence attention is required to avoid overstretch.

Handling the oil seal

Oil seals shall be prevented from dust sedimentation, especially on the lips, and there shall be no rust or scratch.

Lips opposite to the seal shall be lubricated evenly.

The surface of the shaft where the seal is installed shall be checked for contamination, rust, or scratches and grease or lubricant shall be applied so that the seal can be easily installed.

Oil seal installation.

By gently rubbing the wire on the surface, please check the surface of the oil seal lip for scratches.

If there is any scratch, please replace the oil seal.

When inserting the oil seal, please use the guide device and fixture to avoid any damage to the oil seal.

After the oil seal is inserted, the inclination shall be checked (tilt tolerance: 0.2 mm /00 mm, diameter 0.008 in. /3.937 in.). When applying adhesive to oil seal, make sure that there is no adhesive in contact with the lip surface. All residual adhesive shall be removed from the guide and fixture before inserting another seal.

Bearing handling

The followings shall be noted to properly assemble bearings and avoid damage to bearings:

The dust and other contaminants that may shorten the service life of the bearing shall be thoroughly removed.

The bearing shall be kept packaged until it is installed.

Do not over-turn the bearing to remove the purifier by compressed air.

The oil seal ring shall be installed in the correct direction.

Please note the following when installing the bearing.

Neither hit the outer ring with a hammer for installation, nor hit the inner ring to insert the outer ring. Such hammer strike may damage the bearing track.

When you are insert the inner ring of the bearing with a reasonable tolerance, the fixture is required with pressure to the inner ring. For hot insertion, the bearing shall be heated to 120℃（248℉）. However, please note that excessive heating can reduce the hardness of the bearing surface.

When inserting non-split bearings with inner and outer rings with reasonable tolerances, the fixture shall be applied and both inner and outer rings shall be pressed.

Handle the retainer

When removing or installing the retainer, a pair of right ring tongs is required and attention shall be paid against over-pressure on retainer. After installing the retaining ring, the retaining ring shall be checked for correct insertion.

Hydraulic circuit fittings

1. For metal tube to hose installation, the tube shall be installed and all bolts shall be tightened by hands.

2. Tighten the bolt at the rigid end.

3. Install hose and tighten all bolts by hands

4. Place all the hose in a position where it will not contact with the machine or other hoses.

5. Tighten the bolts at both joints

6. Start up the engine.

7. Move the control lever to full position.

8. Inspect the hose during tool movement. Make sure that the hoses do not contact any machines or other hose.

9. Shut off the motor

10. If necessary, place the hose in a new position so that it will not touch the position when moving the tool.

Fitting assembly with straight thread and O rings (for different applications)

1. Place the lock nut (3), support washer (4) and o-ring seal (5) as far away from the fitting body (2) as possible.

2. Tie the joints to the part it is using until the support washer (4) just touches the surface of the part.

3. Place the joint assembly in the correct position, and turn the joint body (2) outward to 359 °(counter-clockwise).

4. Tighten the locking nut (3) to the torque as shown in the correct diagram for the used fitting.

5. If the end shape of the fitting body is the same as shown in figure 1-25 (elbow or straight), please place the sleeve over the tube before connecting the tube to the end.

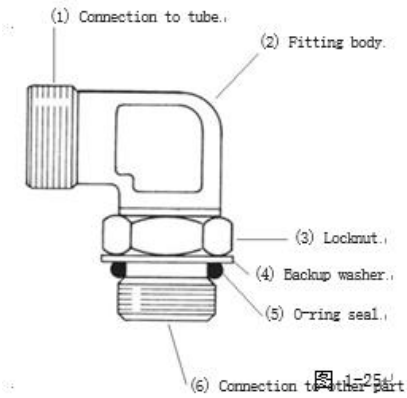


Figure 1-25

Note: if the joint is a connector (direct connector), then the lock nut on the main body shall be replaced by the hexagon nut. To install this type of joint, the hexagon joint shall be tightened to the surface of the parts into which it enters.

Tighten accessories of other types

Pipe fittings (shear sleeve) of high load: please turn the nut with a wrench until a slight reduction in torque is felt after the pipe passes through the nut and touches the shoulder in the fitting body, which indicates that the sleeve has been removed from the nut

High seal fittings: place the nut and sleeve on the pipes with the short end of the sleeve toward the end of the pipes. Press the pipe end against the counterbore in the body of the fittings and tighten the nut until it is above the last thread of the body. As soon as the fitting is removed and reinstalled, the remaining space will be available.

Flexible fittings: please place the nuts and sleeves on the pipes and push the pipes as far as possible into the countersunk holes of the fitting bodies. Tighten the nut until it touches the hexagonal part of the body.

1-8 Standard Torque

1-8-1. Standard torque of bolts and nuts

Be careful that the metric and British size fasteners shall not be mixed in used. Mismatched or incorrect fasteners may cause damages or malfunctions to the vehicle or personal injuries.

Exceptions to these torques may be provided in the service manual if required.

Before installing any hardware, make sure that the components are close to a new state. Threads of bolts and nuts shall not be worn or damaged. Hardware shall be free from rust and corrosion.

Hardware shall be cleaned with a non-corrosive cleaner with oil application to threads and bearing surfaces. Oil shall be not applied if thread locks or other compounds are to be used.

The fastener shall be kept in good condition and reused only in fine conditions after loosening.

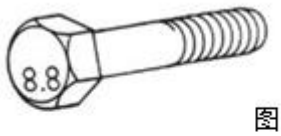
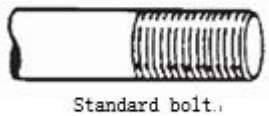
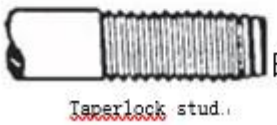


图 1- Figure



Standard bolt



Taperlock stud

图 1-31 Figure 1-31

Make sure to choose the same size and grade of fasteners for replacement.

Generally, you can identify the strength of the bolts based on the numbers marked on the heads (e.g. 8.8 or 10.9) as shown in figure 1-30. The following table are listing the standard torques for typical bolts, nuts and the taper bolts as shown in figure 1-31.

For metric fasten

Thread size(mm)	Metric nuts and bolts		Metric taperlock stud	
	（N · M）	Pounds/feet	（N · M）	Pounds/feet
M6	12 ± 3	9 ± 2	8 ± 3	6 ± 2
M8	28 ± 7	20 ± 5	17 ± 5	13 ± 4
M10	55 ± 10	40 ± 7	35 ± 5	26 ± 4
M12	100 ± 20	75 ± 15	65 ± 10	48 ± 7
M14	160 ± 30	120 ± 22	–	–
M16	240 ± 40	175 ± 30	110 ± 20	80 ± 15
M20	460 ± 60	340 ± 44	170 ± 30	125 ± 22
M24	800 ± 100	600 ± 75	400 ± 60	300 ± 45
M30	1600 ± 200	1200 ± 150	650 ± 80	480 ± 60
M36	2700 ± 300	2000 ± 225	870 ± 100	640 ± 75

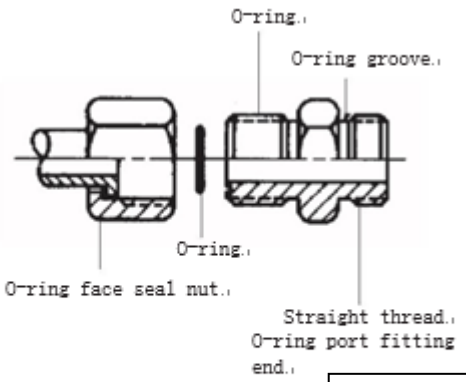
For British fasteners

Thread size(inch)	British nuts and bolts		British taperlock stud	
	（N · M）	Pounds/feet	（N · M）	
1/4	12 ± 3	9 ± 2	8 ± 3	6 ± 2
5/16	25 ± 6	18. 0 ± 4. 5	17 ± 5	13 ± 4
3/8	47 ± 9	35 ± 7	35 ± 5	26 ± 4
7/16	70 ± 15	50 ± 11	45 ± 10	33 ± 7
1/2	105 ± 20	75 ± 15	65 ± 10	48 ± 7
9/16	160 ± 30	120 ± 20	–	–
5/8	215 ± 40	160 ± 30	110 ± 20	80 ± 15
3/4	370 ± 50	275 ± 35	170 ± 30	125 ± 22
7/8	620 ± 80	460 ± 60	260 ± 40	190 ± 30
1	900 ± 100	660 ± 75	400 ± 60	300 ± 45
1 1 / 8	1300 ± 150	950 ± 100	500 ± 70	370 ± 50
1 1 / 4	1800 ± 200	1325 ± 150	650 ± 80	480 ± 60
1 3 / 8	2400 ± 300	1800 ± 225	750 ± 90	550 ± 65
1 1 / 2	3100 ± 350	2300 ± 250	870 ± 100	640 ± 75

1-8-2. Standard torques for fastening fittings

Standard torques for O-ring surface seal fittings

Thread size(inch)	Accessories for straight thread o-ring	
	(N · M)	Pounds/feet
5/ 16-24	5.0±1.5	45±15
3/ 8-24	12±2	110±20
2/7 -16	20±4	15±3
1/ 2-20	40±5	30±4
9/ 16-18	40±5	30±4
3/ 4-16	100±15	75±10
7/ 8-14	135±15	100±10
1 1 / 16-12	200±25	150±20
1 3 / 16-12	250±25	185±20
1 5 / 16-12	300±40	225±30
1 5 / 8-12	300±40	225±30
1 7 / 8-12	300±40	225±30
2 1 / 2-12	300±40	225±30



PIC 1-32

Thread size(inch)	Sealing joint nuts for O-ring face	
	(N · M)	Pounds/feet
9/ 16-18	16±3	12±2
1 / 16-16	30±4	22±3
1 / 16-16	50±7	37±5
1 14	90±10	65±7
1 3 / 16-12	120±15	90±10
1 7 / 16-12	160±20	120±15
1 11 / 16-12	190±20	140±15
2-12	215±25	160±20

Hose clamp- belt type

Clamp width	New hose torque	Torque for re-tightening
7 9 mm (0.312 in)	0 9±0.2 N·m (8±2 lb·in)	0.7±0.2 N·m (6 ±2 lb·in)
1 .5 mm (0.531 in)	4 5±0.5 N·m (40±5 lb·in)	3.0±0.5 N·m (25 ±5 lb·in)
1 .9 mm (0.625 in)	7 5±0.5 N·m (65±5 lb·in)	4.5±0.5 N·m (40 ±5 lb·in)

PIC 1-33

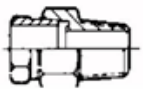
37° bell and straight threaded O - ring accessories

Pic 1-34

图 1-34

37℃ bell and straight threaded O - ring accessories（Sealing accessories for O - ring surface are excluded）				
Nominal pipe external diameter		Thread diameter（in）	Standard torque	
Metric	Inch	Inch	(N·M)	Ponds/Feet
3、18	0.125	5/16	5.0±1.5	4±1
4、76	0.188	3/8	11.0±1.5	8±1
6、35	0.250	7/16	16±2	12±1
7、94	0.312	1/2	20±5	15±4
9、52	0.375	9/16	25±5	18±4
9、52	0.375	5/8	35±5	26±4
12.70	0.500	3/4	50±7	37±5
15.88	0.625	7/8	65±7	48±5
19.05	0.750	1-1 / 16	100±10	75±7
22.22	0.875	1-3 / 16	120±10	90±7
25.40	1.000	1-5 / 16	135±15	100±11
31.75	1.250	1-5 / 8	180±15	135±11
38.10	1.500	1-7 / 8	225±15	165±11
50.80	2.000	2-1 / 2	320±30	240±22

45° bell shape and 45° inverted bell fittings



45° inverted bell

45° bell

| 1-35

45° bell shape and 45° inverted bell fittings				
Nominal pipe external diameter		Thread diameter (in)	Standard torque	
Metric	Inch	Inch	(N · M)	Ponds/Feet
3↵18	0. 125	5/16	5. 0 ± 1. 5	4 ± 1
4↵76	0. 188	3/8	8. 0 ± 1. 5	6 ± 1
6↵35	0. 250	7/16	11 ± 2	8 ± 1
7↵94	0. 312	1/2	17 ± 3	13 ± 2
9↵52	0. 375	5/8	30 ± 3	22 ± 4
11. 11	0. 438	11/16	30 ± 3	22 ± 2
12. 70	0. 500	3/4	38 ± 4	28 ± 3
15. 88	0. 625	7/8	50 ± 5	37 ± 4
19. 05	0. 750	1-1 / 16	90 ± 8	65 ± 6
22. 22	0. 875	1-1 / 4	100 ± 10	75 ± 7

Thread fittings for conical pipes

Thread fittings for conical pipes				
Thread diameter (in.)	Threads with le2200e sealant		Threads without sealant	
	(N · M)	Ponds/Feet	(N · M)	Ponds/Feet
1↵/ 16-27	15	11	20	15
1↵/ 8-27	20	15	25	18
1/8-14	25	18	35	26
3↵/ 8-18	35	26	45	33
1↵/ 2-14	45	33	60	45
3↵/ 4-14	60	45	75	55
1↵11 1/2	75	55	90	65
1↵1 / 4-11 1/2	95	70	110	80
1↵1 / 2-11 1/2	110	80	130	95
2↵11 1/2	130	95	160	120

2.Electric control system

2-1. Overview

This model is equipped with an electrical system with the following components:

1．The battery supplies the power to the electrical system.

2．The emergency switches may be pressed in emergency to turn off all DC and AC circuits.

3．Motors, controllers, and associated equipment are providing the necessary drive and pump power to the vehicle based on their interactions with sensors, switches, relays, actuators, as well as various parameter settings.

4．When the load is supplied at a current above the limit, the fuse will protect all DC loads from overcurrent by cutting off the load's power supply.

5．The DC-DC converter converts the high voltage of the battery to a low voltage or a low voltage load.

6．Other DC loads that activated by the operator's direct requirements will work independently of the controller. First, such DC loads not regulated by controllers and are not the purpose of controllers' signals. However, they may interact with controllers in some configuration. Such loads include light sets and horns.

7．The display board monitors the vehicle, informs the user of its condition and provides basic functions for mode setting, diagnosis and calibration.

8．The handheld programmer provides the same functions as the display board, but are detailed.

2-2. Emergency Stop Button

2-2-1. Appearance and Specifications

Item	Specification
Emergency Stop Switch	CE4T-10R-01

2-2-2. Function

The emergency switch is used to shut off the current in the electrical system in case of emergency, and thereby stopping the operation of the vehicle. When pressed the key, all DC and AC circuits are open except the speaker circuit.

When the emergency switch is opened, the positive terminal of the battery is disconnected from the key switch, thus cutting off all the load power supplied through the key switch. As a result, all DC loads except the horn will be cut off.

2-3. Controller and Related Equipment

2-3-1. Appearance and Specifications

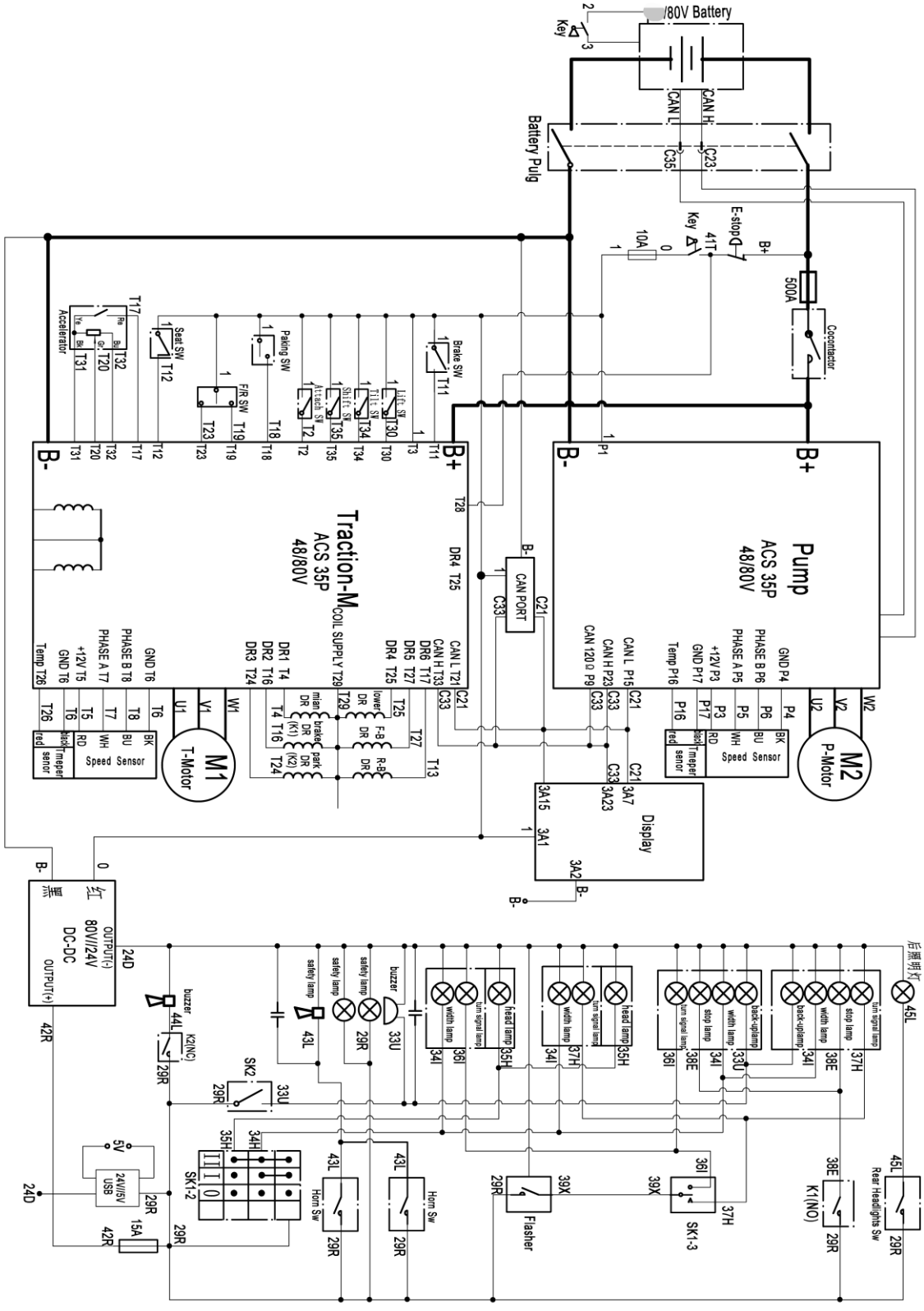
Controller assembly

Inmotion controller

Technical specifications

No.	Description	Specification	Serial Number	Description	Specification
1	PWM Working frequency	10KHZ	8	Accelerator control signal	2 lines of 0-5KΩ/5KΩ-0, 3 lines of potentiometer, 0-5V, current source, electron accelerator
2	Insulation strength with radiator	>500Vac	9	Speed control type	Single end/swing /VCL input
3	Logical port input voltage	If the falling edge > 1.5v, then the voltage is high; if the rising edge >4.4V, then the voltage is high	10	Operating ambient temperature	-40℃ to 50℃
4	KSI input current	<1.0A	11	Storage ambient temperature	-40℃ to 50℃
5	Input current of logical end	<10mA	12	Current limit of over temperature	The current is limited at 85℃ and will cut off at 95℃
6	Maximum output frequency	300Hz	13	Current limit of low temperature	The current will cut off at 40℃
7	Total drive current	<10A	14	Sealing	IP65perIEC529
15	Relevant standards	1) EMC Interference：EN50081-2/08.93；Anti-interference：EN50082-2:1995 2) Safety and Anti-flying：EN1175 3) UL Component Authentication 4) Satisfy the UL583 insulation test			

2-3-2. Circuits and Functions



Electrical schematic diagram of Inmotion controller

Critical Power Supply of Controller

This model is equipped with a drive motor and a pump motor, which are controlled by different controllers.

The forklift is powered by the controllers through key switches and then turned on.

Current to the contactor of the line Power supply of controller.

Once the controller is energized, a magnetic coil built into the line contactor will receive power from the driven motor controller. The two contact points, which act like switches, will then touch each other and connect the lines between the battery and the two controllers. Therefore, the controller becomes a three-phase and three-wire AC power supply and is transmitted to the motor through each UVW connections. The line contactor is equipped with 500A fuse to prevent overcurrent.

Line contactor

The two controllers are connected through the following sensors, switches, relays and actuators.

Key switch
Emergency Switch
Forward/revise units
Accelerator
Seat Switch
Brake pedal switch
Parking brake switch
Hydraulic control switch
Horn relay

These devices provide DC power and interact with controllers that activate or receive data based on a number of parameter settings to control the motor.

The two motor controllers are identical to hardware, but each controller is programmed with different types of firmware to achieve different functions.

The safety & high efficiency performance and complete operation function of electric forklift can be realized by properly setting the motor technical parameters and control technical parameters and function values of the controllers.

1.The crawling speed of electric forklift is adjustable. The crawl speed setting function of the controller enables a long-time operation of electric forklift at a low speed.

2.The acceleration rate is adjustable. The acceleration rate refers to the "soft and hard" feeling of accelerator pedal when operating electric forklift. By setting the acceleration rate, the forklift can meet the requirements of acceleration operation in different working conditions.

3.Plug braking and regenerative braking. The reverse braking signal will be generated when the direction bar is in opposite position, which controls the traction motor to give a braking torque through the motor driver for the purpose of vehicle deceleration. The power level is controlled by the accelerator pedal. Regenerative braking is generated by the controller under the condition that the speed of the vehicle is relatively higher than the speed of the traction motor, of which the braking energy of the vehicle will be converted into electric energy and fed back to the battery. Especially when the electric forklift is on the downhill slope, the regenerative braking to properly reduce the speed of the vehicle on the downhill slope can be achieved through a proper lifting and releasing accelerator foot plate, which thus extends the driving distance of the battery for any single charge.

4.Slope anti-backward slip function. The electric forklift with AC traction motor has the excellent function of staying non-slip on the slope.

5.The maximum driving speed is adjustable. Reasonable setting on maximum driving speed of electric forklift can prevent any overloading of traction motor due to high speed.

6.Static reply switch off. In the event that the seat switch or key switch is disconnected, the control will be turned off and the directional control lever shall be pushed back into the neutral position to restart. If the driver leaves the vehicle and returns at any time, the direction control lever shall be pulled back into the neutral position before restarting. This function may help to avoid any unexpected unsafe operation. A time delay of several seconds is provided at the input end of the seat switch to allow instantaneous disconnection of the seat switch against turbulence.

7.Safety protection function. If the power component of the controller is damaged during operation, the controller will disconnect the main contactor in the shortest time, and the controller will automatically limit the armature current of the motor upon the temperature over rise of the controller. When the battery voltage is too low, the controller will also stop working to ensure safety.

8. Both traction motor controller and oil pump motor controller are functioned with self-diagnosis. When the lead controller come across a fault during operation, the fault code will be displayed on the display and the controller will stop working automatically for the safety of the operating system.

9. The amount of battery power and accumulated working hours will be indicated in display.

2-3-3. Test

A. Controller

The diode voltage of AC MOSFET circuit inside the controller shall be tested and checked for any burn out damage.

According to the table below, each test item shall be tested repeatedly for more than 3 times.

Item	Multimeter terminals		Range of normal value	
	Red indicating pen	Black indicating pen	Polarity measurement	Resistance measurement
1	B+	U/V/W/B-		1MΩand above
2	B-	U/V/W		1MΩand above
3	U/V/W	B+	0.3-0.6V	
4	B-	U/V/W	0.3-0.6V	

Pull multimeter to Ω mode (resistance) Pull the multimeter to the diode mode (polarity measurement)

1). Remove the cables and wires that connected to the controller, and release all the internal power of capacitor (discharge the B + and B - terminals with 30 Ω resistance).

2). Test the diode voltage (0.3-0.6v) with a multimeter and check if it is normal.

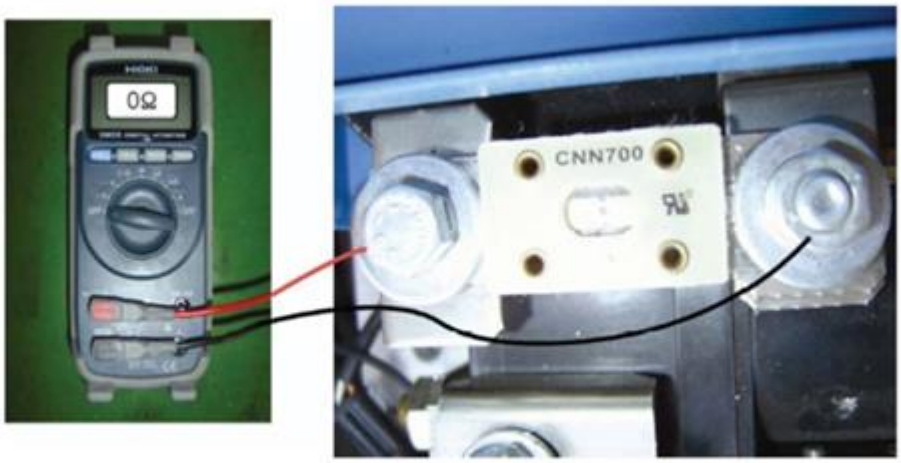
Test1： Read the diode voltage, through which the red wire is B-, the black wires are U, V and W.

3). Test 2： Read the voltage of the diode to U, V and W, and the black lead to B + with red wires.

Notes: The multimeter pointers shall not be inverted in use

Line contactor and fuse

Figure 2-22
Line contactors



Line fuse Figure 2-23

For line contactors and line fuses, an ohmmeter shall be connected at the point shown in the figure and shall be tested for the specified value.

2-3-4. Disassembly and Installation

Access to control panel

1. Disconnect the battery connector.

2. Keep the key switch open to discharge the power module. Twice for 30 seconds.

3. Close the key switch

4. Remove the top cover（1）to enter the drive motor controller and the pump motor controller.

Note：Please remember that the controller contains ESD (electrostatic discharge) sensitive components.

Appropriate precautions should be taken when connecting, disconnecting and handling.

Disassemble/install drive motor controllers

Note： Please remember that the controller contains ESD (electrostatic discharge) sensitive components.

