Service Manual

EK18A

Three Wheel Electric Forklift

Warning

You must understand the operation instructions in this manual before using it.

Note:

· Please check the last page of this document and name plate for all current product type identification.

Keep it for future use

Manual

1 Regular maintenance

Only qualified and trained personnel should perform maintenance work on this vehicle.

Before maintenance, remove the cargo from the fork and lower the fork to the lowest position.

If you need to lift the vehicle, use the specified lashing or jacking equipment.Before operation, place safety devices (such as designated jacks, wedges or wood blocks) under the vehicle to prevent accidental drop, movement or sliding.

Use the original parts approved and released by your dealer.

Please consider that hydraulic fluid leakage may lead to machine failure and accidents.

Pressure valve adjustment is only allowed by trained service technician.

If you need to replace wheels, casters must be round and free of abnormal wear.

Check the items on the maintenance list.

1.1 Maintenance List

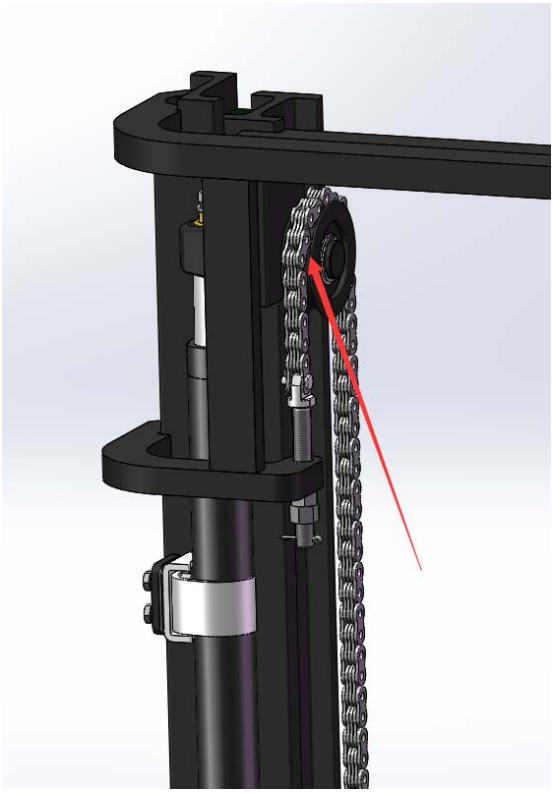
		Interval (month)			
		1	3	6	12
The hydraulic system					
1.1	Check the function of hydraulic system		•		
1.2	Check hoses, piping and joints for tightness, sealing and damage		•		
1.3	Inspect cylinder block and piston for damage, sealing and fixation			•	
1.4	Visually inspect the door stand roller and inspect the roller surface for wear			•	
1.5	Inspect forks and loading parts for wear and loss			•	
1.6	Check load chain Settings and re-tensioning if necessary			•	
1.7	Check oil level in fuel tank			•	
1.8	Replacement hydraulic fluid				•
Mechanical systems					
2.1	Check the fork for deformation and breakage		•		
2.2	Check chassis for deformation and cracking		•		
2.3	Check that all screws are in place		•		
2.4	Check gear box for noise and leakage		•		
2.5	Check wheel for deformation and damage		•		
2.6	Lubricated steering bearing				•
2.7	Check and lubricate the pivot points		•		
2.8	Lubricating grease nozzle	•			
Electrical system					
3.1	Check whether power cables are damaged		•		

3. 2	Check the electrical connections		●		
3. 3	Check the function of the emergency switch		●		
3. 4	Check whether the power drive system is noisy or damaged		●		
3. 5	Test electricity meter		●		
3. 6	Check whether the correct fuse is used		●		
3. 7	Detect warning signals		●		
3. 8	Check the current contactor		●		
3. 9	Check frame for leakage (insulation test)		●		
3. 10	Check the function and wear of the drive controller		●		
3. 11	Check the electrical system that drives the motor		●		
traveling system					
4. 1	Check the gearbox for abnormal sound			●	
4. 2	Check the driving mechanism and grease it		●		
4. 3	Inspect driving and steering wheels for wear and damage			●	
4. 4	Check wheel bearing and fastening condition			●	
4. 5	Check the air gap of the electromagnetic brake			