Appropriate precautions should be taken when connecting, disconnecting and handling.

1. Disconnect the control harness from the controller connectors

2. Disconnect U, V and W cables. Tightening torque： 9.5±1 N·m (7.0±0.7 lb·ft)

3. Remove B+ and B- wires from the drive motor controller

4. Loosen and remove the drive motor controller

5. Perform the above steps in reverse order to install the drive motor controller

Disassembly/installation of line contactor

1. Disconnect the cable from both terminals.

2. Remove the line B+ from the line contactor.

3. Loosen the bracket screw.

4. Remove the line contactor

5. Perform the above steps in reverse order to install the line contactor

Disassembly/installation of line fuse

1. Remove B+x line from line fuse.

2. Remove the line fuse.

3. Perform the above steps in reverse order to install the line fuse

2-4. Miscellaneous Load

2-4-1. Fuse holder

A. With the function and composition to protect DC load from overcurrent, the fuse box is equipped with the following terminals:

Description	Specification
FU1	15A
FU2	10A
FU3	10A
FU4	10A

B. Disassembly and Installation

Preliminary steps

1.Close the key switch

2.Disconnect the battery connector.

3.Remove the cover.

Steps

1.Disconnect the two harness connections from the fuse box.

2.Remove the bolts and washers, and then remove the fuse holder

3.Perform the above steps in reverse order to install the fuse holder

Note: when replacing fuses, new fuses of the same type and specification shall be used to avoid any electrical damage. If the fuse blows out frequently, there may be an electrical fault.

2-4-2. DC-DC Convertor

A. Appearance and Specifications

Item	Specification
Maximum power	IN 300W
Input voltage	DC 80V
Output voltage	DC 24V

B. Circuits and Functions

The DC-DC converter power supply (80V/) into a 24V power supply, which is suitable for various loads.

The functions of each terminal are as follows:

1.The INPUT terminal receives power from the battery to activate the DC-DC converter.

2.Collect the OUPUT terminal with green （24V+), which overrides the load supplied from the converter and then passes the fuse box to the load.

The terminal overrides the load supplied from the converter and then passes the fuse box to the load.

2-4-3. Lamp Bank

This model is equipped with a variety of lamps, each of which has a different purpose.

Headlights (L/R) illuminate the path in front of the vehicle

The rear lights illuminate the path behind the vehicle

The reverse lights will turn on during reverse operation

Press the brake pedal and the brake light will turn on

2-4-4. Horn

The horn is powered directly by a battery. It is used to sound an alarm to warn people around.

2-5. Display panel

2-5-1. Display introduction

A new type of combination display is adopted to realize auxiliary control function and provide driver's vehicle condition display interface. It consists of control circuit, accumulated time counter (LCD), battery power meter, fault code display and other display circuits. According to the current demand of electric vehicles, this display has made a new design in the control circuit and display form, which can provide intuitive vehicle status information for drivers, with compact structure, beautiful appearance, high degree of automation and reliable quality.

2-5-2. Function

Instrument display function（Inmotion system）

1	Tortoise speed	11	E Mode
2	Fault alarm	12	S Mode
3	Battery alarm	13	Battery level
4	Lift lock	14	Travel Speed
5	Seat	15	Steering Angle
6	Parking	16	Forward/Reverse
7	Cancel	17	Speed Mode
8	Enter	18	Working Time
9	Tortoise Mode		
10	P Mode		

Indicator function

NO.	Parameter Name	Description	Remarks
1	Tortoise speed lamp	Light up when the vehicle is running in turtle speed mode	
2	Fault light	Light up when the vehicle fails	
3	Battery lamp	When the battery level is lower than or equal to 20%, the default value is 20%	
4	Lift lock lamp	When the power level is less than or equal to 10%,the lift lock lamp is on, and the default value is 10%	
5	Seat lights	Seat switch on when off	
6	Handbrake lamp	Light up when the handbrake is on	

Key functions

Icon	Name	Function
	Up key	Move the cursor up or add 1 to the selected number; Switch S mode (tortoise speed mode) on the main interface; When entering a password, it represents 1;
	Left shift key	Move the cursor to the left; Switch P mode on the main interface; When entering a password, it represents 3
	Right key	Move the cursor to the right; Switch E mode on the main interface; When entering a password, it represents 4;
	Move Down Key	Move the cursor down or subtract 1 from the selected number up; When entering a password, it represents 2;
	Escape key	Cancel the current content or return to the previous menu level;
	Confirm key	Confirm the current operation and enter the menu mode under the main interface;

The initial operator password for entering the menu is "11111";

Key combination

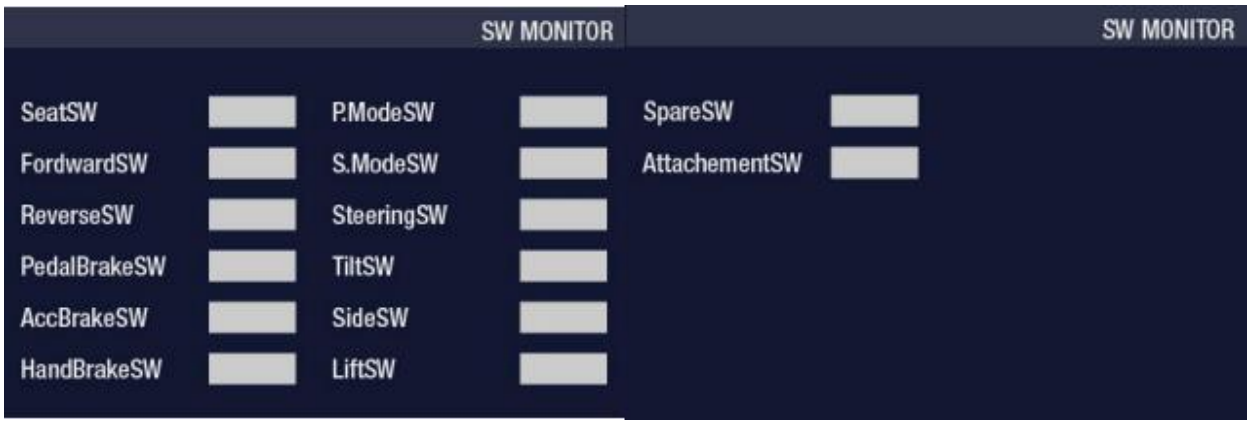
Icon	Name	Function
	Up key	In the main interface, press the "Up" and "Down" keys simultaneously to view the instrument information, including the instrument number, SIM card number, and software version number

Display content of startup interface

Interface display		Function description
1	Battery power and value	Display battery power range 0-100%; The icon is red when the battery level is 0-9, yellow when the battery level is 10-19, green when the battery level is 20-100 in lead acid mode, and blue when the battery level is in li-battery mode (the battery level alarm value is 20 in lead acid mode, and 21 in lithium mode). The icon filling is displayed as the battery level increases
2	SPE mode switching	Switch to S, P, and E speed modes
3	Forward and reverse switch	When the forward switch is closed, the forward icon is displayed, when the reverse switch is closed, the reverse icon is displayed, and when both forward and reverse are not closed, the neutral N icon is not displayed
4	Speed switching	Vehicle speed display, switch speed display with decimal display in other settings
5	Speed unit	When switching speed units in other settings, the display of km/H or MPH can be switched, and the speed value will change with the unit switching
6	Steering angle	The steering angle range is displayed as -90°to 90°, with the pointer pointing left at -90° and pointing right at 90°. The value increases in clockwise increments.
7	Chinese and English mode	The interface displays “模式" in Chinese and "Mode" in English
8	Hour meter display	Display the working time in the controller, with an accuracy of 1h or 0.1h
9	Trouble display	The main interface displays fault E : xxx, and the fault name is displayed in the operation monitoring

2-5-3. Menu functions

a. Switch monitoring display content

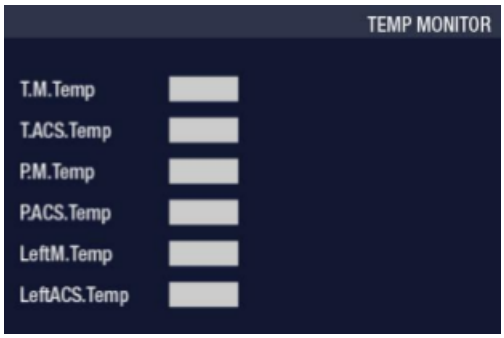


SW MONITOR		Function Description
1	Seat SW	Displays the status of the seat switch, with 0 representing open and 1 representing closed
2	Forward SW	Displays the forward gear switch status, with 0 representing open and 1 representing closed
3	Reverse SW	Displays the status of the reverse gear switch, with 0 representing open and 1 representing closed
4	Pedal Brake SW	Displays the status of the brake pedal, with 0 representing open and 1 representing closed
5	Acc Brake SW	The accelerator pedal status is displayed, with 0 representing open and 1 representing closed
6	Hand brake SW	Display the parking/ handbrake switch status, with 0 representing open and 1 representing closed
7	P. Mode SW	Display the P mode switch status, with 0 representing open and 1 representing closed
8	S. Mode SW	Displays the S mode switch status, with 0 representing open and 1 representing closed
9	Steering SW	Display the steering switch status, with 0 representing open and 1 representing closed
10	Tilt SW	Display the tilt switch status, 0 represents open, 1 represents closed
11	Side SW	Displays the sideshift switch status, with 0 representing open and 1 representing closed
12	Lift SW	Display the lift switch status, 0 represents open, 1 represents closed
13	Spare SW	The standby switch status is displayed, with 0 representing open and 1 representing closed
14	Attachment SW	Display the switch status of the accessory, 0 represents open, 1 represents closed

b. Operation monitoring display content

OPERATE MONITOR		Function Description
1	Key On Hour	Display the startup and operation time of the traction controller
2	T. Enable Hour	Display the running time of the traction controller
3	P. Enable Hour	Display the operating time of the oil pump controller
4	Steer Pot Val	Display the steering analog AD sampling value, which can be used to check whether the steering potentiometer signal is normal
5	Accel Pot Val	Display the analog AD sampling value of the accelerator pedal to determine whether the accelerator signal is normal
6	Lift Pot Val	Display the analog AD sampling value of the lift pump to determine whether the lift potentiometer signal is normal
7	P. Motor Voltage	For semi AC configuration, DC pump empty output monitoring
8	T. Fault Info.	The main interface displays fault codes, and traction fault information is displayed in operation monitoring
9	P. Fault Info.	The main interface displays fault codes, and the operation monitoring displays oil pump fault information

c. Temperature monitoring display content



TEMP MONITOR		Function Description
1	T.M. Temp	Display the current traction motor temperature
2	T.ACS. Temp	Display the current traction drive temperature
3	P.M. Temp	Display the current pump motor temperature
4	P.ACS. Temp	Displays the current pump driver temperature
5	Left M. Temp	Displays the current left drive wheel motor temperature for dual drive vehicles
6	Left ACS. Temp	Displays the current left drive wheel drive temperature for dual drive vehicles

d. Current monitoring display content

CUR MONITOR		Function Description
1	T. Rms Cur.	Display the traction motor current when the vehicle is traveling
2	P. Rms Cur.	Displays the pump motor current when the vehicle is lifted
3	Left Rms Cur.	Displays the left drive wheel phase current for dual drive vehicles

e. Traction setting display content

T.M. SET		Function Description
1	T.E. Max Speed	Traction max speed for E running mode.
2	T.E. Acc	Traction max acceleration for E running mode
3	T.REDU. Brake	The braking rate when the accelerator is not released. The higher the value, the stronger the braking effect
4	T.NEU. Brake	Traction max deceleration at the neutral brake. The higher the value, the stronger the braking effect
5	T.REV. Brake	The braking rate when switching in the forward and reverse directions. The greater the value, the stronger the braking effect
6	T.PED. Brake	Traction max deceleration at the pedal brake, The higher the value, the stronger the braking effect
7	T.S. Max Speed	Traction max speed for S running mode
8	T.P. Max Speed	Traction max speed for P running mode
9	T.P. Max Acc	Traction max acceleration for P running mode. Higher values accelerate faster
10	T.Pot. Active High	Maximum effective value of accelerator analog quantity, used for accelerator calibration
11	T.Pot. Active Low	Accelerator analog minimum effective value for accelerator calibration
12	T.Pot Error.High	Accelerator analog quantity higher than this value reports a fault
13	T Pot Error Low	Accelerator analog quantity below this value reports a fault
14	T.Rev Speed Scale	The speed ratio in reverse, 102 represents 80% of the forward speed
15	Fan On Temp	The temperature for turning on the fan
16	Fan Off Temp	The temperature for turning off the fan.
17	Roll Back Active Time	Active Roll Back function the unit is ms
18	T.SPE. Max Speed	Used to set the speed of the SPE mode

f. Pump setting display content

P.M. SET		Function Description
1	P. Max Speed	Pump drive max speed
2	P. Lift Accel	Pump drive max acceleration， The higher the value, the stronger the acceleration effect
3	P. Lift Speed	Set the maximum rotational speed for lifting. The higher the value, the faster the lifting speed
4	P. Creep Speed	Set the maximum hydraulic steering speed
5	P. Tilt Speed	Set the maximum tilt speed. The higher the value, the faster the tilt speed
6	P. Side Speed	Set the maximum rotation speed for sideshift. The larger the value, the faster the sideshift speed
7	P. Attachment Speed	Set the attachment maximum speed. The larger the value, the faster the accessory speed
8	P. Spare Speed	Set the spare maximum speed. The higher the value, the faster the speed
9	P. Lift Decel	Set the lifting deceleration. The higher the value, the stronger the deceleration effect
10	P.L.Pot.Active High	Maximum effective value of lifting analog quantity, used for lifting potentiometer calibration
11	P.L.Pot.Active Low	Minimum effective value of lifting analog quantity, used for lifting potentiometer calibration
12	P.L.Pot.Error High	If the lifting analog quantity is higher than this value, a fault will be reported
13	P.L.Pot.Error Low	Failure is reported when the lifting analog quantity is lower than this value

g. Battery settings display content

BDI SET		Function Description
1	BDI	The BDI value.
2	Bat. Voltage	Displays the battery voltage detected by the controller
3	BDI.Reset SW	not used
4	BDI.Reset Vol	When the battery voltage exceeds the reset voltage value and the battery power is lower than 70%, the battery power is reset to 100%
5	Bat.Full SW	not used
6	Bat.Full Vol	Voltage value set when the battery is fully charged
7	Bat.Min SW	not used
8	Bat.Min Vol	Voltage value set when the battery is empty
9	BDI.Decrease SW	Consistent with controller values
10	BDI.Decrease Rate	Rate at which power drops
11	Bat.Min Add SW	not used
12	Bat.Min Add Vol	not used
13	Bat.Max Add SW	not used
14	Bat.Max Add Vol	not used
15	BDI.Led Level	When the battery power reaches this value, the battery power display icon on the main interface of the instrument lights up (if parameters need to be modified, the actual effect is that 20 represents lead acid mode, and 21 represents lithium mode)
16	BDI.Lim Level	When the battery power reaches this value, the lifting lock display icon on the main interface of the instrument lights up, lifting is prohibited, and travel speed is limited

h. Steering setting display content

STEER SET		Function Description
1	Steer Lim Speed On	Activate the turn speed limit function
2	Steer Min Lim Scale	Speed ratio during cornering
3	Steer Pot Active High	Maximum effective value of steering analog quantity, used for steering potentiometer calibration
4	Steer Pot Active Low	Steering analog minimum effective value, used for steering potentiometer calibration
5	Steer Pot Error High	If the steering analog quantity is higher than this value, a fault is reported
6	Steer Pot Error Low	Steering analog quantity below this value reports a fault
7	Steer Pot Neau High	not used
8	Steer Pot Neau Low	not used
9	Start Reduce Angle	Angle used to set the start of speed limit
10	End Reduce Angle	Used to set the angle at which the speed limit ends
11	Steer Pot Mid Value	Intermediate value for calibrating the point potentiometer

i. Other settings display content

Other set		Function Description
1	Language Set	Chinese and English language selection
2	Store Para	Write a value of 1 to save the modified parameters
3	Restore Para	Write a value of 1 and restore to the factory default value
4	Version	Display instrument software version information
5	T.C. Version	Display traction electronic control software version information
6	P C. Version	Display pump electronic control software version information
7	S.C. Version	Display steering electronic control software version information

2-6. Jiachen HDU 1296

2-6-1. Function introduction

The Handheld Unit is a powerful and intuitive programming and diagnostic tool that can monitor and modify controller parameters online, allows users to save parameter files online, saves the parameter files to the Handheld Unit or an external USB storage device, and sends the edited parameter files to the motor controller when online.

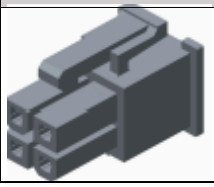
Fault diagnosis and troubleshooting tasks can be performed, which is convenient for users to analyze the cause of the fault. It is widely used in industrial vehicles of Inmotion electronic control system.

Technical parameters

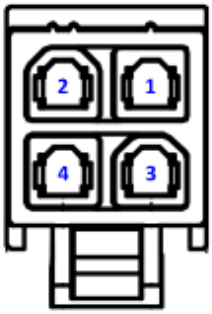
No.	Parameter	Value	Units
1	Rated operational voltage	12~96	VDC
2	Working temperature	-20~70	℃
3	Storage temperature	-40~85	℃
4	Working humidity	95% RH max	RH
5	Degree of protection	IP51 on the front, IP40 on the back	-

Interface pin definition

The external power supply and communication interface of the Handheld Unit adopts the RJ45 network port, which is connected to the electric control through a spiral adapter cable, and the spiral wire interface is a Molex 4PIN connector.

Plug model	Plug picture	Pin model
Molex 4-pin connector, Mini -Fit Jr.™ (5557) series, 0039013048 Molex 4, Mini -Fit Jr.™ (5557), 0039013048		0039000077 Or 39 -00 -0038

The schematic diagram of the interface pin number:



The interface pin definition:

Pin number	Description	Pin number	Description
1	CAN_L	3	CAN_H
2	-	4	B+

KEY

The Handheld Unit uses silicone buttons, a total of 13 buttons, which are up, down, left, right, increase, decrease, F1~F3 function buttons, power button, favorites button, home button, and help button.

Function buttons: F1~F3 function buttons, Corresponds to the content at the bottom of the screen, this button is invalid when there is no content;

Arrow buttons: Arrow buttons can switch up, down, left and right on the main interface; enter the application, the left key can also return to the previous menu item, and the right key can enter the next menu item;

+/- button: In the parameter modification interface, it is used to increase or decrease the parameter; in other interfaces, it is the parameter page turning function; the current value can be switched in the scrollable items, such as language selection, backlight brightness, etc.;

Power button: The power button can turn on or off the Handheld Unit

Under AA battery power supply:

1) When the Handheld Unit is running, press the power button on any interface for 3s, the Handheld Unit will shut down;
2) After the Handheld Unit is turned off, press the power button for 1 second, and it will restart to run.

Favorites button: This button is another way to quickly start the application. This button can view the list of added favorites.

Home button: Press this button in the main interface to cycle through various applications. Press the main interface key in other interfaces to return to the main interface display.

Help button: Press this key to view the help text for the current interface, and close the help text display when you press this key again.

2-6-2. Function description

Main interface menu

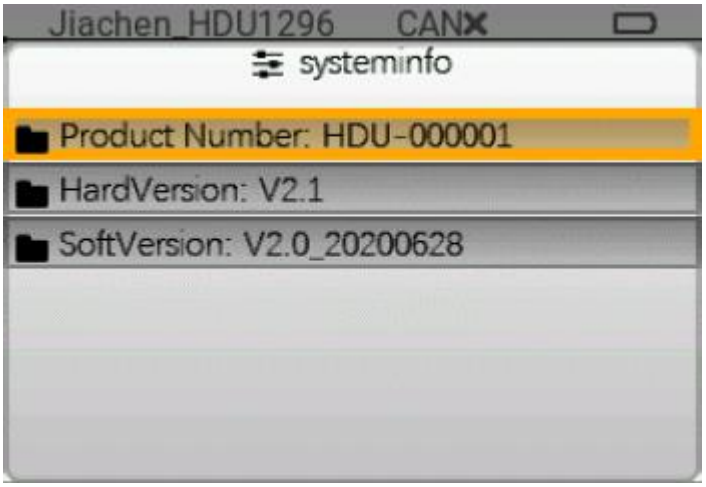
The main interface of the Handheld Unit includes 9 function button icons, USB connection status, CAN connection status and low battery indication. Operate the 4 direction buttons to switch the main interface function icons, the highlighted icon is the selected icon, press the home button to cycle through the function icons press the confirmation key F3 corresponding to the function key to enter the application function sub -interface.

Main interface

Description of the main interface content

No.	Parameter name	Description
1	Battery level	When the battery level is low, an empty battery icon appears;
2	Connection status	Display CAN communication status. When the device receives CAN data, it displays CAN ; when the device does not receive CAN data for 1s over time, it displays CAN ; When the USB selects the Master mode and inserts the USB storage device, the USB icon can be displayed;
3	System Information	Display product serial number, hardware version number, software version number;
4	Parameter setting	Modify the setting parameters of the electric control;
5	Parameter Monitoring	View the monitoring parameters of the electric control;
6	Fault information	View current faults and historical faults;
7	Programming	used to obtain all the parameters and values of the controller (according to the currently confirmed protocol, store the consistent and valid data), which can be exported to the internal Flash; The parameters of the internal Flash can also be restored to the electronic control;
8	Favorites Items	used to favorite customer monitoring parameters and setting parameters;
9	System settings	Set the current backlight brightness, communication mode, and USB mode;
10	File management	Perform file management on external USB storage devices; Manage files stored in internal Flash;
11	Graphic display	It is used to observe the change curve of monitoring parameters and can store the data;
Show item subtotal		

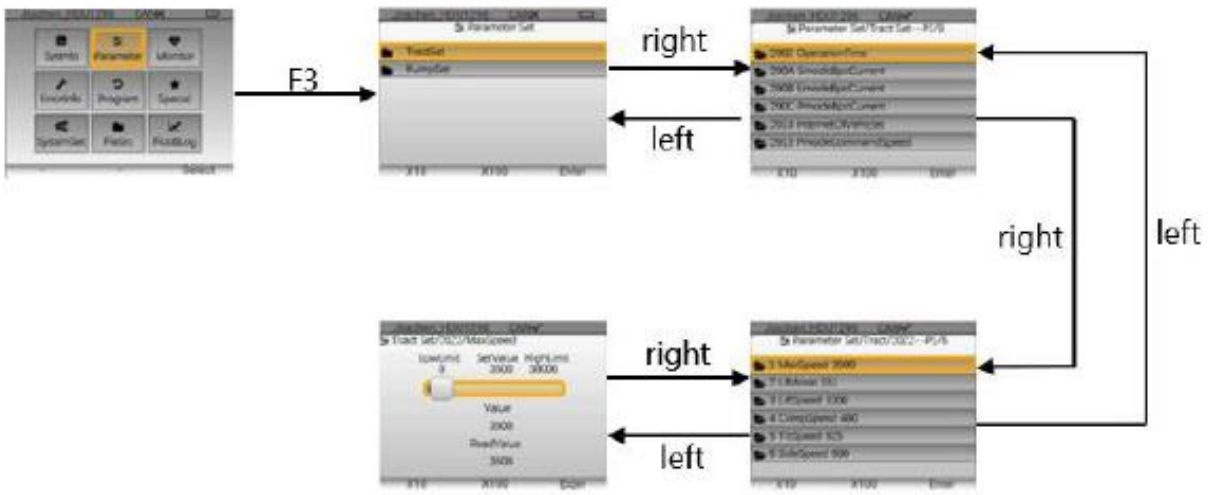
2-6-3. System Information



System Information Interface

Parameter setting

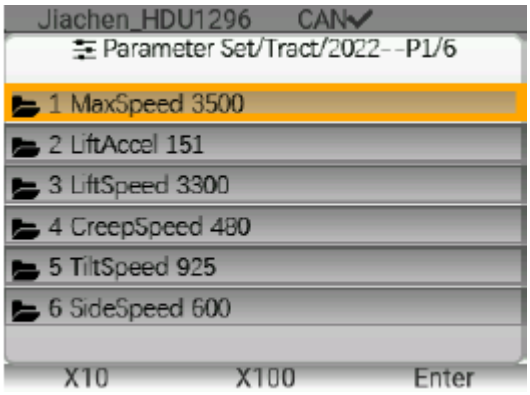
Select the "**Parameters**" function icon in the main interface and press the "**F3**" key to enter the parameter setting sub -interface; the parameter setting sub -interface is divided into Tract Set and Pump Set, which are allocated according to the index address and sub -index of the CAN open protocol; total Tract Set parameters 292 items, a total of 220 items for Pump Set parameters; each page displays up to 6 parameter items; in the sub -interface, press the "**right key**" or "**F3 key**" to enter the next sub -menu; press the "**left key**" ", will return to the previous sub -menu, the up and down keys are used to select items; the **± key** is used to turn pages, the "**+ key**" is used to turn pages down, and the "**-key**" is used to turn pages up.



Schematic diagram of parameter setting menu operation

After entering the parameter modification interface, as shown in the lower left corner of picture, use the "**± key**" to modify the parameter value. Each time you press it, the parameter will increase or decrease by 1; if you increase or decrease by 10 each time, you can press the function key "**F1**". When you press the "**± key**" at the same time to modify; if you increase or decrease by 100 each time, you can press the "**± key**" at the same time to modify while pressing the function key "**F2**" .

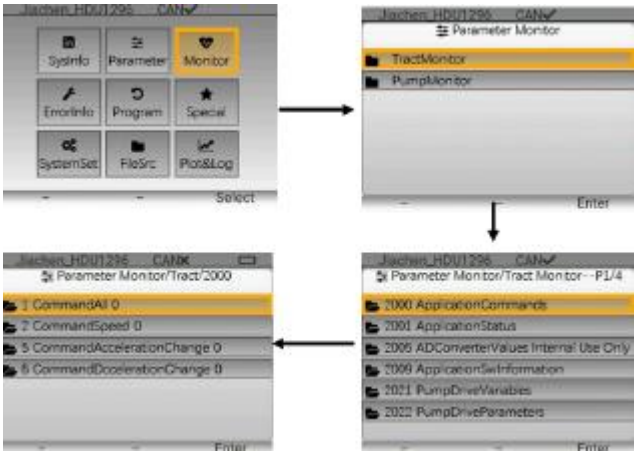
In the menu item selection page, the number **"P1/6**" in the upper right corner of the interface means that there are 6 pages in total, and the current page is the first page; "**+ key**" to scroll down, " **- key**" Turn pages up.



Parameter setting menu item selection page

2-6-4. Parameter monitoring

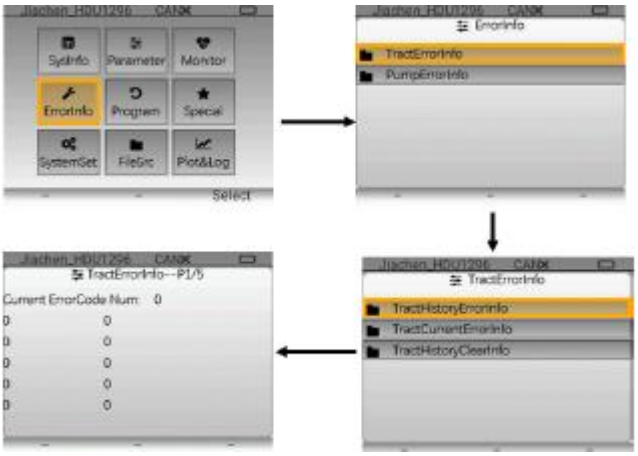
Select the "Monitor" function icon on the main interface. The sub -interfaces are divided into Traction Monitor and Pump Monitor, which are allocated according to the index address and sub -index of the CANopen protocol; there are a total of 97 entries for Traction Monitor parameters, and a total of 51 entries for Pump Monitor parameters; the operation logic and the parameter setting interface is the same.



Parameter monitoring interface

Fault information

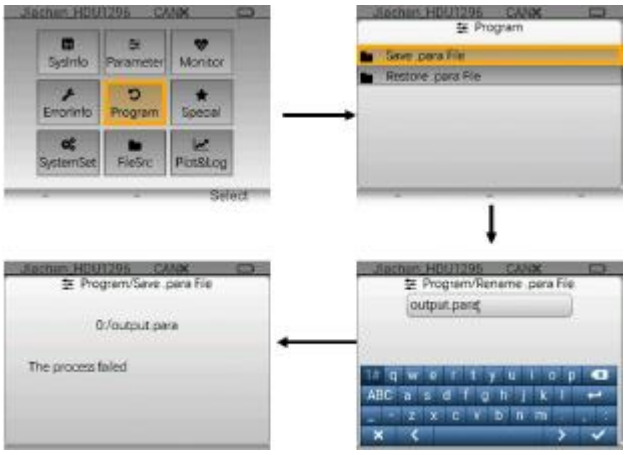
Select the "**Error Info**" function icon on the main interface, you can view the Tract Error Info and Pump Error Info; you can view the current and historical faults of each controller, and you can also clear the historical faults.



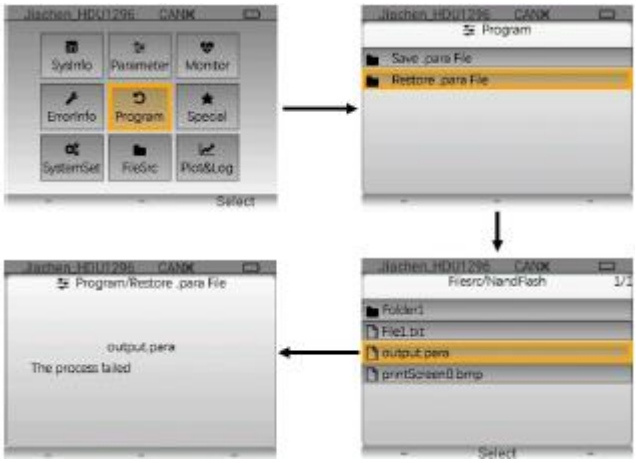
Error information interface

Programming

Select the "**Program**" function icon in the main interface, you can save the parameters of the electronic control as a “para” file, or restore the parameters in the “para” file to the electronic control. (Note: The “original. para” file stored in the device is a parameter export protocol file, please do not delete it.)



Programming -parameter export interface



Programming -parameter import interface

System Settings

Select the "**System Set**" function icon in the main interface to set the current backlight brightness, communication mode (RS232 or CAN), USB mode and system language and other local settings.

a) Backlight brightness: adjust between 10~100, press the corresponding "+" and " -" keys, the value will increase or decrease correspondingly;

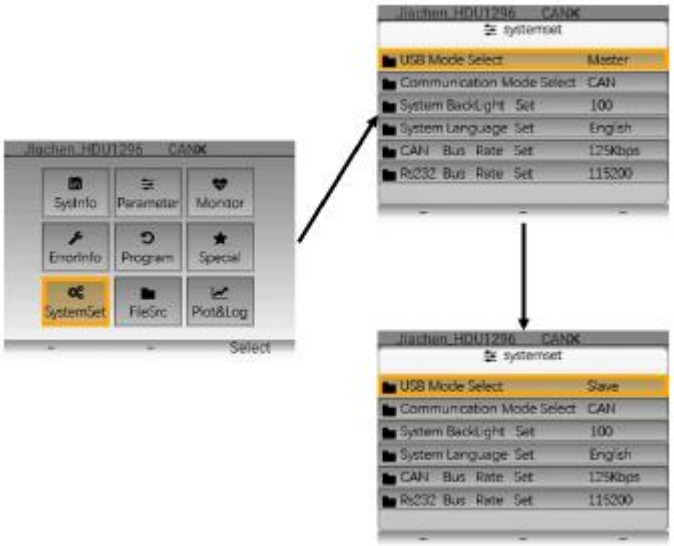
b) Communication mode: The communication mode can be set to RS232 or CAN communication mode. After the setting is successful, it will be effective after the next startup;

c) USB mode: When set to Master mode, the Handheld Unit can recognize external USB storage devices, and the connection status of the external USB devices can be displayed in real time; when set to Slave mode, the Handheld Unit can be recognized as a storage device by the computer, and copy the files on the computer (the file name must be in English) to the internal Flash of the Handheld Unit;

d) Language setting: local language can be selected the default is English;

e) CAN bus rate setting: 125 (default), 250, 500kbps;

f) RS232 bus speed setting: 9600, 19200, 38400, 115200.



System setting interface

2-6-5. Introduction to the menu structure

This module contains the basic information of the Handheld Unit, covering the product serial number and software and hardware version information.

No.	Test Item	Description	Remarks
1	Product Number	Display the product serial number (for example, HDU-xxxxxx)	
2	Hard Version	Display hardware version information	
3	Soft Version	Display software version information	

2-6-6. Connection port

The connection port to the handheld unit is shown in the figures as below.

2-7. Controller fault table diagnostics and troubleshooting

Inmotion system

Code display on the programmer	Code display on the instrument	Troubleshoot	Fault cause
1	20	Incorrect start Accelerator pedal switch active before key on	Release pedal switch
2	21	Incorrect start Forward switch or reverse switch active before key on	Turn off the direction switch
3	22	Forward switch and reverse switch active at the same time	Direction switch fault
4	23	Throttle analog value out of range	Throttle fault or analog need to be calibrated
5	24	Throttle analog fault	
6	31	Traction controller CAN communication fault	Check CAN wire of controller and display
7	32	Battery voltage low	Need charge
8	34	CPU fault	Reset key
9	36	Incorrect start Tilt switch active before key on	Reset tilt switch
10	37	Incorrect start Side switch active before key on	Reset side switch
11	38	Incorrect start Attachment switch active before key on	Reset attachment switch
12	39	Incorrect start Tilt switch active before key on	Reset tilt switch
13	40	Lift analog value out of range	Lift analog fault or need to be calibrated
14	43	Steer analog value out of range	Steer analog fault or need to be calibrated
15	44	Traction controller speed protection	Vehicle speed is too high alarm ”
16	45	Traction controller encoder fault	1. Traction controller encoder fault 2. Traction motor speed sensor connection wire is open
17	81	Traction controller temperature is low	Traction controller temperature is low alarm

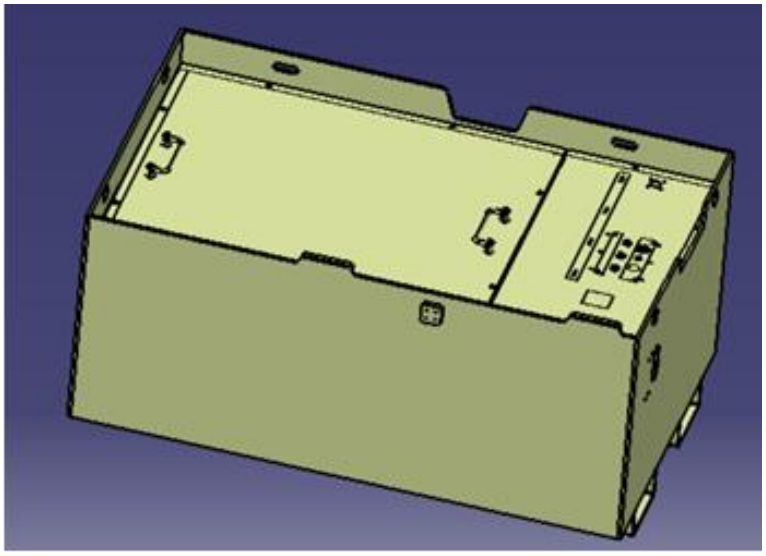
18	82	Traction controller temperature is high	Traction controller temperature is high alarm
19	83	Traction controller temperature sensor fault	Traction controller temperature sensor fault
20	84	Traction motor temperature is low	1. Traction motor temperature is low 2. Traction motor temperature sensor is fault
21	85	Traction motor temperature is high	1. Traction motor temperature is high 2. Traction motor temperature sensor is fault
22	86	Traction motor temperature sensor fault	1. Traction motor temperature sensor is fault 2. Traction motor temperature sensor connection wire is open
23	87	Traction motor encoder fault	1. Traction motor encoder fault 2. Traction motor speed sensor connection wire is open
24	88	DC bus voltage of traction controller is high	1. DC bus voltage high 2. The ramp is too steep
25	89	DC bus voltage of traction controller is low	Need to charge or check power wiring
26	90	The default value of the traction controller is updated	Reset key
27	91	Traction drive limit	Battery low vehicle speed limit
28	97	Open drain of traction output open or short	Check the wire of open drain of traction output open or short
29	98	Traction controller over current or short	Check power wiring
30	101	Traction controller short	1. Check power wiring 2. Controller enable before contactor pull
31	102	Traction controller temperature is high cut back	Traction controller temperature is high need cool
32	103	Traction motor temperature is high cut back	1. Traction motor temperature is high need cool 2. Traction motor temperature sensor fault
33	104	Traction controller over current	1. Vehicle overload or Mechanical clamping 2. Traction motor speed sensor fault

34	105	Traction controller precharge failed	Replace the pre charge resistance
35	110	DC bus voltage of traction controller is low cut back	Battery need charge
36	111	DC bus voltage of traction controller is high cut back	DC bus voltage of traction controller is high cut back
37	112	DC bus voltage of traction controller is high cut back (Hardware monitoring)	DC bus voltage of traction controller is high cut back(Hardware monitoring)
38	114	Internal power supply error	Traction motor temperature sensor or speed sensor connection wire is open
39	121	Pump controller temperature is low	Pump controller temperature is low alarm
40	122	Pump controller temperature is high	Pump controller temperature is high
41	123	Pump controller temperature sensor fault	Pump controller temperature sensor fault
42	124	Pump motor temperature is low	1. Pump motor temperature is low 2. Pump motor temperature sensor fault
43	125	Pump motor temperature is high	1. Pump motor temperature is high 2. Pump motor temperature sensor fault
44	126	Pump motor temperature sensor fault	1. Pump motor temperature sensor fault 2.Pump motor temperature sensor connection wire is open
45	127	Pump controller encoder fault	1.Pump motor speed sensor fault 2.Pump motor speed sensor connection wire is open
46	128	DC bus voltage of pump controller is high	DC bus voltage of pump controller is high
47	129	DC bus voltage of pump controller is low	Check power wiring
48	130	The default value of the pump controller is updated	Reset key
49	132	Pump drive limit	Battery voltage low need charge
50	137	Open drain of pump output open or short	Check the wire of open drain of pump output open or short
51	138	Pump controller over current or short	Check power wiring

52	141	Pump controller short	
53	142	Pump controller temperature is high cut back	
54	143	Pump motor temperature is high cut back	Pump motor temperature is high alarm
55	144	Pump controller current calibration error	Reset key
56	145	Pump controller precharge failed	Replace the pre charge resistance
57	150	DC bus voltage of pump controller is low cut back	DC bus voltage of pump controller is low cut back
58	151	DC bus voltage of pump controller is high cut back	DC bus voltage of pump controller is high cut back
59	152	DC bus voltage of pump controller is high cut back(Hardware monitoring)	DC bus voltage of pump controller is high cut back (Hardware monitoring)
60	153	Pump controller CPU fault	Reset key
61	154	BMS CAN bus Off	The BMS CAN communicate incorrectly
62	155	BMS over temperature protection	BMS over temperature protection
73	171	BMS CAN Error	BMS CAN Error
84	79	HPG CONTROLLER INCORRECT START	HPG controller incorrect start
90	161	DISPLAY CAN FAULT	Check display and controller CAN connection

3.Battery

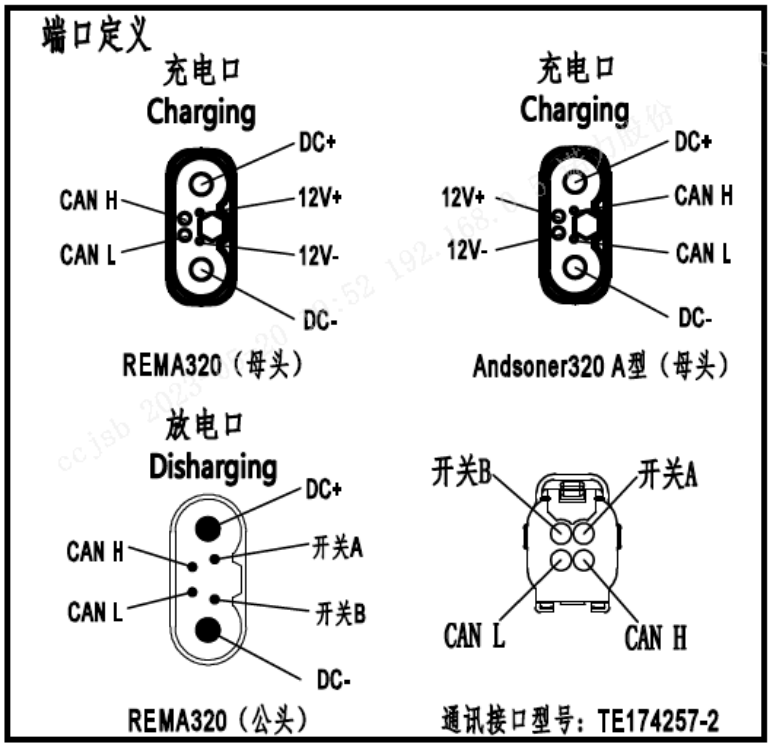
3-1. Appearance and Specifications



Battery system parameters			
1	Composition of battery system	2 in parallel and 25 in series	
2	Rated voltage	80V	
3	Rated capacity	200Ah	
4	Battery system voltage range	62.5V ～91.25V	
5	Maximum discharge voltage	91.25V	
6	Discharge cut-off voltage	75V	
7	Standard charging current (A)	0.5C,100A	
8	Standard discharge current (A)	0.5C,100A	
9	Battery cycle life	≧3000cycles	
10	Cooling mode	Natural cooling	
11	Seismic performance	Meet the following standards: UN38.3.4.3	
12	IP protection class	IP32	
13	Humidity of working environment	Humidity is≤85％RH	
14	Operating ambient temperature	charging：0℃～55℃	
		discharge：-20℃～55℃	Pay attention to ventilation and heat dissipation when the temperature is>45 ℃
15	Recommended storage conditions	-15℃~60℃,30%-50%SOC,The recommended long-term storage temperature is 0 ℃ ~ 35 ℃	
		Humidity is≤85％RH	
16	Total weight	265±10KG	Subject to actual conditions (excluding counterweight)

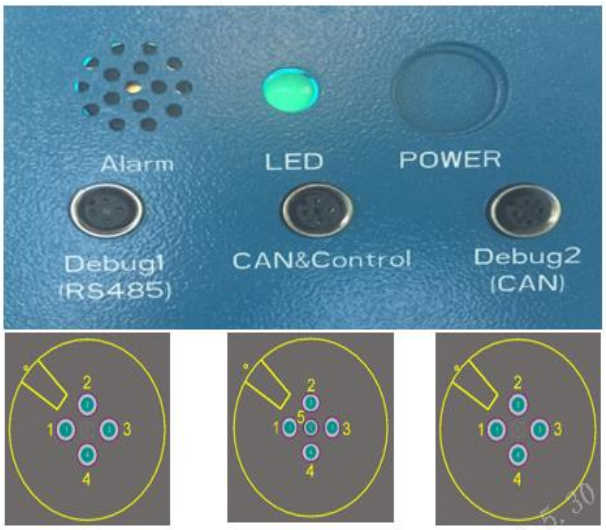
3-2. Interface description

Lithium battery charging port description



charging input	DC+	Positive pole of DC power supply, connect the positive pole of DC power supply and the positive pole of the battery
	DC-	Positive pole of DC power supply, connect the positive pole of DC power supply and battery positive pole
	CAN-H	CAN-H, charger and vehicle communication connection
	CAN-L	CAN-L, charger and vehicle communication connection
	-12V	Charger supplies BMS with 12V negative pole
	+12V	The charger supplies 12V positive pole of BMS power supply

Description of lithium battery debugging port



Interface name	**NO**	interface	definition	Remark
Debug1	1	4-2	12V+	**Pay attention to the direction of the notch**
	2	4-1	B 485	
	3	4-4	A 485	
	4	4-3	12V-	
Debug2	1	4-2	key switch	
	2	4-1	key switch	
	3	4-4	CAN-L 1	
	4	4-3	CAN-H 1	

3-3. Lithium battery fault analysis and description

Fault repair list of battery pack system					
No.	Fault type	Preliminary estimate	Test method	Failure confirmation	Countermeasure
1	The battery pack shall have no output after starting, and the switch indicator light shall be on	1. Abnormal communication with forklift 2.System internal components damaged	1. Check the alarm code on the locomotive display to confirm the specific fault. If it is confirmed as CAN communication problem, the discharge connectors shall be disconnected, and the both ends of the battery pack discharge connectors of CAN communication shall be checked for 120 Ω resistance;	1. If the resistance is measured to be infinite, the the CAN communication wire harness is indicated as disconnected. In this case, the CANH and CAN CAN shall be checked for normal breakover between the discharge connector and the panel communication port, and then the panel communication harness CAN shall be checked for breakover. 2. If there is resistance and is far bigger than 120 Ω, damage may be indicated inside the BMS CAN chip.	1. Replace damaged wiring harness; 2. Replace damaged BMS
			1. Disconnect the discharge plug and start the battery pack separately to check whether the discharge plug has an output.	If there is an output, the locomotive may have an internal circuit error which will result disability of the battery pack output	Check the locomotive communication and power lines
			1. Remove the battery box cover and high pressure box cover, check whether the fuse is normal (in the case of shutdown, select the lead file of the multimeter and use the meter pen to check the two ends of the fuse. If there is a drop of sound, then it is normal. If there is no sound, then the fuse is damaged.)	Broken fuse	Before replacing the fuse, check whether there is a short circuit between the positive and negative discharge of the locomotive and the battery pack. If there is no short circuit, then replace the fuse; if there is a short circuit, first deal with short circuit fault, and then replace the fuse.
2	The battery pack have no output after	1.System internal components damaged 2.Insufficient	1.Select the DC voltage mode of the multimeter, test the total positive and negative voltages at both ends with the	The system voltage is low, and BMS cannot work normally	Charge the battery pack first

	starting, and the switch indicator light is not on	system voltage	meter pen, and check whether the total voltage of the system is normal;		
			2.Select the lead mode of the multimeter, and check if the communication harness S1_A and the S1_B of the panel have normal lead	Turn on the light and confirm the fault of BMS to replace BMS preliminarily	Replace panel communication harness
			3. After the voltage harness is connected normally, press the start switch to check if the BMS is on;	After pressing the start switch, the BMS does not turn on the light, and the fault of BMS is preliminarily confirmed	Replace BMS
3	The battery pack cannot be charged. The indicator light of the battery pack is on	1. Abnormal communication with forklift; 2. System internal components damaged	1. Check if the 12V charging socket harness , GND, CANH and CNAL harness is normal	The conduction is abnormal	Replace the cable harness of the charging socket
			2. Connect the charger to check the fault code of the charger display; switch off to see if there's any loose for charging terminals and terminal jump; check the CAN communication if there are 120 Ω resistance on both ends	If no120 Ω resistance is detected, then the CAN chip is damaged	Replace BMS
4	The battery pack cannot be charged. The indicator light of the battery pack is not on	1. The charger has no 12V auxiliary power output; 2. System internal components are damaged	1. Disconnect the charger and battery pack, and check the charger for 12V auxiliary power output separately after starting up;	1.The charger has no 12V auxiliary power output	Replace the battery charger
			2. Check if the 12V charging socket harness , and GND harness are normal	Wire harness is not working properly	Replace the cable harness of the charging socket
			3. Confirm if the 12V auxiliary power output of the charger is	The BMS does not turn on the light, and the fault of BMS is preliminarily confirmed	Replace BMS

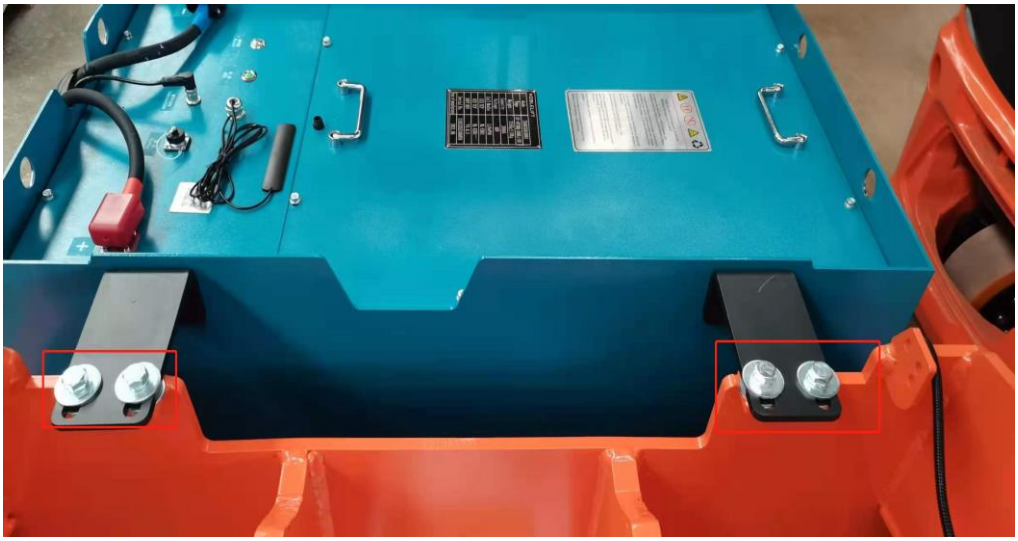
			normal, and the wiring harness of the charging socket is normal. Keep the charger on and connect to the battery pack, and then check if the BMS is on.		
5	The battery pack cannot shut down	1. Car key switch get a short circuit, 2.Internal components of battery pack system are damaged	1. Car key switch get a short circuit, 2. Internal components of battery pack system are damaged	The battery pack can switch the machine normally and the locomotive switch harness is short-circuited	Check the wire harness of forklift switch
			2. After disconnect the battery pack from the forklift and pressing the start switch button on the battery pack, the battery pack cannot be shut down normally. After disconnecting the battery box panel and the wire harness on the switch, the battery can be shut down normally	The battery pack can switch the machine normally and the locomotive switch harness is short-circuited	Replace the start-up switch
			3. Disconnect the battery pack from the connection to the forklift and the wiring harness on the switch.	BMS fault	Replace BMS

3-4. Disassembly and Installation

When installing and replacing lithium batteries, they shall be fixed reliably and shall not be overturned; It is forbidden to knock the pole post and lead clamp; Strong impact shall be avoided during handling.

1. Open side panels on both sides

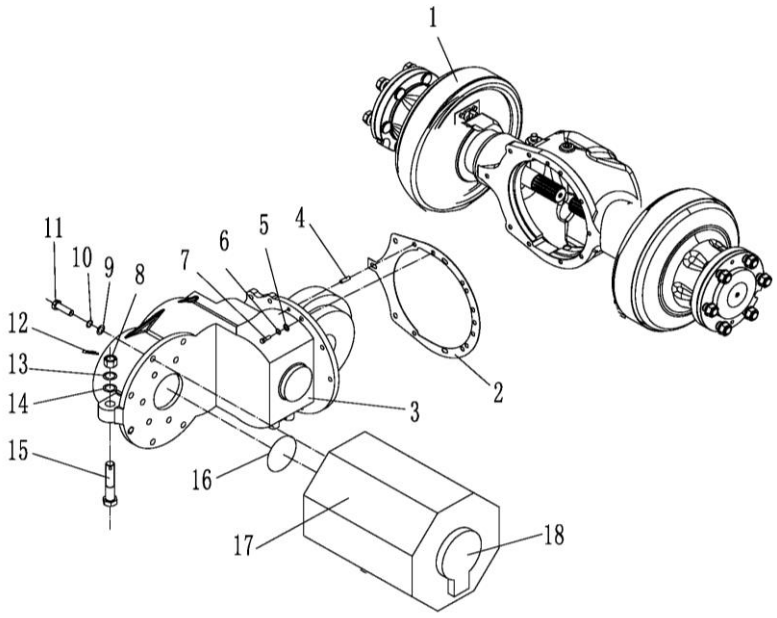
2. Remove the battery fixing block



4.Drive / Brake System

4-1. Overview

4-1-1 Assembly



The drive/brake system consists of the followings:

1 The drive motor regulated by the respective controller transmits the rotating force to the drive shaft (electric mechanical power).

2 The drive shaft converts the rotational force transmitted from the drive motor into torque and speed suitable for driving through its gear set and sends them to the corresponding wheels (mechanical power). They also contain service brakes, which are actuated by depressing the brake pedal to produce braking power (hydraulic power friction).

3 The accelerator sends an electrical signal to the drive motor controller to accelerate the motor (analog signal digital signal).

4 The F / R unit sends an electrical signal to the drive motor controller to determine the drive direction of the motor (analog signal digital signal).

5 The service brake pedal assembly injects brake fluid into the drive shaft to drive the service brake (hydraulic power friction).

6 The parking brake built into each drive axle secures the motor shaft when engaged to ensure that the vehicle is stationary (mechanical power friction).

4-2. Drive motor

4-2-1 How to run it

Electrically, the drive motors rotate their respective drive wheels so that the vehicle can move forward / backward

Controlled by controller
Each drive motor is connected to the controller through U, V and W lines. The controller operates the drive motor according to inputs from multiple switches and sensors and internal parameter settings.
The drive motor operates when the following conditions are met:
1 the key switch is turned off to supply power to the controller,
2 operator seat (seat switch),
3 determine the driving direction(F / R unit),
4 accelerator pedal pressed (accelerator)
Motor speed detection (encoder operation)

Each drive motor is equipped with an encoder, which is used as the speed sensor of the motor. It includes two hole sensors, and a gear is installed on the drive shaft of the motor to interact with the two hole sensors. The gear rotates simultaneously with the drive shaft so that the gear teeth periodically pass through the magnetic field of each hole sensor. When the top platform of the gear passes through the magnetic field, it is close to the hole sensor, so the magnetic flux increases. On the other hand, when the bottom platform passes through the magnetic field, the distance increases and the magnetic flux decreases accordingly

The cycle occurs again and the magnetic flux has a waveform that generates a voltage pulse. The controller analyzes the amplitude of the pulse to calculate the speed of the motor. The smaller the amplitude, the higher the speed of the motor.
Like other sensors, the encoder generates a main signal (signal a) and a reference signal (signal B) through two hole sensors. The order of the generated signals varies according to the direction of rotation.
Overheat protection (thermal sensor operation)
Each drive motor is equipped with a thermal sensor to prevent overheating. Once the motor is heated to 145 ℃ (293 ℉), the overheat alarm is activated and the operating performance of the motor is limited.

4-2-2 Disassembly/assembly and test of drive motor

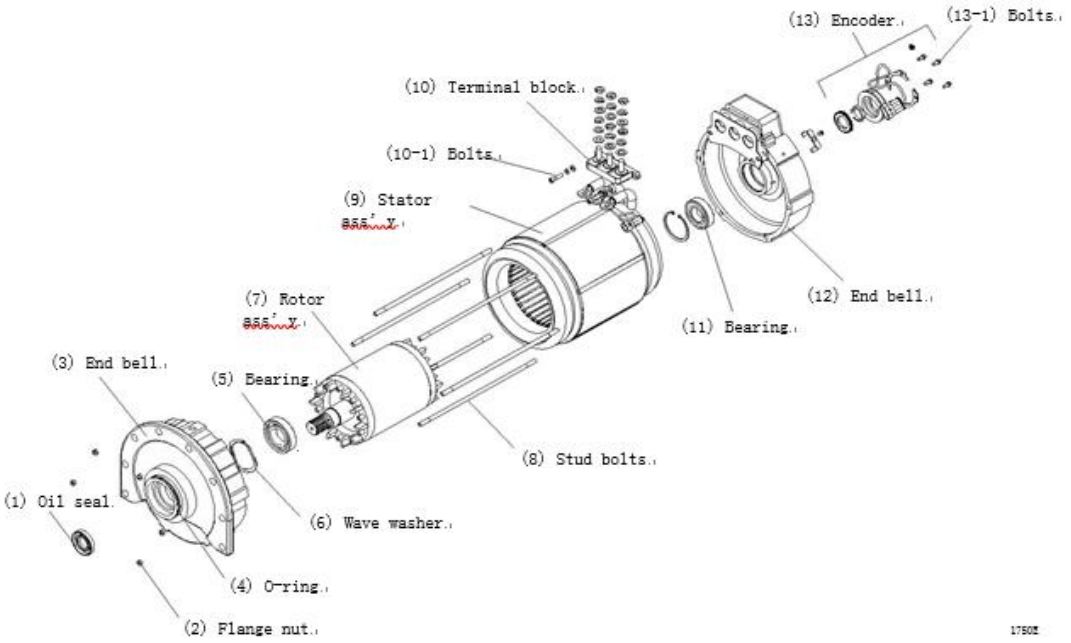


图 3-9

Disassembly/assembly

1 after removing the terminal protector, loosen the screw (10-1) and remove the terminal block (10).

2 loosen the bolt (13-1) and remove the encoder (13).

3 remove the O-ring (4) and oil seal (1).

4 loosen the back nut (2) and remove the lower end cover (3).

5 remove the stator assembly (9) by hand or with a tool.

6 remove the wave washer (6) and bearing (5) from the rotor assembly (5).

7 remove the bearing (11) and rotor assembly (7) from the end cap (12).

It is recommended to use a bearing puller, as shown in the figure.

8. Perform the above steps in reverse order to assemble the drive motor.

Note: before reassembling the motor, you can test its components as follows.

Stator test

1.Carefully wipe the contamination on the stator surface with a clean cloth dipped in alcohol.

Note: contamination in the stator can cause coil damage and therefore damage to the stator itself.

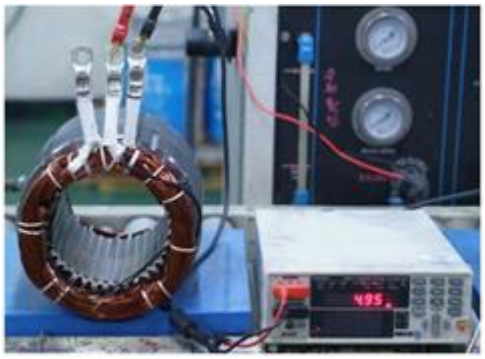
Stator test

1.Carefully wipe the contamination on the stator surface with a clean cloth dipped in alcohol.

Note: contamination in the stator can cause coil damage and therefore damage to the stator itself.

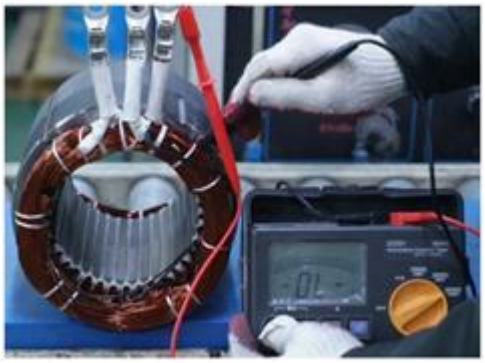
2.Use a milliohmmeter to measure the resistance of each phase (UV, VW, WU).

Rated resistance: 0.4 Ω

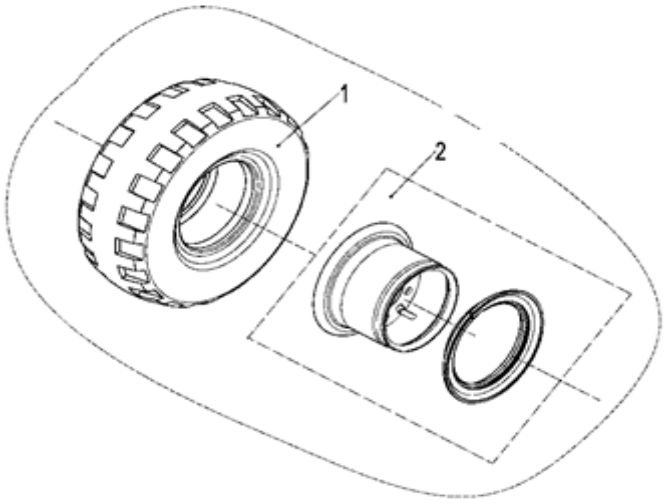


3. Test insulation at 1000 VAC and minUse insulation tester for 10m Ω.

If there is a problem with the insulation, replace the stator with a new one.



4-2-3 Removal / installation of drive wheel



1.Place a jack or block of wood under the forklift to empty the wheel and loosen the nut (1).

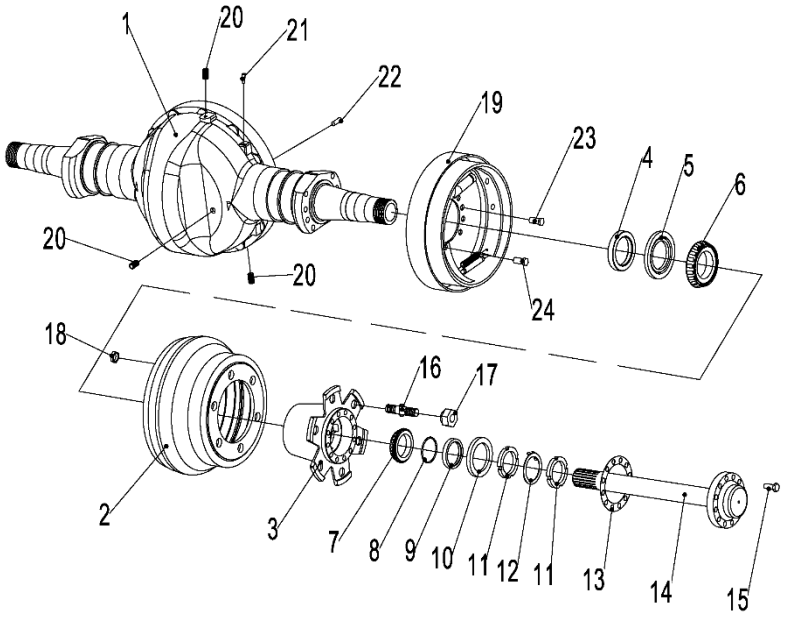
Installation torque: 450 ±70 n m (331.9 ±51.6 LB ·ft)

2.Remove the nut (1) and drive the tire (2).

3.Perform the above steps in reverse order to install the drive wheels.

4-3. Drive axle

4-3-1 Appearance and specifications



NO	SN	Description	**NOTE**
1	256798523502	Drive axle G-2301101-04	25-28Q
1	256898523501	Drive axle H-2301101-00	30-35Q
2	256798523505	Brake drum G-3103103-00	25-28Q
2	256898523502	Brake drum H-3103103-00	30-35Q
3	256798523506	hub G-3103101-04	25-28Q
3	256898523503	hub H-3103101-00	30-35Q
4	256898523504	Large oil seal seat ring H-3103102-00	25-35Q
5	256898523505	oil seal 100X130X12	25-35Q
6	256898523506	Tapered roller bearing 30214	25-35Q
7	910700600020	Tapered roller bearing 32012	25-35Q
8	254198523557	O-ring 65X3.1	25-35Q
9	256898523507	Small oil seal seat ring H-3103109-00	25-35Q
10	254198523555	oil seal 75X100X10	25-35Q
11	910300700005	Round nut M60X2	25-35Q
12	910400900013	Tab washer60	25-35Q
13	256798523509	Half axle padG-2303106-00	25-28Q
13	256898523508	Half axle padH-2303106-00	30-35Q
14	256798523503	Half axle G-2303101-04	25-28Q
14	256898523509	Half axle H-2303101-00	30-35Q
15	256898523510	Half axle bolt H-2303107-00	25-35Q
16	256798523507	hub bolt G-3103106-00	25-28Q
16	256898523511	hub bolt H-3103106-00	30-35Q
17	256798523508	hub nut G-3103110-04	25-28Q
17	256898523512	hub nut H-3103110-00	30-35Q
18	910300200005	hexagonal nut M20X1.5	25-35Q
19	256798523501	left brake G-3501100-00	25-28Q
19	256898523513	left brake H-3501100-00	30-35Q
20	256798523504	right brake G-3501200-00	25-28Q
20	256898523514	right brake H-3501200-00	30-35Q
20	256898523515	Block ZG1/2 H-1701104-00	25-35Q
21	256898523516	Vent plug H-2301301-00	25-35Q
22	256898523517	Cylindrical pin	25-35Q
23	256898523518	Brake set bolt H-3501301-00	25-35Q
24	256898523519	Brake fastening bolt H-3501302-00	25-35Q

4-3-2 How to operate

Driving function

The drive shaft is responsible for transmitting the output of the drive motor to the wheels, reducing the speed and multiplying the torque according to the specific gear ratio generated by its internal gear train. This is to adapt the high speed of the motor to driving and obtain enough force to bear the load of the vehicle and other external conditions.

When the motor shaft rotates, its connected pinion also rotates, and then rotates the helical gear, and the spline is connected to the pinion. Since the helical gear has several times more teeth than the pinion, the first deceleration occurs between the two gears and the torque multiplies accordingly:

The sun gear meshed with the spiral hearing rotates simultaneously with the rotation of the spiral hearing. The rotation of the sun gear causes the three planetary gears to move around the sun gear. As contained in the ring gear, the planetary gears maintain their circular motion without becoming out of mesh. These gears are so named because the way they work together can be compared to the planetary orbit around the sun.

Braking function

Once the brake pedal is pressed, brake oil is injected into the drive shaft through the master cylinder to push the piston. Then, the pushed piston compresses the friction disc and the steel disc overlapped with each other; There is friction between them. Thus, the friction disc loses its rotating power. When the friction disc loses power, all other rotating parts, including the wheel, slow down and stop together.

After the brake pedal is released, the brake oil is discharged, the return spring returns the compression disc to the original position, leaves a gap between the inner disc and the outer disc, and rotates to release the brake. Therefore, all

Other rotating parts become free to rotate.

4-3-3 Drive gear oil replacement

Preliminary steps

1 park the vehicle on a flat ground. Check whether the parking brake indicator lights up, then place the F / R switch in neutral.

program

1 lift the gantry and support it with support blocks.

2 turn off the key switch.

3 unscrew the oil level check plug and remove the oil drain plug to drain the oil.

4 clean and install the drain plug.

5 unscrew the oil replenishing plug and fill with oil.

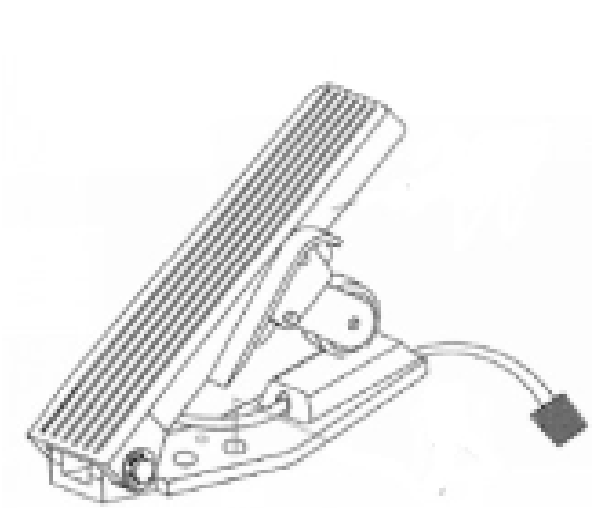
Maintain the proper oil level by checking the dip stick.

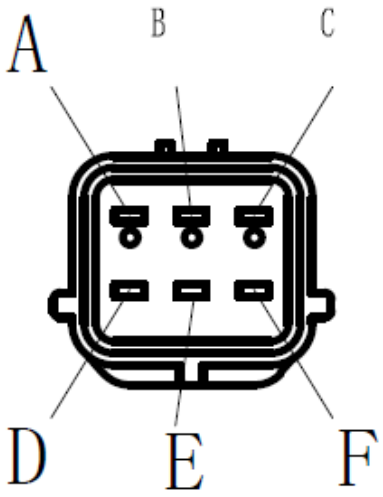
6 install the oil level check plug and tighten the oil replenishment plug together.

7 lift the gantry and remove the support block.

4-4. Accelerator

4-4-1 Appearance and specifications





No.	Plug-in definition	Colour
A	Power supply + 12V - + 80V	Red
B	Signal output, 0-10V	Green
C	Ground wire 1	Black
D	CAM (common)	White
E	Idle switch signal	Blue
F	None	N/A

4-4-2 How does it work

Electric vehicle is powered by a drive motor. As a result, the accelerator that determines the vehicle's travel speed is connected to the drive motor controller.

The accelerator is powered by 5 V from the drive motor controller, and generates Signal A in gear F and Signal B in gear R. This output determines that the speed of the vehicle is proportional to the angle at which the accelerator pedal is pressed.

As shown above, Signal A or B sent by the accelerator are communicated to the controller by CAN. In principle, the values of the two signals shall be the same. If they differ by more than the tolerance, it will be identified as a problem in the electrical system or accelerator and a fault code will appear on the display.

4-4-3 Disassembly and installation

Initial steps

1.Turn off the key switch.

2.Remove floor covering mat

Process

1.Lift the base plate slightly and perform the following steps:

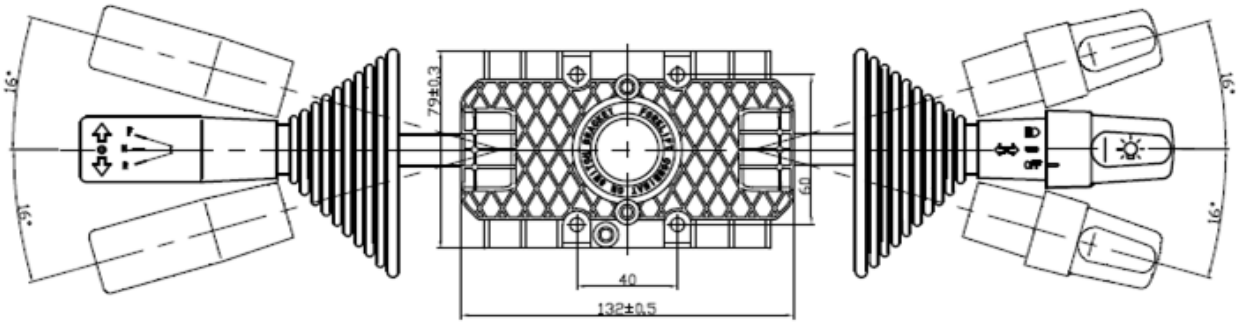
2.Remove the accelerator pedal connector from the main harness.

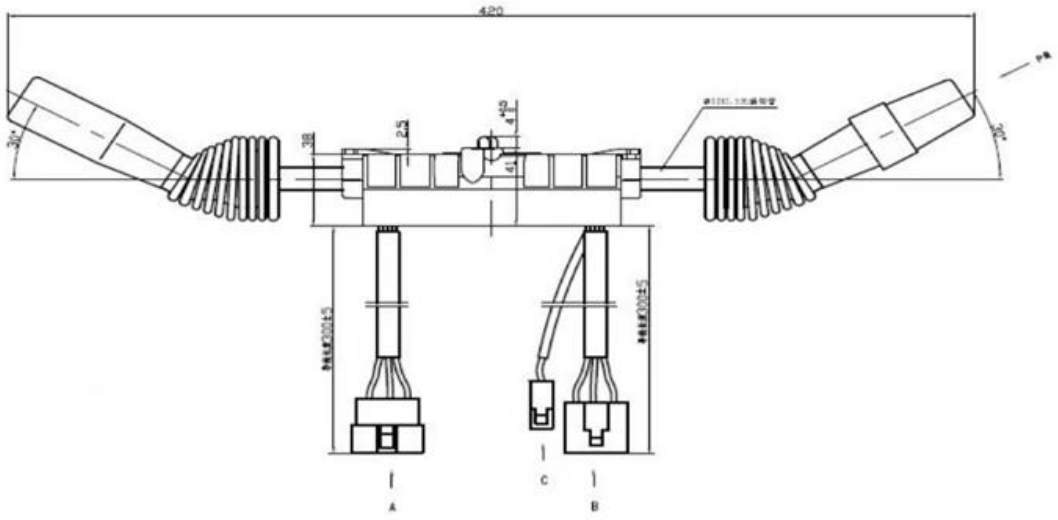
3.Loosen the three sets of bolts and nuts and remove the accelerator.

4.Perform the above steps in reverse order to reinstall the accelerator pedal.

4-5. F/R units

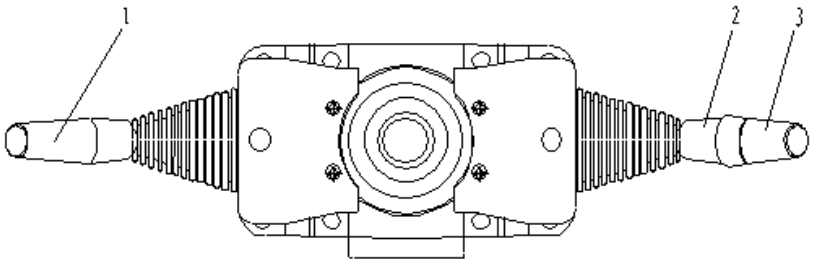
4-5-1 Appearance and specifications





4-5-2 How does it work

The combination switch is a combination of direction switch, turn light switch and large and small light switch.



1. F/R direction switch 2. Turn light switch 3. Large and small light switch

The direction switch controls the driving direction of the vehicle and transmits the signal to the display for display. Push the handle forward, pull the handle backward, and set the middle position to neutral. When the handle is set to the backward position, the reversing light and warning light are on and the reversing buzzer sounds.

The steering light switch indicates the turning direction of the forklift. When the switch handle is turned to the steering position, the steering light flashes.

Push forward	Left turn signal flashing
Middle	Median position
Pull back	Right turn signal flashing

The large and small lamp switch controls the on and off of the large and small lamps. This switch has second gear. When it is rotated to the first gear, the small light will be on. When it is rotated to the second gear, the large and small lights will be on.

Gear position / Automative lighting	OFF	Gear I	Gear II
Indicator lamp	×	○	○
Taillight	×	○	○
Headlamp	×	×	○

○: Light on ×: Light off

(4) Rear headlamp switch

The rear headlamp switch is a single gear switch, which controls the lighting and extinguishing of the rear headlamp. Pull up and light up the rear headlamp, and push down to extinguish the rear headlamp.

The F / R direction switch (forward / reverse) is used to enable the operator to use the connection to the F/R combination switch to select the driving direction of the vehicle.

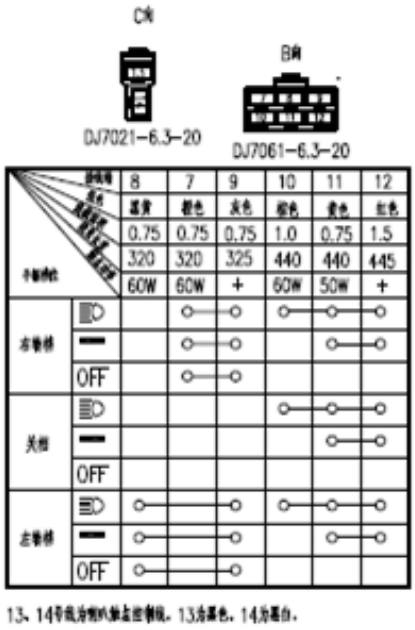
The F / R direction switch has one connector (6-pin connector, a-direction), which can be connected with multiple devices interact as follows:

DJ7061-6.3-10

	1	3	2	5	6
	棕色	红色	绿色	黄色	红蓝
	0.75	0.75	0.75	0.75	0.75
	320	325	320	320	325
	60W	+	60W	60W	+
	○—○				
		○—○		○—○	

The 6-pin connector pins of the F/R direction switch are all connected with the F/R switch to provide 5V power supply and receive the operator's requirements through forward, reverse or undirected switches.

When the switch is in neutral, it sends voltage signals from the forward and reverse terminals.The B-way and C-way connectors are the vehicle's lamp switch connectors, as shown below.



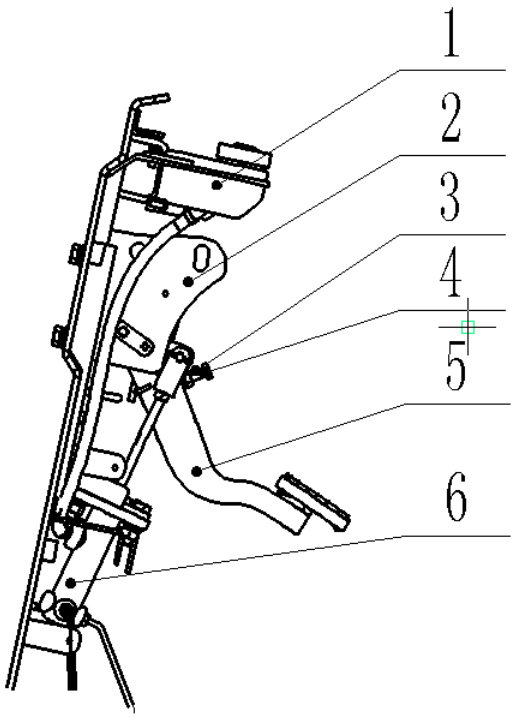
4-6. Brake system

4-6-1 Overview

The brake system is composed of brake pedal, brake master cylinder and wheel brake, which is the internal expansion oil pressure type of the front two wheel braking.

4-6-2 Brake pedal

The structure of the brake pedal is as shown in the figure. The pedal converts the pedal force acting on the pedal into the brake oil pressure through the push rod of the brake master cylinder.



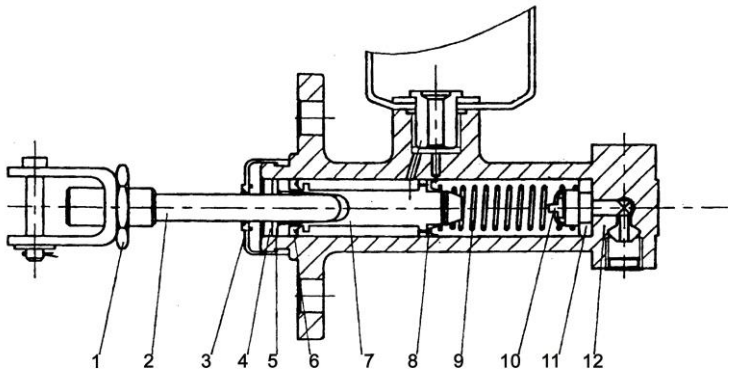
1. Brake oil cup	2. Brake mount	3. Brake sensor
4. stop bolt	5. Brake pedal	6. Brake master cylinder

Figure Brake pedal assembly

4-6-3 Brake master cylinder

The master cylinder consists of a valve seat, a check valve, a return spring, a main cup, a piston and an auxiliary cup. The end is fixed with stop washer and stop steel wire, and the outside is protected by rubber dust cover. The master cylinder piston acts by operating the brake pedal through the push rod. When the brake pedal is pressed, the push rod pushes the piston forward, and the brake fluid in the pump body flows back to the oil storage tank through the oil return port until the main leather cup blocks the oil return hole. After the main cup is pushed through the oil return port, the brake fluid in the front chamber of the master cylinder is compressed and the check valve is opened to flow to the slave cylinder through the brake pipeline. In this way, the piston of each slave cylinder extends outward to make the brake shoe friction plate contact with the brake drum to achieve the effect of deceleration or braking. At

this time, the piston rear chamber is supplemented by brake fluid from the oil return port and oil inlet port. When the brake pedal is released, the piston is pressed back by the return spring. At the same time, the brake fluid in each brake wheel cylinder is also compressed by the return spring of the moving shoe, so that the brake fluid returns to the master cylinder (piston front chamber) through the one-way valve, the piston returns to its original position, and the brake fluid in the master cylinder flows back to the oil storage tank through the return port, The pressure of the check valve is adjusted to a certain proportion to the residual pressure in the brake pipeline and the brake wheel cylinder, so that the leather cup of the wheel cylinder is correctly placed to prevent oil leakage and eliminate the possible air resistance during emergency braking.

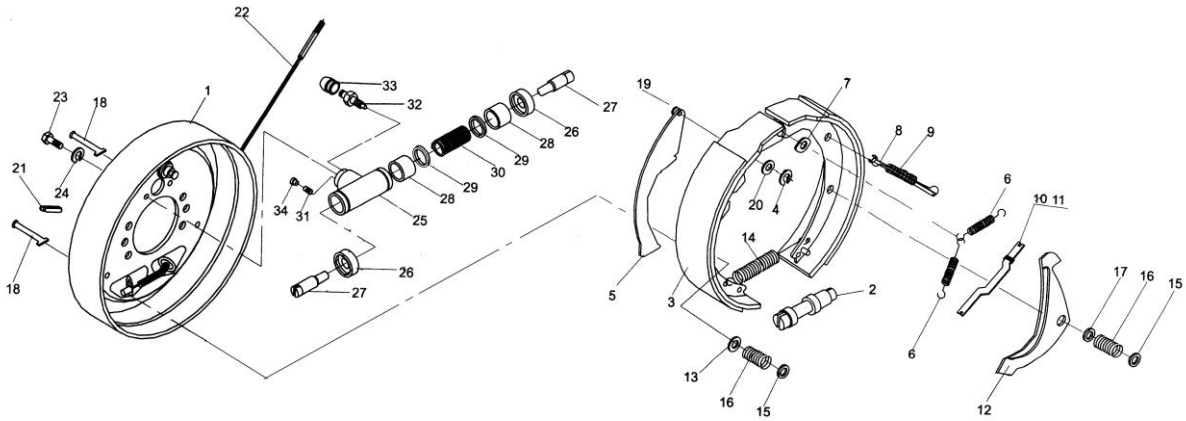


1.Lock nut	2.Push rod	3.Dust cover.	4.Lock wire
5.Lock washer	6.Auxiliary seal cup	7.Piston.	8.Main seal cup
9.Spring.	10.Check valve	11.Seat.	12.Pump body

Figure Brake master cylinder

4-6-4 Brake

The brake is a double shoe brake, which is installed on both sides of the drive axle.The brake consists of two sets of brake shoes, brake cylinder and regulator.One end of the brake shoe is in contact with the fixing pin and the other end is in contact with the adjusting device.Press the parking brake part against the return spring and pressure spring rod.In addition, the brake is also equipped with a parking brake mechanism and an automatic adjusting device.



1.Brake base plate assembly	2.Gap adjuster	3.Friction plate assembly	4.Elastic gasket
5.Hand brake lever	6.Return spring	7.Shim	8.Ejector pin
9.Return spring	10.Hand brake push rod	11.Compression spring	12.Adjustment lever
13.Pressure spring seat	14.Spring	15.Pressure spring cover	16.Spring
17.Pressure spring seat	18.Tension spring rod	19.Support pin	20.Shim
21.Glue plugging	22.Brake cable assembly	23.Bolt M8×16	24.Spring washer 8
25.Wheel cylinder	26.Shield of brake cylinder	27.Piston rod of brake cylinder	28.Piston
29.Pump seal cup	30.Brake cylinder spring	31.Brake cylinder oil plug	32.Bleed screw of brake cylinder
33.Cylinder bleed screw guard	34.Dust cover		

(1) Brake action

The brake wheel cylinder presses the brake drum with the same force as the main brake shoe and the secondary brake shoe until the upper end of the secondary brake shoe is against the fixed pin, and the brake shoe moves towards the rotation direction of the brake drum.After holding the fixed pin, the friction force between the friction

plate and the brake drum increases. Because the main brake shoe gives the auxiliary brake shoe a much greater pressure than the brake cylinder pressure, a great brake force is generated.

The brake action in reverse is the opposite of that in forward.

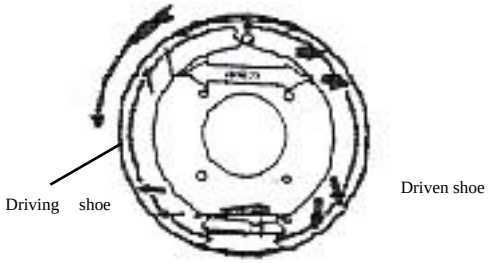


Figure forward action

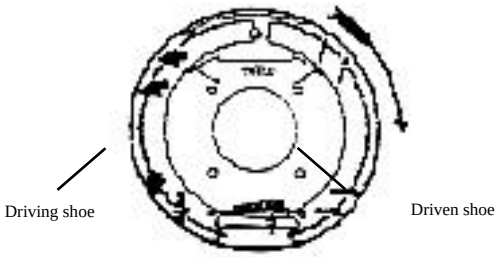


Figure backward action

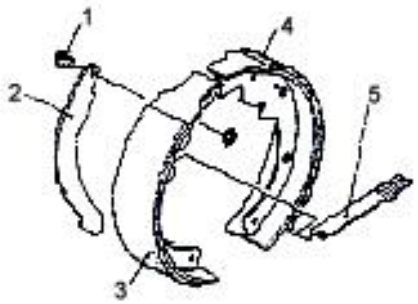
(2) Parking brake

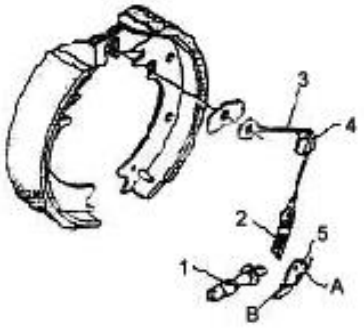
The parking brake device is assembled in the wheel brake and consists of a pull rod and a push rod.The pull rod is installed on the side of the main brake shoe by the pin and pulled

The action of is transmitted to one side of the auxiliary brake shoe through the push rod.

(3) Clearance self-adjusting mechanism

The clearance self-adjusting mechanism can maintain proper clearance between the friction plate and the brake drum.The clearance self-adjusting mechanism only operates when reversing.





1.Pin	2.Pull rod	3.Driving shoe	1.Regulating mechanism	2.Spring	3.Inhaul cable
4.Driven shoe	5.Strut		4.Guide slot	5.Pull rod	

(4) Action of clearance automatic adjustment mechanism

When the forklift is backing up, brake operation is carried out. The auxiliary brake shoe contacts with the main brake shoe and rotates together to make the pull rod turn right around point a, as shown in the figure, point B is raised. After the brake is released, the pull rod turns left under the action of spring force, and point B drops.When the clearance between the friction plate and the brake hub becomes larger, the vertical distance of point B rotation increases, the adjuster is moved by a tooth, the adjusting rod becomes longer, and the clearance decreases accordingly.The clearance adjustment range is 0.40mm-0.45mm.

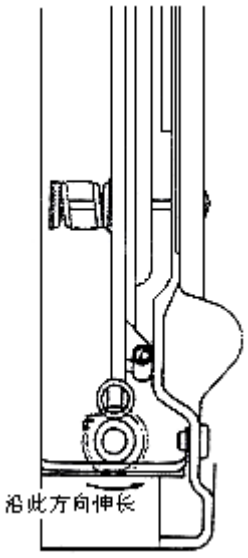
4-6-5 Parking brake control

The parking brake handle is cam type, and the brake force can be adjusted by the adjuster located at the end of the brake handle.

Adjustment of braking force: turn the adjuster clockwise to increase the braking force; turn the adjuster anticlockwise to reduce the braking force.

Tensile force: 196N ~ 294N.

Elongate in this direction



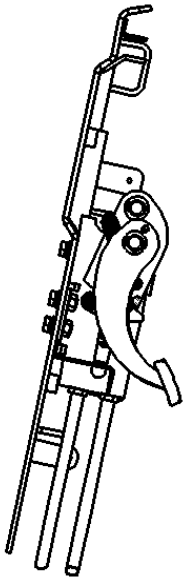


Figure Clearance self adjusting mechanism Figure Parking brake pedal

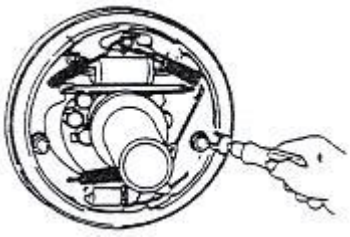
4-6-6 Key points of brake disassembly and adjustment

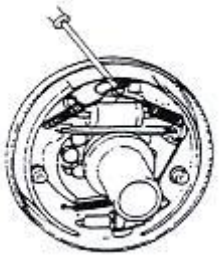
When the wheel and hub are disassembled, the disassembly, assembly and adjustment of the brake and the adjustment method of the brake pedal.

1.Brake disassembly

(1) Remove the support pin, adjusting rod, adjusting device and spring on the auxiliary brake shoe.

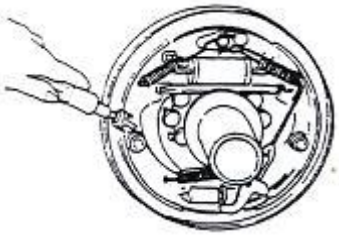
(2) Remove the shoe return spring.

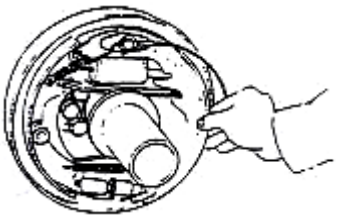




(3) Remove the fixed spring from the main brake shoe.

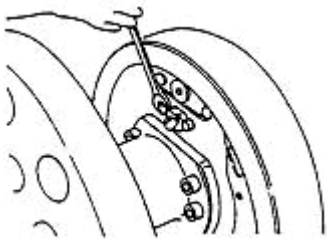
(4) Remove the main brake shoe and auxiliary brake shoe. Remove the adjuster and adjuster spring at the same time.

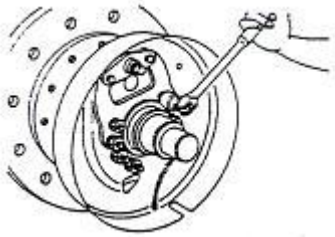




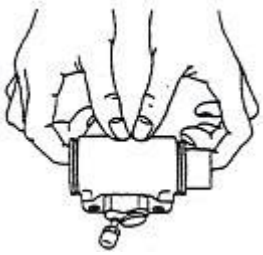
(5) Remove the brake pipe from the brake cylinder.Then remove the mounting bolts of the brake cylinder and remove the brake cylinder from the brake base plate.

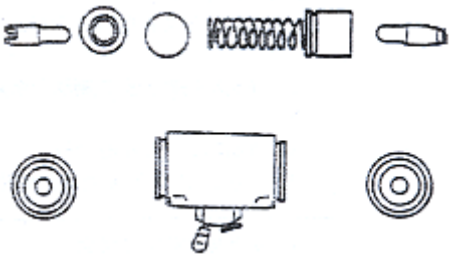
(6) Remove the E-ring used to fix the brake cable on the brake base plate.Then:, remove the bolts that install the brake base plate, and remove the brake base plate from the drive axle.





(7) Disassemble the brake cylinder: remove the dust ring.Press one side of the piston to push out the other side of the piston, and then press this side of the piston with your fingers.





2.Brake inspection

Inspection of all parts, repair or replacement of damaged parts.

(1) Check whether there is rust on the inner surface of the cylinder and the outer circumference of the piston; then measure the clearance between the piston and the pump body.

Standard size: 0.03mm-0.10mm; limit size: 0.15mm

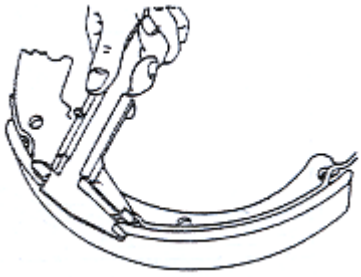
(2) Visually check whether the piston cup is damaged and deformed, and replace it if there is any abnormality.

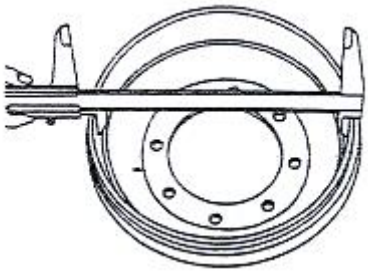
(3) Measure the free length of the brake cylinder spring, and replace it when it exceeds the reference.

(4) Measure the thickness of the friction plate and replace it when it exceeds the wear limit.Standard value: 8.0mm; limit value: 2.0mm

(5) Visually inspect the inner surface of the brake drum. If there is damage or partial wear, grind it for correction. If it exceeds the correction limit, replace it.

Standard value: 314mm; limit value: 316mm.





3.Brake assembly

(1) Apply brake fluid on the cup and piston of the brake cylinder, and assemble the spring, piston cup, piston and anti ring in sequence.

(2) Install the brake cylinder on the brake base plate.

(3) Install the brake base plate on the drive axle.

(4) Apply heat-resistant grease all over as shown in the figure.

Be careful not to apply it to the friction plate.

(a) the contact surface between the base plate and the brake shoe;

(b) fixing pins;

(c) the contact surface between the shoe and the spring seat;

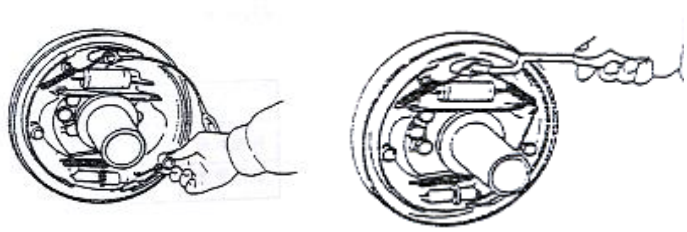
(d) hand brake pull rod support pin;

(e) adjusting mechanism threads and other rotating parts.

(5) The parking brake cable is clamped with E-shaped retaining ring.

(6) Install the brake shoe with the fixed spring.

(7) Install the compression spring onto the hand brake push rod, and then install the push rod onto the brake shoe



(8) Install the brake shoe guide plate onto the support pin, and then install the brake shoe return spring.Install the main shoe first, then the auxiliary shoe.As shown in Figure 2-28

(9) Install the adjuster, adjuster spring, ejector rod and ejector rod return spring. Note the following:

(a) The thread direction of the adjuster and its installation direction;

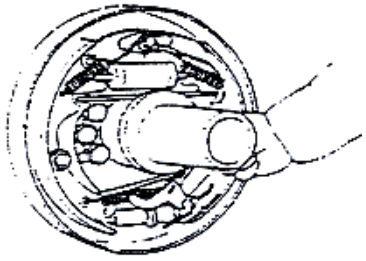
(b) Adjuster spring direction (the adjuster teeth are not allowed to contact with the spring);

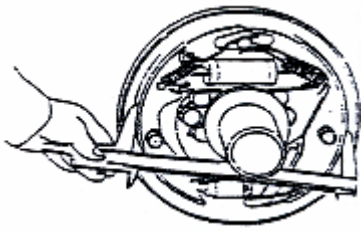
(c) The direction of the return spring of the ejector pin (the spring hook at the end of the support pin shall be fixed on the opposite side of the ejector pin);

(d) The lower end of the adjusting lever must be in contact with the tooth part of the adjuster.

(10) Connect the brake oil pipe to the slave cylinder.

(11) Measure the inner diameter of the brake drum, the outer diameter of the brake shoe and adjust the regulator so that the difference between the inner diameter of the brake drum and the outer diameter of the brake shoe friction plate is 0.3mm-0.5mm





4.Operation test of automatic gap adjuster

(1) First, make the diameter of the brake shoe close to the specified installation size, and pull the adjusting lever by hand to make the adjuster rotate. When the hand is released, the adjusting lever returns to its original position, while the adjuster gear does not rotate.

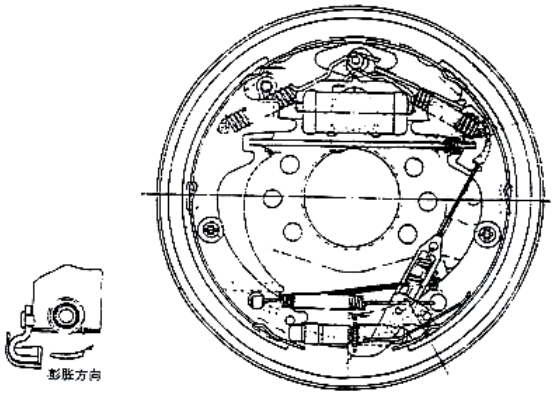
Note: the adjuster can work normally even when the hand is released and the adjuster gear returns together with the adjusting lever.

(2) If the adjuster fails to do the above actions when pulling the adjusting lever, the following inspection shall be carried out:

(a) Install the adjustment lever, top bar, top bar spring and compression spring seat firmly;

(b) Check whether the ejector return spring and adjuster spring are damaged, and then check whether the rotation of adjuster gear and its engagement part are excessively worn or damaged.Check whether the lever is in contact with the gear.

Replace damaged parts.



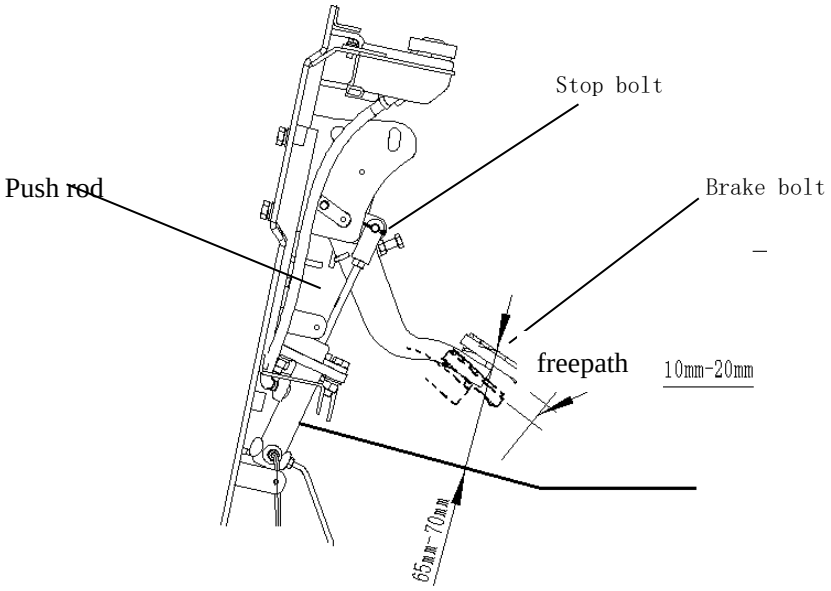
3-6-7 Brake pedal adjustment

(1) Shorten the push rod;

(2) Adjust the pedal stop bolt and the pedal height;

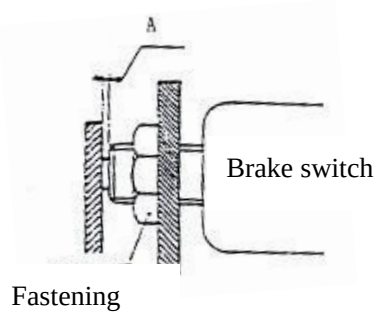
(3) Lengthen the push rod until the front end of the push rod contacts with the piston of the master cylinder, and then return 1-2 turns to ensure the free stroke of the pedal is between 10 mm and 20 mm;

(4) Lock the push rod nut and pedal stop bolt nut.



free stroke

(5) Adjustment of brake switch



(a) After the height of the brake pedal is adjusted, loosen the lock nut of the brake switch;

(b) Pull off the plug to separate the wire;

(c) Turn the switch so that the clearance A = 1mm;

(d) Make sure that the brake light is on when the brake pedal is depressed;

(e) Finally lock the nut.

3-6-8 Fault analysis and troubleshooting

Problem	Cause analysis	Exclusion method
Poor braking	1 Brake system oil leakage	repair
	2 Brake shoe clearance not adjusted	Regulator
	3 Brake overheating	Check for slipping
	4 Poor contact between brake drum and friction plate	Resetting
	5 Impurities attached to friction plate	Repair or replace
	6 Impurities mixed into brake fluid	Check brake fluid
	7 Improper adjustment of brake pedal (micro valve)	adjustment
Brake noise	1 The surface of friction plate is hardened or foreign matters adhere to it	Repair or replace
	2 The base plate is deformed or the bolt is loose	Repair or replace
	3 Brake shoe is deformed or installed incorrectly	Repair or replace
	4 Friction plate wear	replace
	5 Loose wheel bearing	Repair or replace
system move No all	1 Oil stain on the friction plate surface	Repair or replace
	2 Brake shoe clearance not adjusted	Regulator
	3 Sub pump failure	Repair or replace
	4 Brake shoe return spring damaged	replace
	5 Brake drum deflection	Repair or replace
system move No Power	1 Brake system oil leakage	Repair or replace
	2 Brake shoe clearance not adjusted	Regulator
	3 Air in the brake system	Deflation
	4 Brake pedal is not adjusted correctly	Resetting

3-6-9 Maintenance and service

① Before running in test, the new drive axle shall be filled with gear oil (the selection of gear oil shall be strictly in accordance with the specification, and the specific model shall refer to table 2-1).Oil shall be injected from the oil filling hole on the upper part of the axle housing until oil overflows from the oil level hole in the middle of the axle housing.

② The thickness of the friction plate on the brake shoe is 8mm.The minimum thickness allowed is 2mm.These two parts are key parts of the brake system, which shall be checked once a month. If excessive wear is found, it shall be replaced in time to avoid accidents.

③ Technical maintenance every 50h:

I. After the new bridge works with the main engine for 50h, the gear oil shall be replaced.When changing oil, clean the bridge and add new oil.

II. Check the fastening of each fastener. If it is loose, fasten it immediately.

III. Check whether there is oil leakage at the connection between the wheel half shaft and the hub. If there is any leakage, reapply the sealant.

④ Monthly technical maintenance:

I. check the wear condition of brake drum to see if there is destructive wear.

II. Check the wear condition of the brake shoe. When the wear has not met the use requirements, replace it immediately.

III. Check whether the oil level of the axle housing meets the requirements. If the oil level drops, make up in time.

⑤ Technical maintenance every half a year: replace the gear oil in the bridge every half a year.

⑥ Annual technical maintenance: the work shall be disassembled and inspected for one year.

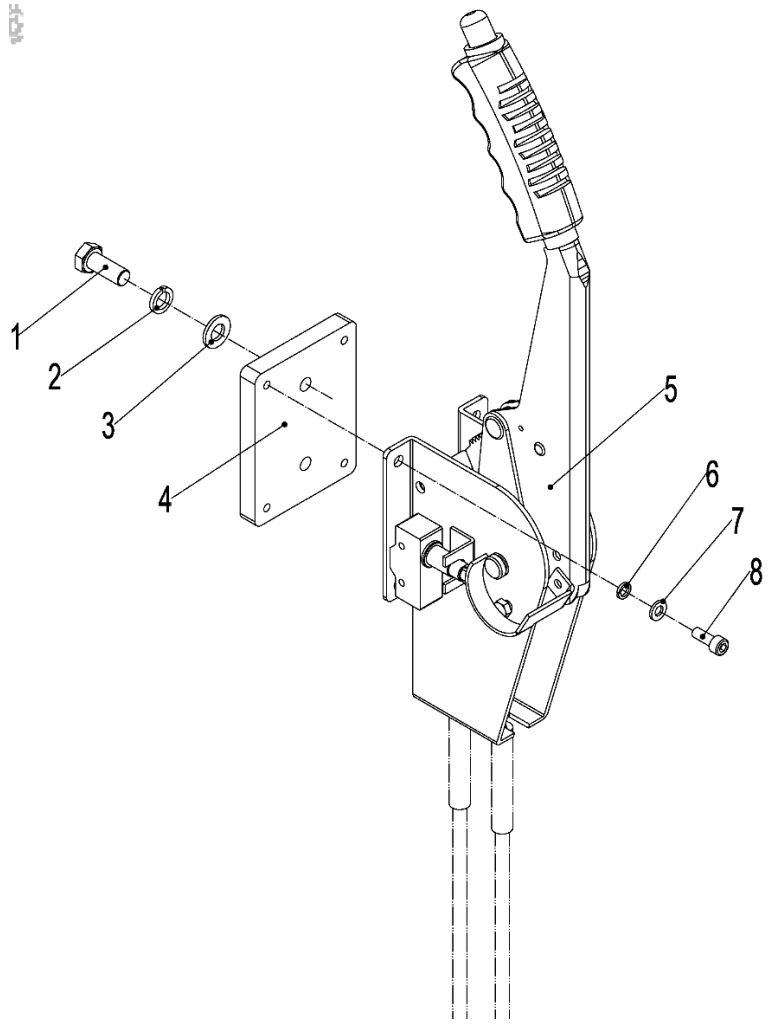
⑦ Requirements for inspection and commissioning items during installation:

When reinstalling the drive axle hub, pay attention to adjusting the brake clearance adjuster so that the clearance between the brake drum and the friction plate is between 0.3mm and 0.5mm. The tapered roller bearing on the hub shall be filled with about 100ml of 3 ×lithium grease.

Adjustment of wheel hub bearing clearance: tighten the lock inner nut until the wheel hub brake drum can only barely rotate. Then turn the lock inner nut backward by 1 / 8 turn. At this time, the hub brake drum shall be able to rotate freely without jamming, obvious axial clearance and yaw. Then assemble the lock washer, and finally lock it with the lock outer nut.

4-7. Parking brake

4-7-1 Appearance and specifications



NO	SN	Description
1	910100300035	Bolt GB5783-M10x20-8.8
2	910400500007	Spring washer GB93-10
3	910400100007	Flat washer GB97.1-10-200HV
4	256812020005	Backing plate (hand brake)
5	XG1801542747	Hand brake assembly
6	910400100005	Flat washer GB97.1-6-200HV
7	910400500005	Spring washer GB93-6
8	910100300010	Bolt GB5783-M6x16-8.8

4-7-2 How does it work

For this model, the parking brake is built into each drive shaft.Once the operator pulls the lever, the cable assembly pulls the brake lever, which in turn presses the brake piston and the resilient disc.This causes the compression discs to produce friction braking forces in the drive shaft.In this case, all rotating parts in the drive shaft are no longer able to move, thus keeping the drive wheel stationary.And once the lever is pushed back, the cable no longer pulls the lever, releasing the brake.In addition, the parking brake switch is installed behind the lever.The switch opens when the lever moves to engage the parking brake and closes when the lever moves to release the brake.

4-7-3 Parking brake test

Warning
If the parking brake is not properly adjusted, the vehicle rolls over, resulting in a dangerous situation: If the parking brake fails during this process, be prepared to operate the driving brake.

1. Place rated load capacity on fork

2. Tilt the vehicle up 15%.

3. Stop the forklift with the service brake at the half of the tilt, and the brake will automatically engage as the parking brake.

图 3-64

4. If the parking brake has been adjusted correctly, the vehicle shall remain stationary If the vehicle descends, refer to Section 3-8-3 parking brake failure exclusion.

4-8. Troubleshooting

4-8-1 Driving motor

Problem	Possible causes
Drive motor does not work	Switch not off (battery connector, key switch, seat switch, F/R switch or parking brake switch): Turn off the switch. If it still fails to operate, use a voltmeter to test the power supply of the control panel and the current of each switch. However, turn on the service brake switch.
	Bad signal. Fuse blown: Check the battery connections. Check the connection of the battery connector. Check fuses, drivers and logic. Replace the fuse if it is blown. Check whether the drive motor and control panel may cause the fuse to blow. Some of the reasons are: Working under excessive load, current limit is too high
	Low battery voltage: Check the battery terminal voltage. If it is too low, charge the battery. Check all cells for one or more defective cells. Check the specific gravity of each cell. The maximum density difference from the highest battery to the lowest battery shall not exceed. 020 SG (specific gravity)
	Incorrect operation of the control panel: Refer to "2-3-5 motor controller test" and "2-7 diagnosis / calibration / troubleshooting".
Drive motor does not work	Encoder failure.
Traction does not operate during normal operation, but hydraulic operation is normal	The brake is defective, resulting in excessive resistance. The increase in heat causes the motor to stop running. Check the brake adjustment.
	There is too much heat in the control panel for the following reasons: Overweight traction load: reduce duty cycle load. Bay thermal sensor failure: refer to "Section 2-7 in display panel Handling fault on ".These may cause the drive motor to fail, Control panel faulty or drive fuse open
Traction and hydraulic pressure will not last the whole normal operation period	The lift car is equipped with too small battery:
	Battery not fully charged during battery charging: Check whether the battery is charged Check the battery charger for failure.
	The battery replacement interval is too long or the cooling time of the replacement battery is too short.
	The battery has one or more defective single cells, causing the rated capacity and capacity of the battery to be lower than normal:
	Due to the failure of the drive system, the drive system consumes too much battery power. Check the brake adjustment. Check the wheel bearing, axle and other mechanical parts for

	correction to eliminate the fault. Change to a tire with less friction
	The hydraulic system consumes too much battery power due to lifting and tilting faults, or the hydraulic conditions of the duty cycle are incorrect: Reduce the setting of the hydraulic relief valve to the capacity used only. Replace with a smaller hydraulic pump. Check the mast for restrictions during operation.
	After a work shift, the forklift's working capacity exceeds its designed capacity without available power:
Battery positive (-) or negative (-) in direct contact with forklift frame (body) or drive motor	The battery is dirty and the electrolyte is on the top of the battery and in contact with the frame.The current flows through the battery box, which applies voltage to the forklift frame: clean the battery with baking soda and water solution.
	Battery or control panel wire connection in contact with forklift frame: Carry out continuity test and move wire contact. Remove the wires in sequence until the fault is cleared. The fault will be disconnected at the end of the wire
	Dirty motors:
	Wet motor:
Forklift does not reach the maximum speed	The battery is not fully charged or poor: Charge the battery.Check the single battery.If necessary, replace the single battery.
	Faults in drive motor, control panel or drive train: Check the forklift speed in both directions.If you need to adjust the control panel, adjust it according to the corresponding section of "Section 2 electrical system". If the drive motor fails, test the motor assembly
Slow acceleration of forklift	Drive control overheating, temperature sensing switch on. Note: if the temperature is 145 ° C (293 ° f), the thermal switch will give a warning.

4-8-2 Drive axle

Problem	Possible causes
Noise or vibration in the transmission	Incorrect oil level: Meet the correct oil level
	Use non-standard oil: Replace the oil with standard oil.
	Gear damaged or dented: Replace the gear.
	Bearing damage: Replace the bearing.
	Loose mounting bolts: Apply thread compound to the threads of the bolts and retighten to the specified torque.
Noise or vibration in the brake disc pack	Use non-standard oil or friction materials: Replace oil or friction materials with standard materials.
	Incorrect oil level: Meet the correct oil level

	Foreign matter (water) introduced into oil: Replace the oil.
	Friction plate wear: Replace the friction plate.
Leakage of installation part	Loose mounting bolts: Apply thread compound to the threads of the bolts and retighten to the specified torque.
	Damaged mounting surface: After removal, readjust or replace the components.
	O-ring damage: Replace the O-ring.
Hub leakage	Damaged oil seal: Oil seal replacement
	O-ring damage: Replace the O-ring.
Input shaft leakage	Damaged oil seal: Replace the oil seal.
	Motor O-ring damaged: Replace the motor O-ring.
	Damaged motor mounting part or housing: Replace the components.
Air respirator leakage	Too much oil: Meet the correct oil level
	Air respirator damaged: Clean or replace vent
	Use non-standard oil: Replace the oil with standard oil.
Brake disc pack leakage	Brake seal damaged: Replace sealing ring
	Brake seal not installed correctly: Reinstall or replace the seal.
	The sliding parts of the brake seal (damaged shaft, bearing seat or piston: Replace damaged components.
	The outer particles are placed on the sliding parts of the seal: Clean sliding parts and master cylinder and replace them if damaged parts are found
	Material or oil passage damage: Replace damaged parts
	Gear damaged or dented: Replace the gear.
	Bearing damage: Replace the bearing.
	Loose mounting bolts: Apply thread compound to the threads of the bolts and retighten to the specified torque.

4-8-3 Service brake

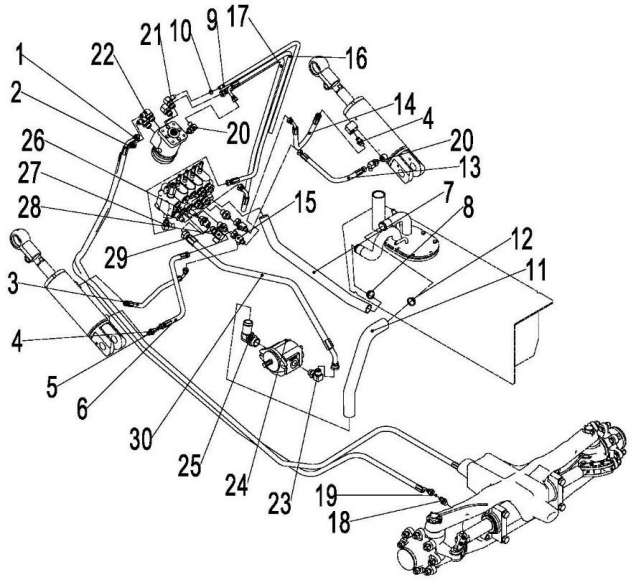
Problem	Possible causes
Pedal resistance is not firm (spongy)	Leakage or low level
	Air in the brake hydraulic system.
	Master cylinder loosening
Too much pressure of pedal when braking	Mechanical resistance on the brake pedal.
	Limit the brake lines.
	Bad master cylinder
Pedal towards the floor	Leakage or low level.
	Bad master cylinder.
Excessive pedal travel	Incorrect pedal adjustment.
	Leakage or low level
	Air in the brake hydraulic system.
	Bad master cylinder.
Brake not applicable	Leakage or low level.
	Air in the brake hydraulic system.
	The linkage is not adjusted correctly or bent.
	There is oil or brake fluid on the brake disc.
	Bad master cylinder.
Uneven braking or roughness (flutter) during braking	There is oil or brake fluid on the brake disc.
	There is poor contact between the steel plate and the friction plate.
	Uneven (uneven) brake discs
	Pressure plate bearing loose
	Broken disc and friction disc assembly

4-8-4 Parking brake

Problem	Possible causes
Brake not engaged	The parking brake is not adjusted correctly.
	The parking brake cable is not adjusted correctly.
	The brake disc is too worn

5. Hydraulic system

5-1. Overview



5-1-1 Component

序号/NO	编码/SN	名称
1	256823520001	Hydraulic pipe assembly (different) 8-L2500-1SC-60 °
2	256823520009	Hydraulic pipe assembly (different) 8-L2700-1SC-60 °
3	256823520002	Hydraulic pipe assembly (90 °)6-L600-1SC-60 °
4	255023520007	Joint (straight) 6-G1/4 - M14x1.5-60 °
5	910800100021	O-ring - Inner 11.2x2.65
6	256823520003	Hydraulic pipe assembly (90 °)6-L750-1SC-60 °
7	256523520014	Rubber hose (oil return)
8	911000600004	Throat hoop QC/T390-(34-38)
9	900200401001	Rubber hose (oil return)23x5
10	911000600003	Throat hoop QC/T390-(22-26)
11	255023520008	Rubber hose (oil suction)
12	911000600006	Throat hoop QC/T390-(40-45)
13	256823520004	Hydraulic pipe assembly (135 °)6-L450-1SC-60 °
14	281223521016	Hydraulic pipe assembly (straight)6-L600-1SC-60 °
15	255023510012	Connector (TEE)7-2xM14x1.5-M16x1.5-60 °
16	252123520011	Hydraulic pipe assembly (90 °)6-L1320-1SC-60 °
17	251123521005	Hydraulic pipe assembly (90 °)8-L1320-1SC-60 °
18	255023520034	Joint (straight)8-2xM16x1.5-60 °
19	910800100002	O-ring - Inner 13.2x2.65

20	255023510003	Connector (locking bend)6-G1/4-M14x1.5-60 °
21	255023510008	Connector (locking bend)11-M20x1.5-0
22	255023510007	Connector (locking bend)10-M20x1.5-M16x1.5-60 °
23	255023520035	Connector (locking bend)12-G1/2-M22x1.5-60 °
24	255023510006	Gear pump
25	255023510005	Connector (steering bend)25-G1-Φ32
26	255023520030	Joint (straight)12-2xM22x1.5-60 °
27	255023510001	Connector (locking bend)6-M12x1.5-M14x1.5-60 °
28	255044020143	Connector (locking bend)12-M20x1.5-M22x1.5-60 °
29	255023520033	Joint (straight)8-M20x1.5-M16x1.5-60 °
30	256823521004	Hydraulic pipe assembly (135 °)13-L780-2SC-60 °

The hydraulic system operates multiple brakes with pressurized oil from the main hydraulic pump and draws oil from these actuators.

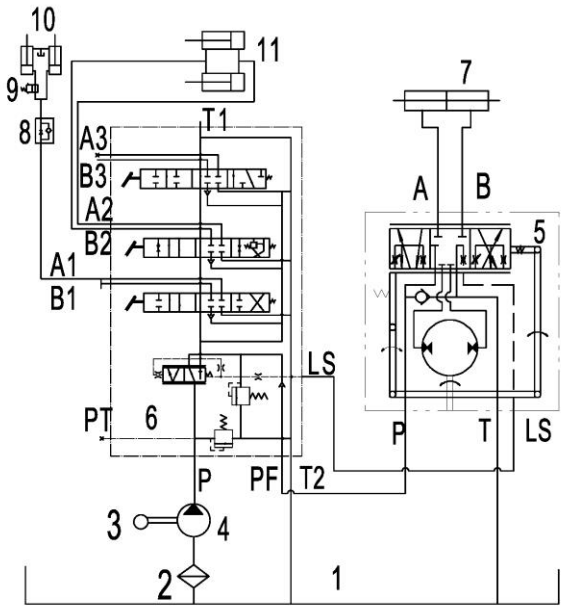
1.The main hydraulic pump is driven by the pump motor controlled by the controller.

2.The main hydraulic pump uses the rotating force output from the motor to pressurize the oil in the hydraulic tank and send the oil to the priority valve.

3.The priority valve determines which device is preferred between the steering and the control valve, and then supplies most of the pump oil to the priority valve.

4.The hydraulic tank stores the hydraulic oil that is returned from the actuator.The stored oil is drawn in by the main hydraulic pump for reuse.

5-1-2 hydraulic schematic diagram



1. Hydraulic oil tank	2. Oil suction filter	3. Pump motor	4. Gear pump
5. Steering gear	6. Multi way valve	7. Steering cylinder	8. Speed limiting valve
9. Shut off valve	10. Lifting cylinder	11. Tilt cylinder	

5-2. Pump motor

5-2-1 How does it work

The pump motor electrically transfers power to the main hydraulic pump for pumping hydraulic oil to operate the hydraulic system.

The pump motor is connected to the pump motor controller through U, V and W lines. The controller operates the pump motor based on inputs from multiple switches and sensors and internal parameter settings.

The pump motor operates when the following conditions are met:

The key switch is off.

With the operator seated, turn off the seat switch.

One of the hydraulic control switches, the F / R switch or the accelerator switch signals the controller.Turning the F / R switch to forward or reverse will trigger the pump motor to run at idle for 6 seconds.It then goes into PP mode to stop unless it's in six seconds

The clock signals from the accelerator.To restart the pump motor, the operator shall return the F / R switch to neutral before switching it forward or backward, or move one of the hydraulic levers to turn on the corresponding switch.

Motor speed detection (encoder operation)

The pump motor is equipped with an encoder, which is used as the speed sensor of the motor.The controller analyzes the amplitude of the pulse to calculate the speed of the motor.The smaller the amplitude, the higher the speed of the motor.

Like other sensors, the encoder generates the main signal (signal a) and the reference signal (signal B) through two hole sensors.As shown in Figure 4-6, the sequence of the generated signals varies according to the direction of rotation.

Overheat protection (thermal sensor operation)

The pump motor is equipped with a thermal sensor to prevent overheating.Once the motor is heated to 145℃(293℉), an overheat alarm is activated and the motor's performance is limited.

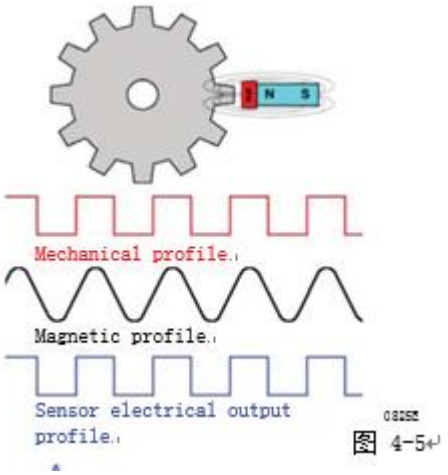


图 4-5

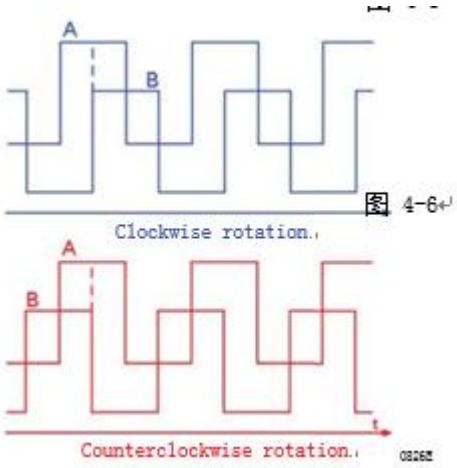


图 4-6

5-2-2 Pump motor and main hydraulic pump removal / installation

1.Remove the oil pump motor U V W

2 Remove the hydraulic pump

3 Remove the fixing screw to remove the motor

5-3. Main hydraulic pump

5-3-1 How does this work

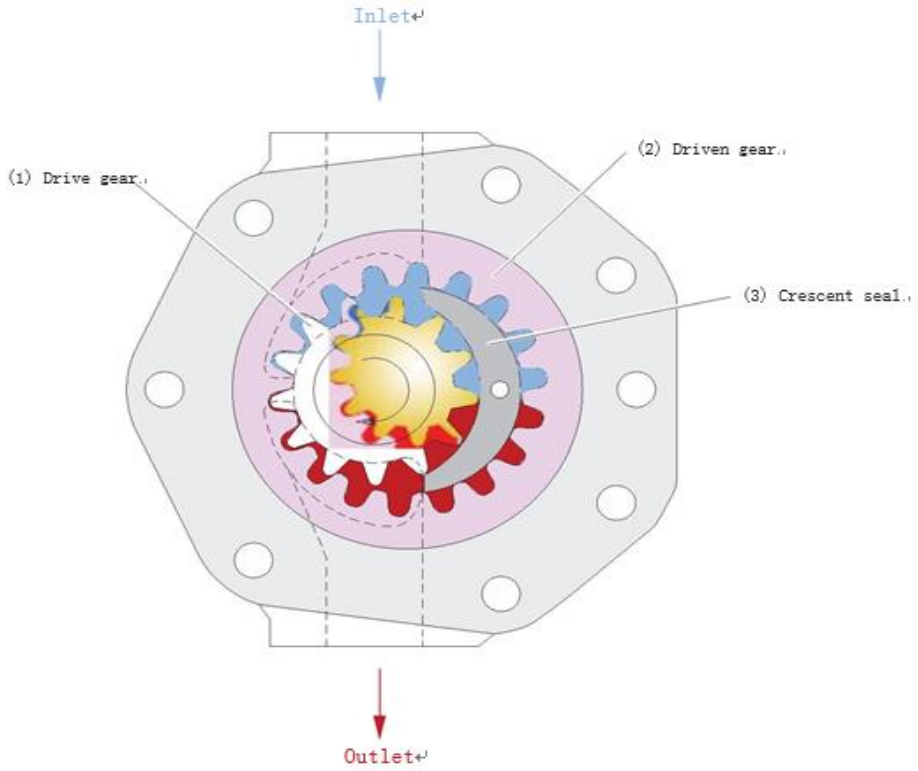


图 4-13

This model uses internal gear pump as its main hydraulic pump.

The internal gear pump includes a driven gear (2) [external gear] and a driving gear (1) [internal gear], as shown in the figure.The volume of the meshing area between the driving gear and the driven gear increases as they rotate and draw oil.The suction cage is then placed between the teeth of the two gears and the crescent seal (3) (the bright area in the figure) and brought to the outlet as the volume of the gear engagement area decreases.The high pressure chamber (discharge) and the low pressure chamber (suction) are sealed by a crescent seal (3).Theoretically, the internal gear pump has less pulsation than the external gear pump.

5-3-2 Disassembly and assembly

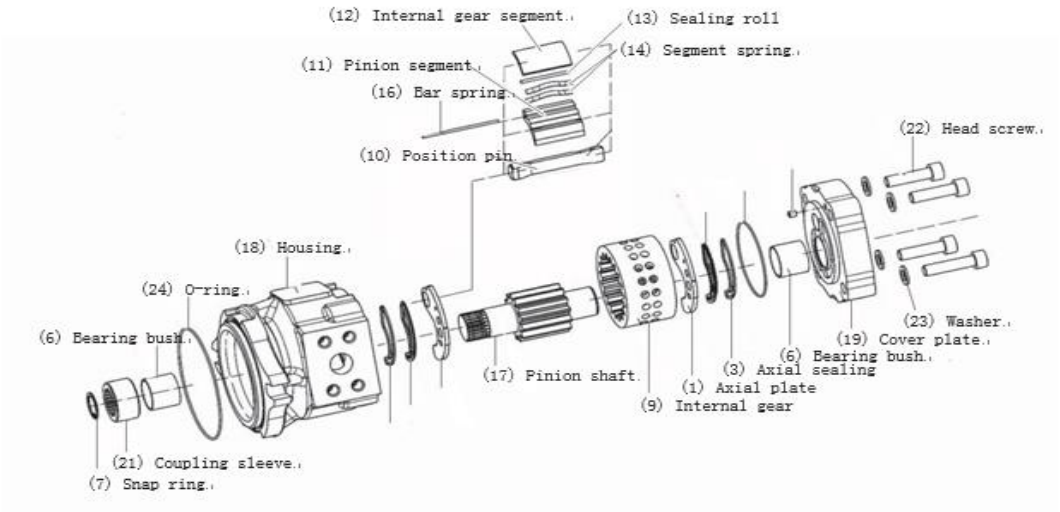
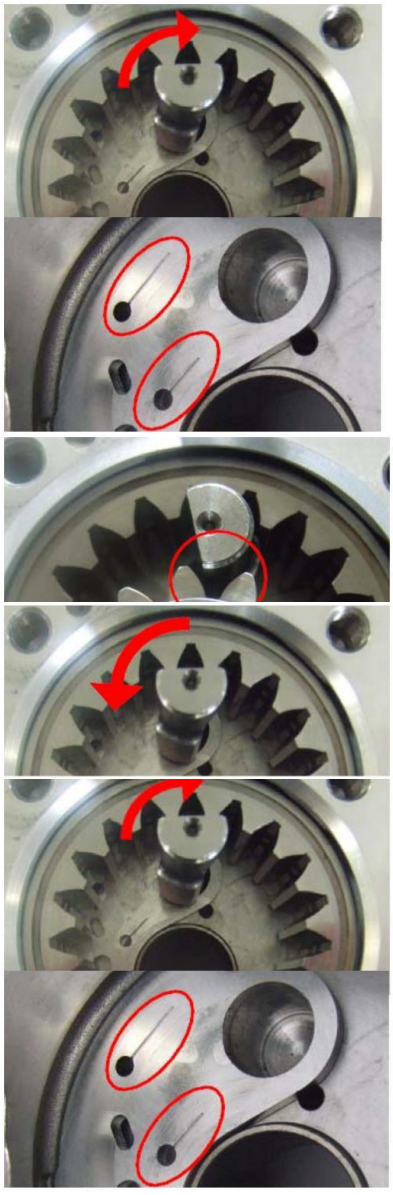


图 4-14

Disassemble

1. Loosen and remove the 4 screws (pos.22) on the cover plate (pos.19).
2. Carefully remove the cover plate (pos. 9) from the housing (pos. 18).
3. Remove the shaft plate II (2), pinion shaft (17), rod spring (16), segment (11,12), segment spring (14,15) and sealing roller (13).Note the position of the pinion shaft (17), which may be locked by the locating pin (10), as shown.
4.Remove the inner gear (9), rotate the locating pin (10) by about 90 °. After that, pull out the locating pin (10).
5. Remove shaft plate I (1)
Below are the backup ring (4) and the axial seal (3).



Parts

(1) Make sure that the axial seal (3) and the left support ring (4) are in good condition in the machined groove.The groove of shaft plate I (2) must be upward as shown in the figure.
2. Install the dowels (10) first, as shown.Then place the inner gear (9) and turn the locating pin (10) about 90 °

3. Install the pinion shaft (17) and make sure it is not obstructed by the dowels (10), as shown.

4. Install the pinion Section (11) and the internal gear Section (12).Make sure that the side of the inner gear segment (12) with two bevels is shown on top of the pinion segment (11) (green mark).

5. Place the sealing roller (13) and the bar spring (16).The rod spring (16) is fixed in the housing (18) through the shaft plate I (1).

6. Place the section spring II (15) so that the 2 bows are pressed on the sealing roller, as shown in the figure.

7.Install in the same way as the bow against the inner gear segment (12

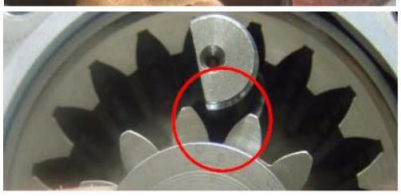
8. Install shaft plate II (2) close to the housing or damage to the bearing bush (6) hydraulic system in the cover plate (19

9. Check the green O-ring (20) and check the position on the cover plate (19).Install the flexible axial seal (3) first, then the right-hand ring (5).It is helpful to cover the axial seal (3) and the right backup ring (5) with grease, which makes assembly easier.
The straight pins must be located in the cover plate (19) or in the housing (18).

10. Measure the gap between the cover plate (19) and the housing (18).

If the gap is greater than 0.6 mm (0.024 in), the axial plate or seal may slide, removing the pump again!

11. Tighten the four screws with 50 N ·m (37 LB ft).

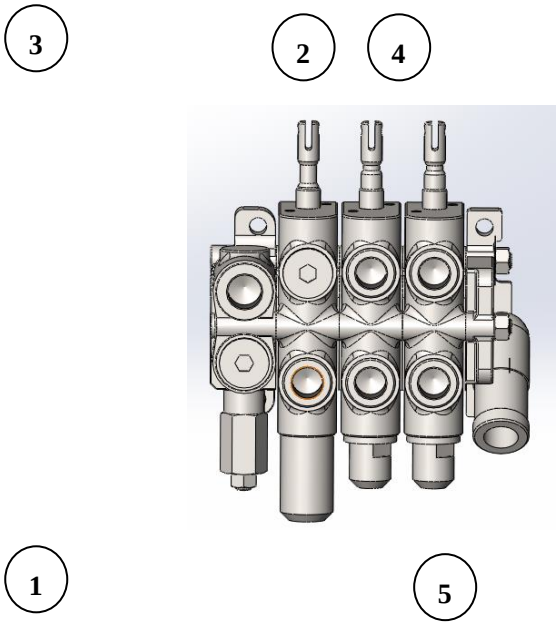


Note: if the pump is assembled correctly, the pinion shaft shall be able to turn by hand.

5-4. Multi-way and priority valves

5-4-1 Appearance and specifications

The multi-way valve adopts two-piece four body type. The hydraulic oil from the working oil pump is controlled by the multi-way valve stem to distribute the high-pressure oil to the lifting cylinder or tilt cylinder. There are safety valve and self-locking valve inside the multi-way valve. The safety valve is set on the upper side of the oil inlet of the multi-way valve to control the system pressure; The self-locking valve is set on the tilt valve plate, which is mainly used to prevent serious consequences caused by misoperation of the control lever of the tilt cylinder without pressure source. A check valve is installed between the oil inlet and the oil suction port of the lifting valve plate, and between the oil inlet of the lifting valve plate and the oil inlet of the tilt valve plate.



1. Safety valve
2. Lifting linkage
3. Inclined coupling
4.Attachment
5.Oil return port

5-4-2 How does this work

The multi way valve adopts the two piece four body type. The hydraulic oil from the working oil pump is controlled by the multi way valve stem to distribute the high pressure oil to the lifting oil cylinder or the tilt oil cylinder.There are safety valve and self-locking valve inside the multi way valve.The safety valve is set on the upper side of the oil inlet of the multi way valve to control the system pressure; the self-locking valve is set on the tilt valve plate, which is mainly used to prevent serious consequences caused by wrong operation of the control rod in the case of no pressure source of the tilt cylinder.A check valve is installed between the oil inlet and the oil suction port of the lifting valve plate, and between the oil inlet port of the lifting valve plate and the oil inlet port of the tilting valve plate

The pressure of the main safety valve has been adjusted before delivery, and the user is not allowed to adjust and disassemble it at will.

The priority valve measures the hydraulic oil to the control valve and steering unit after receiving the oil from the main hydraulic pump,In order to always give priority to the steering system when steering is required.

Priority valve is mainly composed of steering safety valve, spring, valve core and valve body as shown in the figure.Its working principle is that port P is the oil inlet of the steering pump, port CF is connected with the oil inlet of the steering gear, port EF is connected with the oil inlet of the multi way valve of the working system, port LS is connected with the control port of the steering gear, and port t is the oil return port of the safety valve.

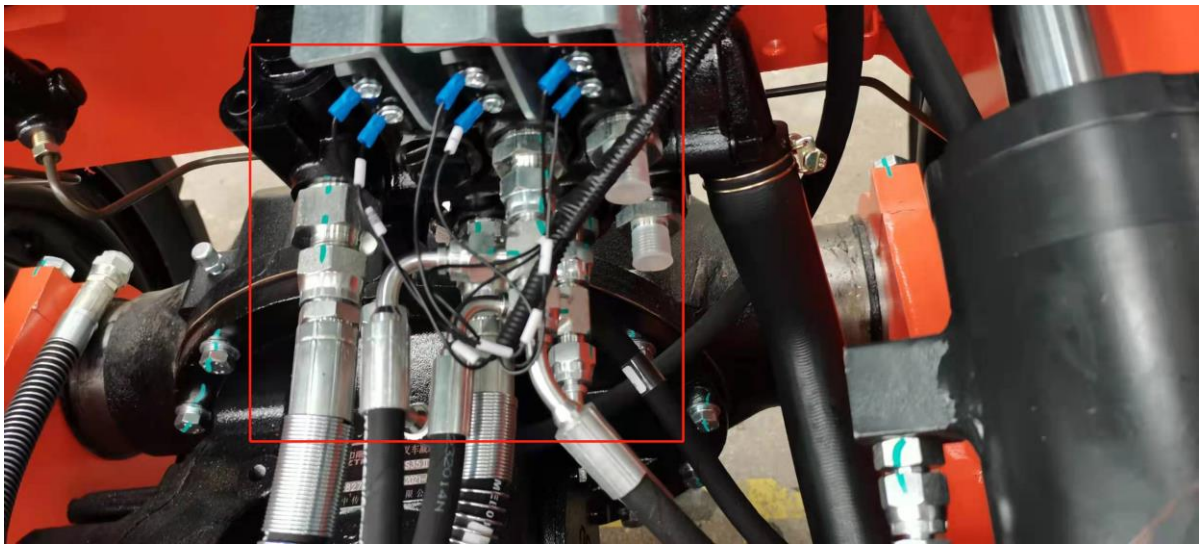
When oil is fed into port P, hydraulic oil is preferentially supplied to port CF through valve element 3.When the steering gear is not working, the CF port is in a closed state. At this time, the pressure of the LS port is zero, the right end of the valve core enters the oil, and the hydraulic pressure acts on the right end of the valve core. Overcoming the pre pressure of spring 2, the valve core moves to the left. At this time, the P port is connected with the EF port to realize the functions of lifting, tilting, side shifting, etc.

When the steering gear works, the CF port is connected with the steering cylinder through the steering gear, and the gear pump oil enters the steering cylinder first to realize steering

5-4-3 disassembly and assembly of multi way valve

1 remove the connection between the control lever and the multi-way valve

2 remove the connector and micro-switch



3 remove the fixing bolts

5-5. Troubleshooting

5-5-1 Pump motor

Fault phenomenon	Possible causes
The hydraulic pump motor does not work.	Poor connection or blown fuse. Check the battery connections. Check the key fuse. Check whether the hydraulic pump motor may cause the fuse to blow.
	Key switch, seat switch or line contactor not closed. Turn off the seat and key switch.Use a multimeter to check the power flow through the seat switch, key switch, line contactor coil and line contactor.The key switch, seat switch and wiring connector must be turned off for the power steering function to operate.
	Insufficient voltage. Charge or replace the battery. Check all battery cells for one or more defective battery cells. Check the specific gravity of each battery cell.The maximum density difference from the highest battery to the lowest battery shall not exceed 0.020 SG (specific gravity). Check whether the cable terminal is closely matched with the battery terminal and the control panel connector. Check whether the wire inside the cable is broken.
	Incorrect operation of the lift and drive system.
The battery does not work continuously and completely	The battery installed on the forklift is too small. Study and question the use of forklift trucks in their full working conditions, select and purchase the appropriate battery capacity to understand the working hours.
	During the battery charging operation, the battery is not fully charged. Check whether the battery is evenly charged (charging makes the specific gravity of all batteries the same). Check the battery charger for defects.
	The charging interval of the battery is too long or the cooling time of the charging battery is too short.Reduce battery life. Before charging, please extend the cooling time of the battery before putting it into use.
	The battery has one or more defective battery cells, which may result in below rated capacity and battery capacity. Test and identify defective cells.Replace the defective battery. Battery cells are connected in series, one bad battery causes high power connected in series with other batteries Obstruction.This reduces the speed of the motor as the battery resistance increases.This can happen when other batteries are almost fully charged.
	The hydraulic system consumes too much battery power due to incorrect lift and tilt devices or hydraulic controls for the duty cycle. Reduce the hydraulic relief valve setting to the capacity required for the application. Replace with a smaller hydraulic pump (if any).Check the mast for restrictions during operation.

	Remove the quick disconnect and install the connection with less oil flow resistance. Check the defective hydraulic control valve and pilot relief valve.Remove any restrictions in the hydraulic circuit. Check for restrictions on movable hydraulic attachments.Check sliding parts, bearing wear, hinge binding and proper lubrication on necessary parts.
	Hydraulic pump motor overheated. If the motor temperature reaches 155°C (311°f) The controller does warn of overheating and reduce performance.
The hydraulic speed of forklift is very slow	Pump motor control circuit overheated. If the temperature of the power unit reaches 100°C (212°f), the controller will display overheat warning and reduce performance.

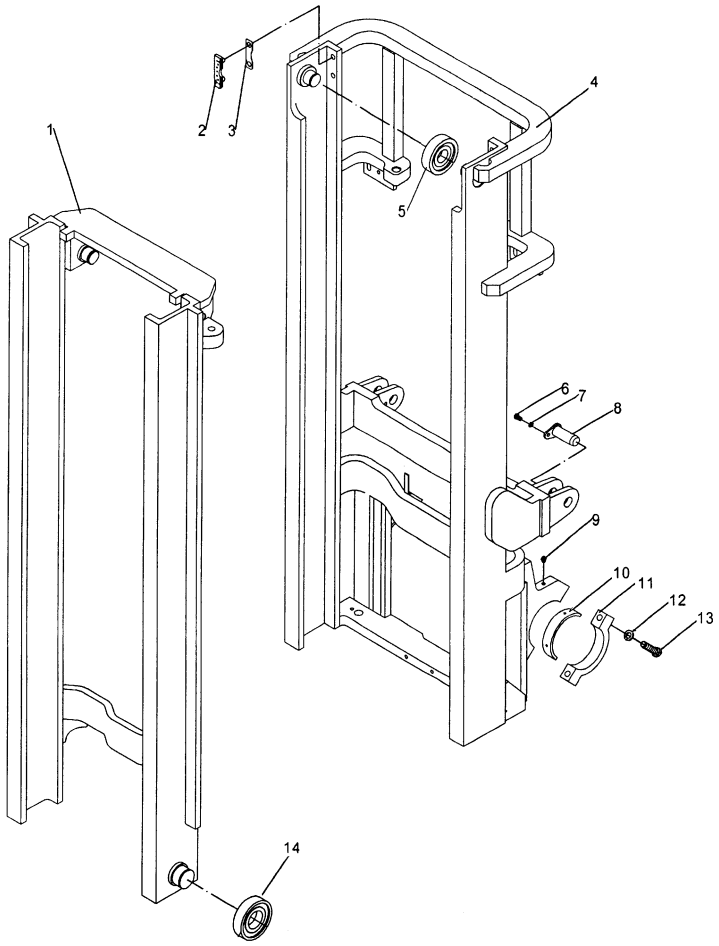
5-5-2 Main hydraulic pump

Fault phenomenon	Possible causes
Noise in the pump.	The oil level is low.
	The oil is very thick (viscosity is too high)
	The pump inlet line is limited.
	Wear parts in the pump.
	The oil is dirty.
	Air leaks into the inlet line.
The oil temperature is too high.	The oil level is low.
	There are restrictions on the passage.
	Relief valve set too low.
	The oil is too thin.
	There is air leakage in the system.
	The pump is too worn.
	The system is operating under too high pressure. The relief valve is set too high.Restrictions in flow control valves, check valves and oil circuits.
Leakage at pump shaft seal.	The shaft seal is worn.
	Internal wear of pump body.
	Operation with a low oil level in the tank can cause suction on the seal.
	During installation, the seal is cut at the shaller of the pump or keyway.
	The sealing lip is dry and hardened by heat.
The pump is unable to deliver fluid.	The oil content in the tank is low.
	The pump inlet line is limited.
	There is air leakage in the pump inlet pipeline..Loose bolts. Defect in suction line of bay.
	The viscosity of the oil is wrong.
	The pump is too worn.
	Pump shaft failure
	The bolts for the pump do not have the correct torque.

6. Lifting/tilting/auxiliary system

6-1. Overview

The lifting system is a two-stage roller type vertical lifting and shrinking system, which is composed of inner and outer door frames and fork frames



6-2. How to operate

A. Mast tilt

Mast tilt operation is performed by two double acting cylinders. In the case of each cylinder, one end is connected to the chassis of the vehicle and the other end to the side of the Mast.

Tilt forward

Push the tilt lever to move the tilt spool of the multi-way valve to send the hydraulic oil to the opposite chamber of each cylinder rod and extract the oil from the rod chamber. This causes the piston to push forward, tilting the front door frame mounted on the cylinder rod on the axis connected to the vehicle.

Tilt backward

Pull the tilt lever to move the tilt spool of the multi-way valve to send the hydraulic oil to the chamber of each cylinder rod and extract the oil from the opposite chamber.This causes the piston to be pushed back, tilting the rear mast mounted on the cylinder rod onto the connecting shaft to the vehicle.

B. Standard Mast lifting

The standard (STD) Mast assembly uses two Mast and two single acting cylinder cylinders to lift the load.
Rollers mounted on the inside and outside of the carriage and Mast respectively facilitate these up / down movements.

Cylinder

After receiving the hydraulic oil from the lift part of the multi way valve, the rod of the standard oil cylinder stretches out to push the internal Mast upward. At the same time, the bracket is also pulled by the lifting chain, which is connected to the external Mast to lift together with the chain.

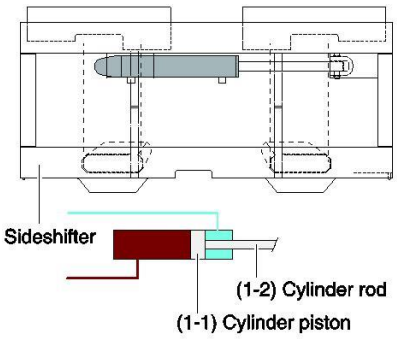
Lower
If the operator controls the lever to open the outlet port in the poppet of the multiway valve, the oil output from the standard cylinder will begin to flow out by gravity.

When the oil is drained, the cylinder rod and the attached inner Mast will retract.
When the inner Mast is lowered, the tension of the lifting chain will be relaxed and the bracket will also be lowered.

C Side shifter

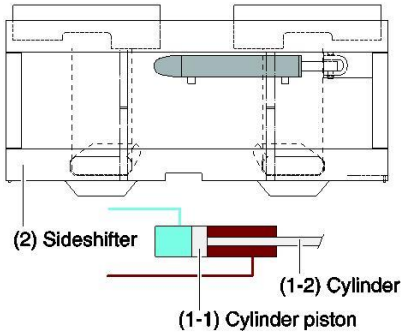
Move to the right

Press down the sideshift rod to move the AUX1 valve element of the multiway valve to send the hydraulic oil to the left chamber of the cylinder piston (1-1) and recover the oil in the right chamber.This causes the piston (1-1) to push forward with the side-shifter (2) mounted on the piston rod (1-2) and also moves the fork attached to it to the right



Move to the left

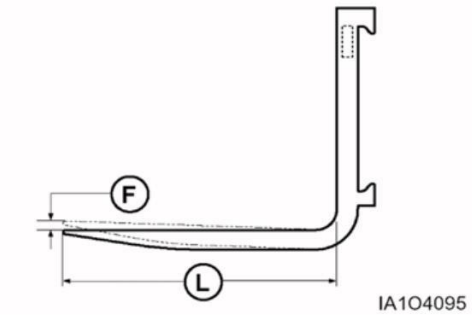
Pull the sideshift lever to move the AUX1 spool of the multi-way valve to send hydraulic oil to the right chamber of the cylinder piston (1-1) and recover the oil in the left chamber.This causes the piston (1-1) to push back together with the Side-shifter (2) mounted on the piston rod (1-2) while moving the fork attached to it to the left.



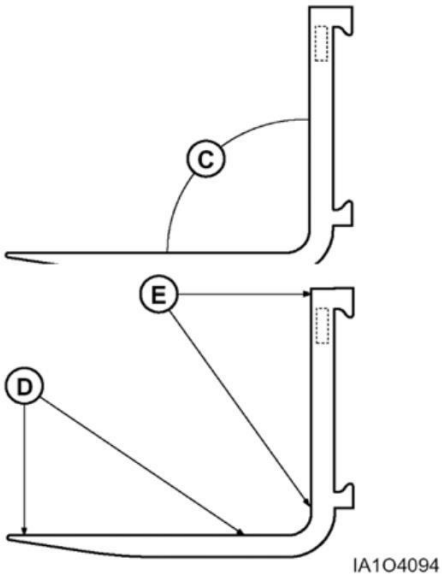
6-3. Fork service

A fork inspection

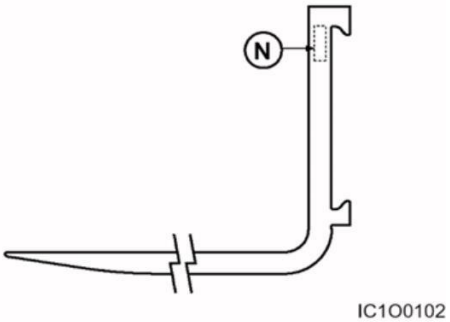
The forks shall be checked at least every 12 months.If the forklift is used in multi shift or heavy work, it shall be checked every six months.



1. Check the fork carefully for cracks.Pay special attention to the heel (A), all welding areas and mounting brackets (B).Check hanging
The top and bottom of a fork used on a fork on a fork lift truck
A hook.
A cracked fork shall be replaced
2. Check the angle between the upper surface of the fork blade and the front surface of the fork shank.
If the angle (C) exceeds 93 degrees or deviates from 90 degrees
If the original angle is more than 3 degrees, the fork shall be stopped, such as some special
Apply the fork as shown in.
3.Check the upper surface of blade (D) and the front surface of handle (E) with straight edge
The straightness of.
If the deviation of straightness exceeds 0.5% of the blade length and / or the blade
Handle height is 5 mm / 1000 mm (0.18 "/ 3"),
Stop using the front fork.

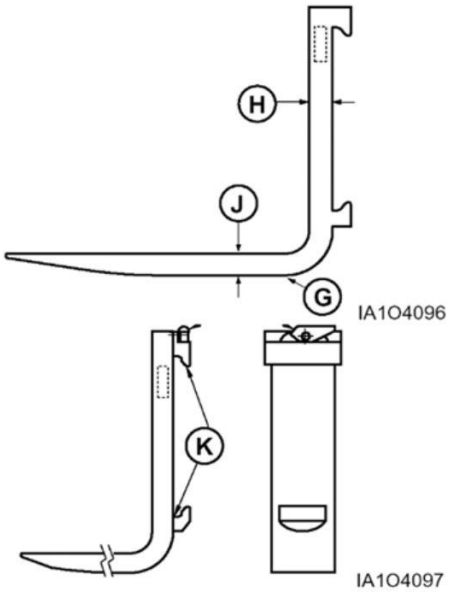


4. When installing on the fork frame, check the connection between one fork tip and the otherHeight difference.The difference of fork tip height may lead to uneven load
Support and cause problems entering the load.
The maximum recommended difference in fork height (F) is 6.5 mm for pallet fork Meter (0.25 inch) and full tapered fork 3 mm (0.125 inch Inch.Maximum allowable height of fork tip between two or more forks
The allowable difference is 3% of blade length (L).
If the difference of fork tip height exceeds the maximum allowable difference, the Change one or two forks.
5. Check the front fork blade (J) and handle (H) for wear, especially
Pay attention to the heel (G).If the thickness is reduced to 90% of the original thickness Or smaller, replace the front fork.
Fork blade length may also be reduced by wear, especially in the
Tapered fork and pressing plate.If the blade length is no longer as expected
Replace the fork from service.



6. Check the fork frame (K) for wear, extrusion and other local deformation,
This may cause excessive lateral swing of the fork.Cross on hook fork
Large gaps may cause them to fall off the carrier.
The fork showing obvious signs of damage shall be stopped.
7Check the lock and other front fork fixings to ensure they are in place
And work normally.

The hook yoke is engaged using a spring pin (M) located in the top hook
Notch in the top carrier bar to hold the fork in place.
When adjusting the front fork spacing, prevent the fork from sliding out of the carriage through the stop
End.These stops are located at both ends of the carriage and at the bottom yoke
In the path of.In some cases, a load backrest can be used
Extension instead of stop.
The shaft mounting fork can use any collar or gasket on the shaft to the fork
One side.They can also use U-bolts, pins or similar devices,
It engages the fork through the top structure of the bracket.
8. Check that the fork mark (N) is readable.Update tags as needed to
Maintain readability.
9. Lift the Mast and operate the tilt lever until the top surface of the fork is
The ground is parallel.Place two straight bars with the same width as the bracket, horizontally
Cross fork.
10. Measure the distance from the bottom of each of the two rods to the floor.
For fully tapered and polished (FTP) forks, the forks must be parallel
Full length of all other forks within 3 mm (. 12 in.)
Degrees are 6.4 mm (. 25 in).
11. Place a fork (one third of the tip) on one that will not move
Under the fixture.Then operate the tilt control carefully until it is stuck
The back of the car just lifted off the floor.Use the second fork to perform the phase
The same procedure.Repeat step 9.



B fork removal / installation

1. Lower the fork completely.

2. Unlock the latch at area (1).

3. Slide the fork into the center groove (2) and remove it.

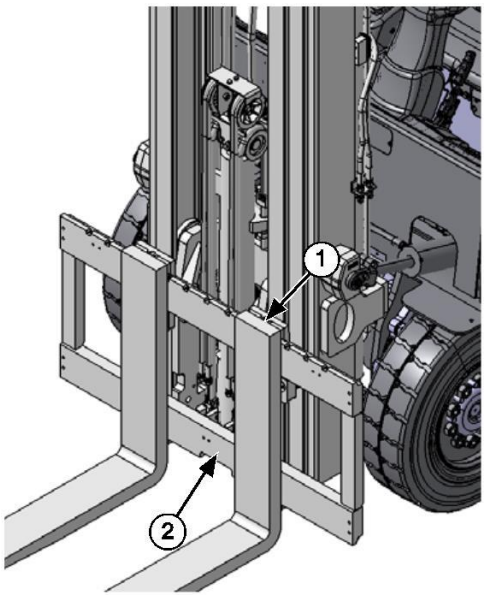
4. Perform the above steps in reverse order to install the front fork.

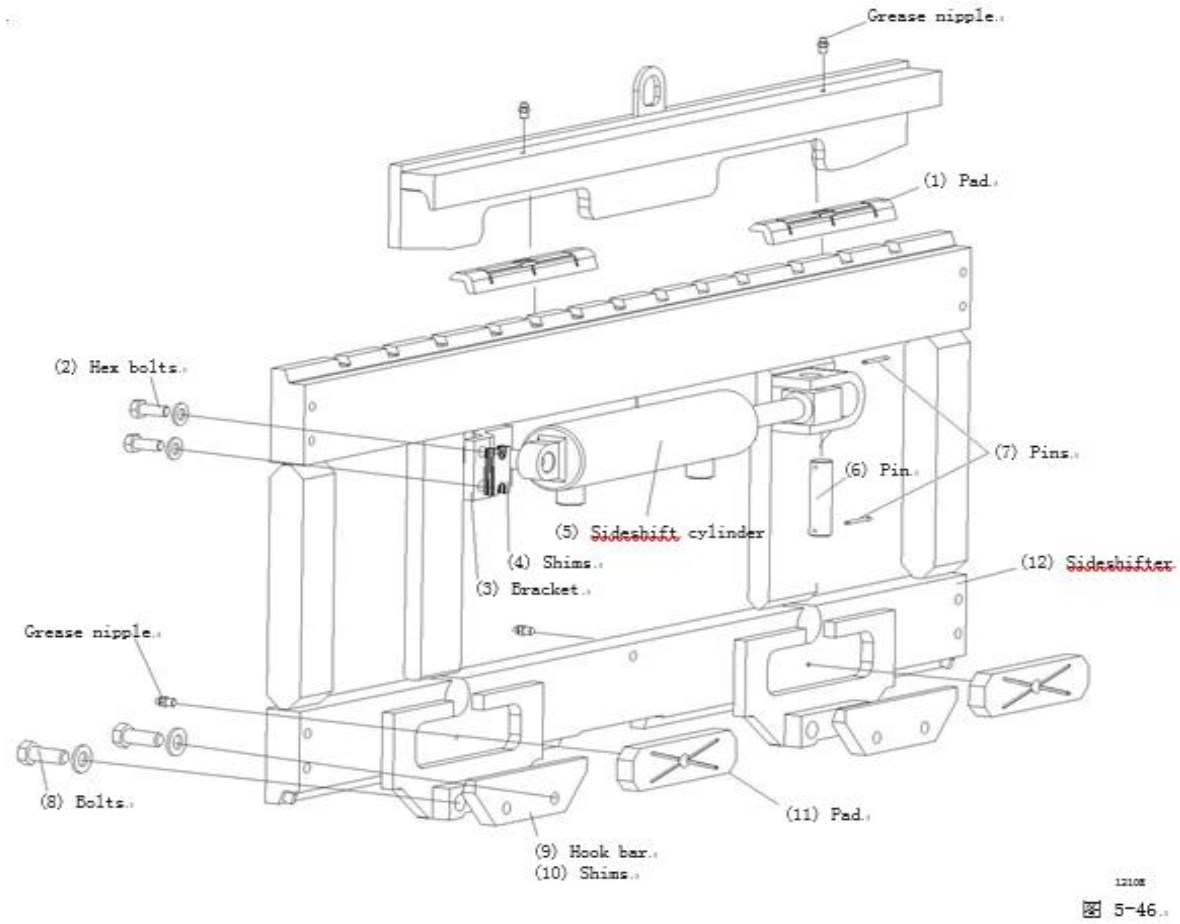
Note: during disassembly, check the fork and fork frame, and replace them for possible damage,

Any part that is cracked or excessively rusted.

6-4. Side-shifter service

A Standard side-shifter and cylinder removal / installation





Initial steps

1. Lift the bracket and place a wooden block under it.

2. Lower the bracket onto the wood block and secure the crane to the load backrest.

3. Remove the fork (see Section 5-3-3 b).

4. Remove residual pressure in the hydraulic system by moving the lever back and forth several times by closing the key

Process

1. Mark the hose and port of the side-shift cylinder as reference for assembly.

2. Disconnect the hose from the side-shift cylinder and plug and cap the hose and port.Prepare the oil pan to catch any oil that is coming out of the hose and the cylinder port.

3. Remove the hexagon bolt and washer, and then remove the gasket. When installing, apply thread sealant on the hexagon bolt. When installing, adjust the thickness of the gasket so that the gap between the bracket and the cylinder is at least 1.5 mm (0.06 in).

4. Slide the side shifter out of the bracket. During installation, check whether the clearance between bracket and side shifter is consistent. If this is not the case, the hook bar must be shimmed on each side. They can be removed by removing the bolts and washers. After installation, lubricate all gaskets with grease through their respective fittings.

5. After removing the pin, pull out the split pin and remove the side-shift cylinder.

6. Perform the above steps in reverse order to install the side-shifter body and the side-shift cylinder.

6-5. Tilt cylinder service

A. Integral removal / installation of tilt cylinder

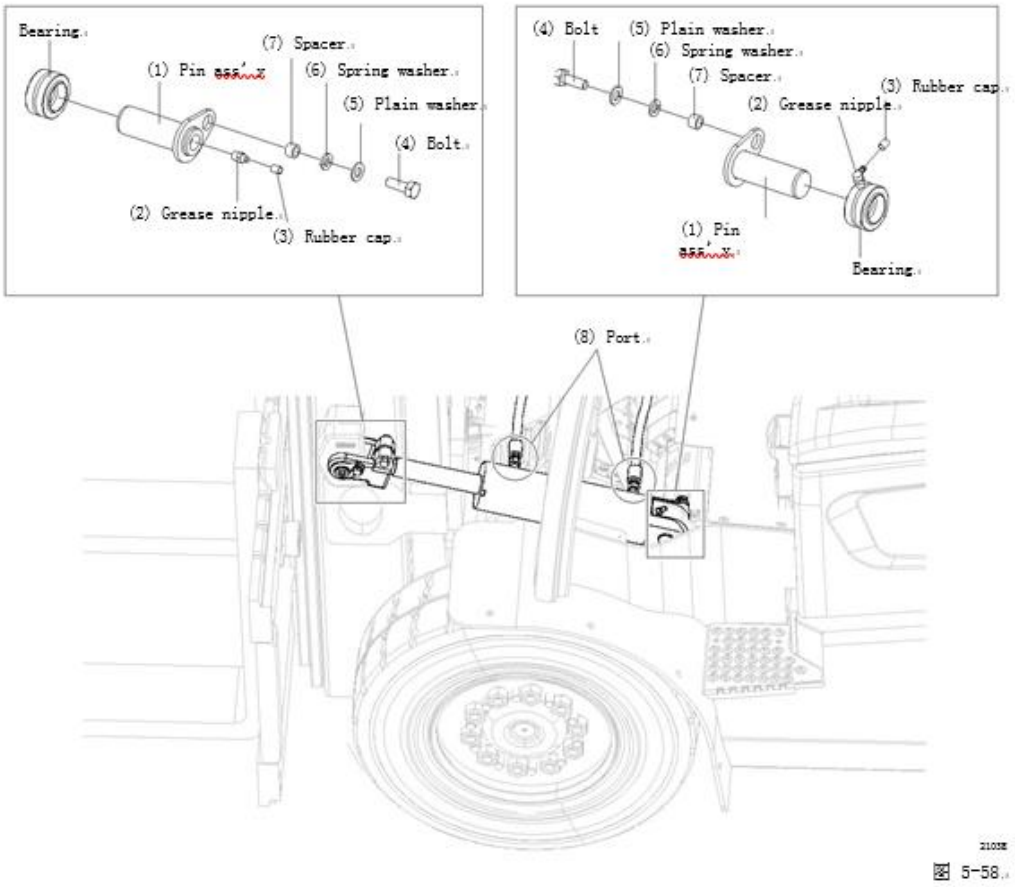


Figure 5-58

Initial steps

1. Prepare a hoist and tie the straps to both sides above the Mast.

2. Remove residual pressure in the hydraulic system by moving the lever back and forth several times by closing the key

3. Prepare the oil pan.

4. Remove the base plate

Process

1. Mark the hose and port (1) as an assembly reference.

2. Disconnect the hoses from the ports and plug them.Prepare the oil pan to catch any oil coming out of the hose and cylinder port.

3. Remove the bolt (4), washers (5, 6), and shim (7) from the Mast end of the cylinder.

4. Pull out the pin (1) from the end of the Mast.

5. Repeat steps 3-4 for the frame end of the cylinder.

6. Remove the tilt cylinder.

7. Perform the above steps in reverse order to install the tilt cylinder.

8. Refill the tank with hydraulic oil according to the specifications given in Section 1-6 and perform the tilt cylinder alignment procedure provided in Section 5-3-6 A.

B. Disassembly / assembly of tilt cylinder

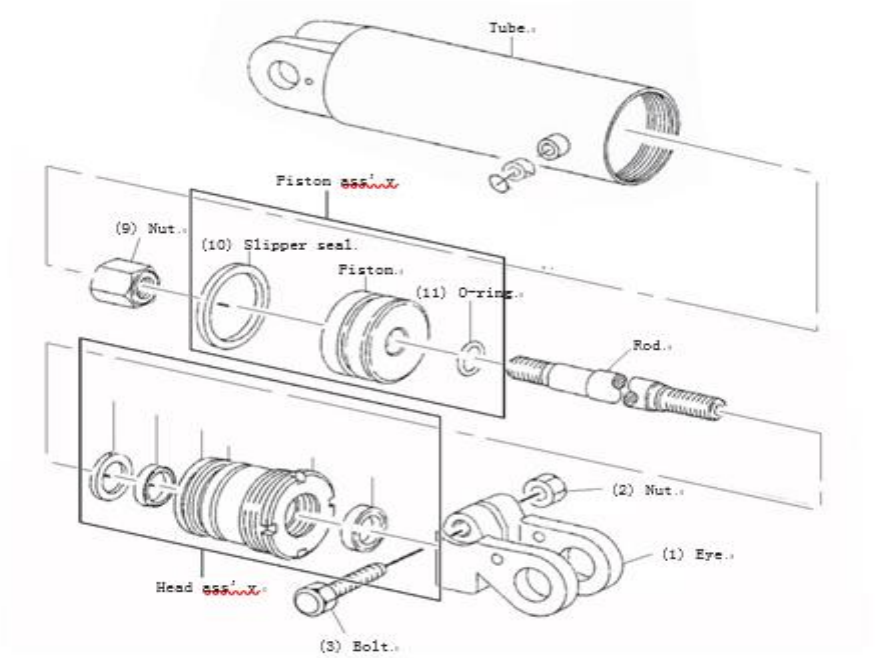


图 5-60

Tools needed: claw spanner

1. Place the tilt cylinder in a vise and use a dog wrench to remove the rod assembly.

Installation torque: 270±30 Nm (200±22 lb ·ft)

2. Loosen the nut (2) and bolt (3) and remove the eye (1).

Installation torque: 95±15 Nm (70±11 lb · ft)

3. Remove the butt from the head.

4. Remove the seal ring (4).

The lip shall face the head during installation.

5. Remove the U-cup (5).

6. Remove the O-ring (6).

Install the contact side of the support ring so bent.

7. Remove the backup ring (7).

8. Remove the dust seal (8).

The lip shall face the head during installation.

9. Remove the nut (9).0

Installation torque: 402±29 Nm (297±21 lb ft)

10. Remove the piston assembly.

11. Remove the slipper seal (10).

12. Remove the O-ring (11).

13. Perform the above steps in reverse order in order to assemble the tilt cylinder.

Note: after assembly of the tilt cylinder, make sure that the dust cover and plug are used

New seal port.

6-6. Mast side cylinder

A. Overall removal / installation of main lift cylinder

1. Remove the chain.
2. Remove the upper and lower fixing bolts and hoops of the oil cylinder

3 Remove the lifting oil pipe and lift the middle gantry to remove the oil cylinder

B. Main lift cylinder removal / assembly

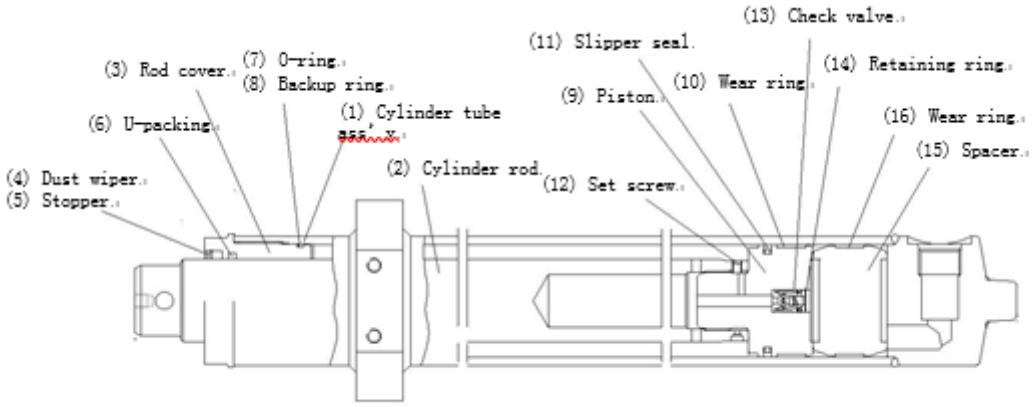


图 5-63

Tools needed: claw spanner

Initial steps

1. Remove the main lift cylinder (see Section 5-3-7).

Process

1. Using a claw wrench, remove the rod cap (10).

2. Remove the O-ring (7) and support ring (8) from the outer diameter of the rod cover (3), the dust wiper (4), the plug (4) and the U-ring seal (6) from the inside.Install the U-gasket (6) with the lip facing outward.Check the condition of the dust wiper (4).

3. Secure the cylinder tube assembly (1) in a vise and remove the cylinder rod (2).

4. Loosen the set screw (12).

5. Unscrew the piston (9)

6. Remove the sliding seal ring (15) and wear ring (10) from the outside diameter of the piston (9), and remove the retaining ring (14) and check valve (13) from the inside.

7. Remove the wear ring (16) and the gasket (15).

8. Check the condition of the seal and replace the damaged or worn seal.

9. Perform the above steps in reverse order to assemble the main lift cylinders.

Note: make sure that the port is resealed with a dust cap after the cylinder is assemble

6-7. disassembly and assembly of gantry assembly

1. Use the crane to lift the gantry at the specified lifting point
2. Remove the lifting oil pipe
3. Remove the tilt cylinder pin shaft

4 remove the gantry fixing tile to remove the gantry

7. Steering system

7-1. Overview

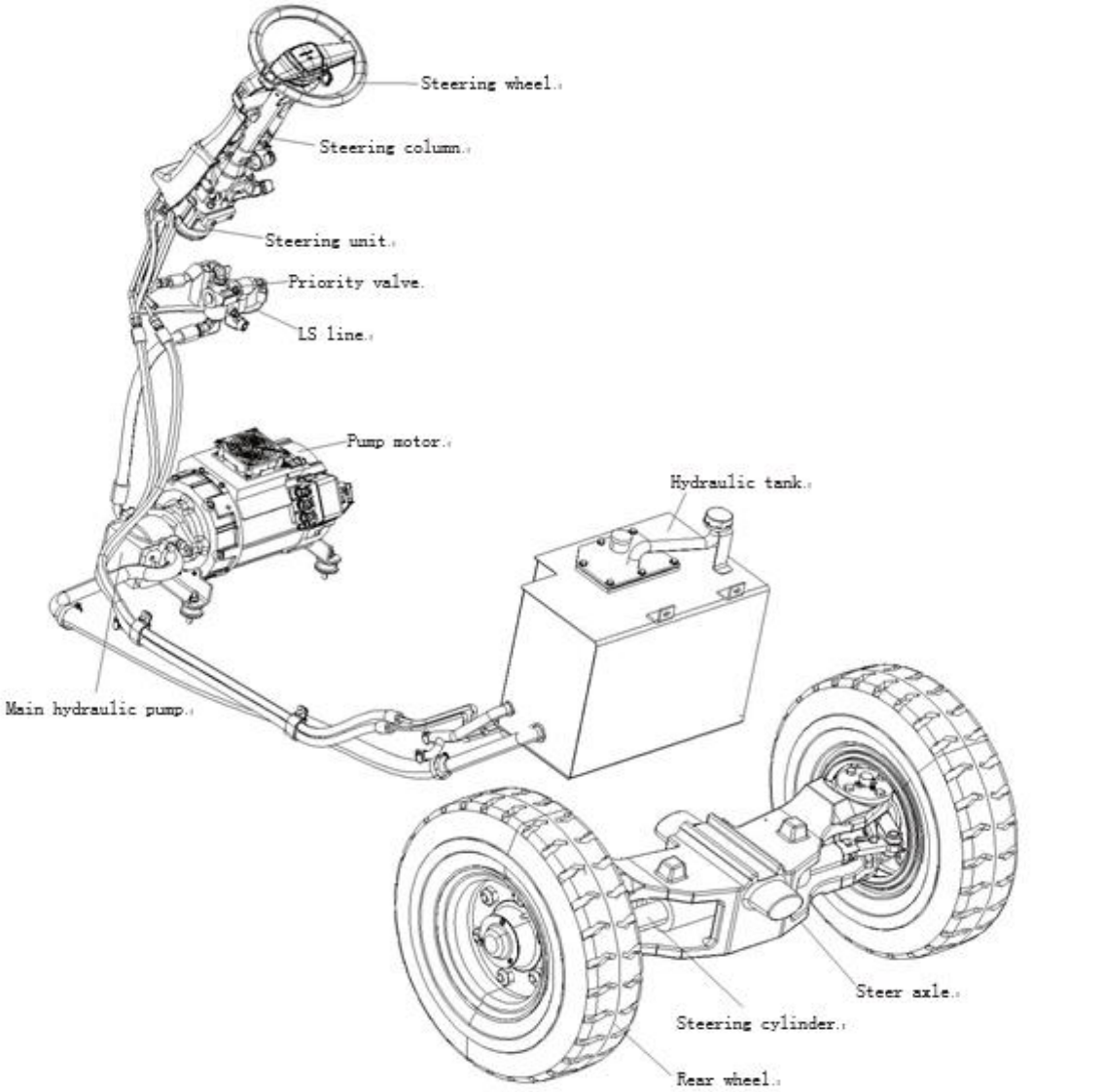


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图 6-1

The steering system is a set of devices that turn the vehicle left or right.In this model, the steering system is hydraulically operated and consists of a control group and an actuator group:

1. The control group determines the speed and direction of steering and

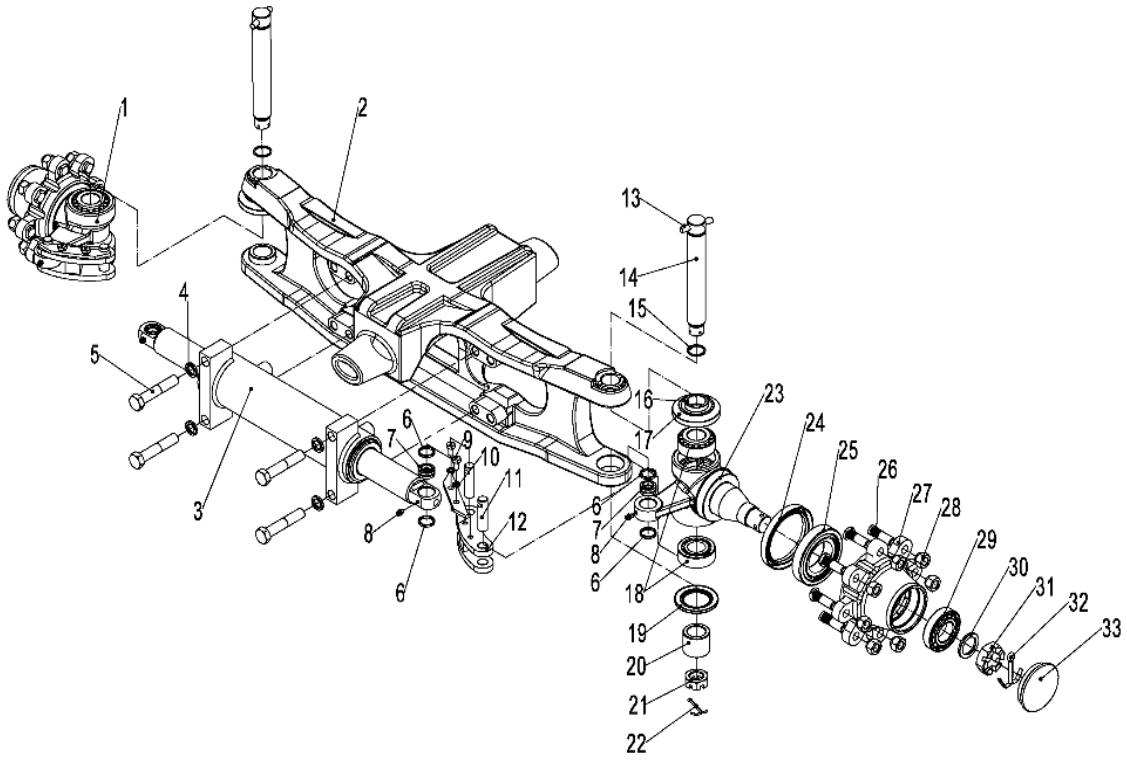
supplies hydraulic oil to the operation group accordingly.This group includes steering wheel and steering device.

2. The operation group converts the hydraulic power transmitted from the control part into mechanical power through the hydraulic oil to make the rear wheel turn.This group includes the steering cylinder, steer axle and two rear wheel assemblies.[Section 6-3]

Unlike cars, forklifts use the rear wheels as steering wheels, because their priority is not to drive at speed, but to ensure a wider steering angle in a narrow area.

7-2. Steering axle

7-2-1 Appearance and specifications



A	256816010001	25Q-30Q Steering axle
1	256898526001	Left steering knuckle Z30KD011G
2	256898526002	Axle body ZDS/K30-35D-03
3	256898516001	Steering cylinder LGZN030K-0100
4	910400500010	Spring washer 16
5	910100100073	Hexagon bolt M16X65
6	256898526003	Bushing Z30KD024
7	256898526004	Joint bearing Z30KD023
8	254198526085	Straight through oil injection cup M6
9	910100300022	Hexagon bolt M8X18
10	910400500006	Spring washer 8
11	256898526005	Connecting rod pin Z30KD025
12	256898526006	connecting rod Z30KD002
13	256898526007	pin shaft Z30KD004G
14	256898526008	Steering knuckle kingpin ZBYD27KD010G
15	910800100084	O-ring 25X2.65
16	256898526009	Dust ring seat ZBD20KD011G
17	256898526010	Dust ring Z30KD006G
18	256898526011	Tapered roller bearing 33206
19	256898526012	Composite dust ring Z30KD009G
20	256898526013	Bushing ZDS/K30-35KD-05
21	256898526014	Pin lock nut Z30KD010G
22	256898526015	cotter pin 3.2X50
23	256898526016	Right steering knuckle Z30KD007G
24	256898526017	Rotary shaft lip seals FB85X110X12
25	256898526018	Tapered roller bearing 30211E
26	256898526019	Hub bolt Z30KD013
27	256898526020	Steering hub Z30KD011
28	256898526021	hub nut Z30KD012
29	910700600003	Tapered roller bearing 30207
30	910400100016	Flat washer 30
31	256898526022	Hexagon slotted thin nut Z30KD009
32	256898526023	cotter pin 6.3X50
33	256898526024	Hub cover Z30KD010

7-2-2 Disassembly and assembly method of steering axle

1 Lift the vehicle at the counterweight lifting position to make the rear wheels empty

2 Remove the tire

Then can remove the steering axle

7-2-3 Disassembly and assembly of steering gear

1 Open the casing and remove the oil pipe

2 Remove the fixing bolts

7-3. Troubleshooting

Problem	Possible causes
It takes too much force to turn the steering wheel	Priority valve (if equipped) releases pressure oil at a low setting
	The pump oil pressure is low and the pump is worn.
	Steering gear cover too tight
	The steering column is not aligned with the steering gear.
	The priority valve spool remains in one position.
	The steering gear does not need lubrication.
	The level in the hydraulic supply tank is low.
The steering wheel did not return to the center position correctly.	The steering gear cover is too tight.
	The steering column is not properly aligned.
	The valve element in the steering gear is limited.
	The priority check valve allows the lift and tilt hydraulic oil to affect the hydraulic circuit.
Pump oil leakage.	Loose hose connections.
	Bad shaft seal
Low oil pressure.	The oil level is low.
	The priority valve (if equipped) relief valve spring is weak.
	The relief valve (priority valve) does not move from the open position.
	Oil leakage inside or outside the system.
	Bad pump.
The pump makes noise when turning the steering wheel, and Can't move smoothly	Air in the steering hydraulic circuit.
	The pump is too worn.
	The oil pipe connection at the inlet side of the pump is loose.
	The viscosity of the oil is wrong.
	The oil level in the hydraulic tank is very low.
	The oil level in the tank is very low.
	There is air in the steering system.
	Incorrect pump operation.
	Dirt in the steering system
	The steering gear is not operating correctly.
	Limitation of the steer axle linkage.
	The steering cylinder has worn components.
The oil temperature is too high.	The viscosity of the oil is wrong.
	Air is mixed with oil.
	Relief valve set too high (priority valve).
	There are restrictions in the return circuit.

8. Battery charger

Concise operation guide for high frequency intelligent charger of industrial battery

General Edition

8-1. Precautions for safe operation

Foreword

Thank you for using this product. Please read this manual carefully before installation and use, and carefully check whether the product packaging and accessories are complete according to the packing list.

In order to ensure the safety of the operator and the normal operation of the charger, please strictly abide by the installation procedures, operating procedures and safety tips specified in this operation guide to ensure the normal operation of the equipment.

Note: If the product is damaged due to failure to operate in accordance with the prescribed procedures, the company will not be responsible for product maintenance and additional losses caused by it.

Please be sure to keep this operation guide properly so that it is convenient for installation, use and maintenance, and the operator can use and refer to it at any time.

cPrecautions

♦This charger is specially designed for battery charging, please do not use it for other purposes.

♦The battery must match the voltage and current of the charger before the charger can run.

Electrical Safety

♦This charger must be connected to the power supply system specified in the "Product Specifications".

♦Must use the supplied accessories, in order to ensure safe use, please do not replace the accessories without permission.

♦If you find that the cables, connectors or other accessories are damaged, you must stop using the charger immediately and contact the technical service center for repair or replacement.

Operating environment safety

♦Smoke, water, flame and corrosive gas shall be prevented from entering the charger.

♦If a small amount of liquid intrudes, please turn off the charger immediately and hand it over to the designated professional technicians for maintenance.

♦The protection grade of this charger is IP20, which means that it has only basic dust-proof and no water-proof functions.

♦The working environment of the charger is: - 20 ℃ ~ 40 ℃.

♦The storage temperature of the charger is: - 40 ℃ ~ 70 ℃.

♦Working and storage relative humidity: 0% ~ 95% (no condensation).

8-2. Installation guide

8-2-1 AC input wiring mode

The AC input wiring mode of our factory charger is as follows:

Specifications	Wiring mode
3KW series	Single phase three wire system
6KW series and more	Three phase four wire system
	Three phase five wire system

♦ The charger is equipped with industrial plug and socket accessories. The plug has been pre installed by our company. You need to install the socket accessories yourself.

♦ Please have the professional electrician with electrician certificate complete the socket wiring installation.

Single phase three wire socket	Three phase four wire socket	Three phase five wire socket	Y-type terminal block	
			phase	color
			L1	brown
			L2	black
			L3	grey
			N	blue
			G / PE	Yellow green

8-2-2 DC output wiring mode

The charger you purchased may be the following DC output connectors:

(Anderson) (DIN) (National standard gun) (others)

No matter what kind of DC output connector you choose, be sure to connect the charger correctly according to the identification on the connector.

8-2-3 note

Before use, please carefully check whether the AC input end and DC output end are connected in place without looseness.

8-3. Quick setup

♦ The charger is equipped with a circuit breaker, which is located at the side or rear of the casing. You may see the following models:

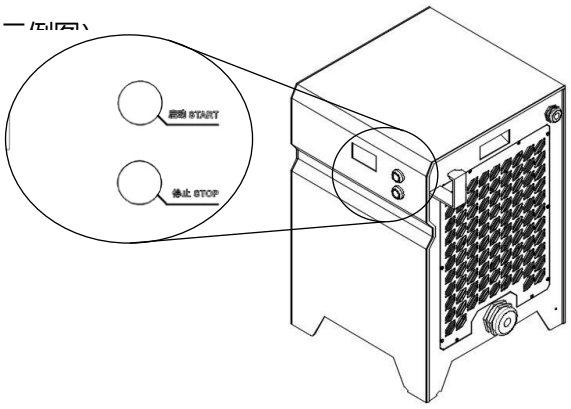
(1

ies)

Check that the AC input terminal is connected, and the DC output terminal is connected with the battery, turn the circuit breaker up to the on position, and power on the charger.

♦ After power on, the charger system automatically starts self inspection, the system detection is normal, and the front panel display screen prompts "ready".

♦ Press the "start" button on the front panel to start charging (the following is 18kw Series)



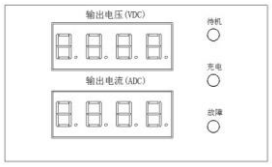
(Example: 18kw series)

♦ Press the "stop" button on the front panel, and the charger stops charging.

♦ When the charger is not in use, please turn the circuit breaker down to the "off" position.

8-4. Charger display and simple troubleshooting

♦ According to the different models you buy, the charger is equipped with an LCD or LED nixie tube display, which can display the charging status



（LCD display） （LED display）

Status display:	Status description:
Self-checking (LCD)	Check whether the battery is faulty, whether charging is allowed, and whether the charger itself is faulty
Ready (LCD)	The external environment is normal and can be charged
Battery charger (LCD)	Charging
Battery full (LCD)	Charging complete
Shutdown (LCD)	Power off, and the main switch can be turned off at this time
Grid anomaly (LCD)	The input voltage of the charger is higher or lower than the input voltage range
Please connect the battery (LCD)	The output line is not connected to the battery or the hardware is poorly connected
Battery disconnect / mode error: (LCD)	Charger charging mode selection error
Error E01	The charger output voltage is higher than the predetermined value
Error E02	The charger output current is higher than the predetermined value
Error E03	Communication failure of charger
Error E04	Charger temperature above set value
Error E09	Charger temperature acquisition signal is abnormal
Error EB1	Battery voltage too high
Error EB2	Excessive battery current
Error EB3	The communication between the charger and the power management fails, and the charger cannot detect the BMS message
Error EB4	Battery temperature too high
No charging (LCD)	The battery is not allowed to be charged
Note: some of the above fault codes need to be sent with BMS for display. If the battery has no BMS, some fault codes will not be displayed.	

♦ If you cannot solve the charger fault by yourself, please contact the technical service center for assistance.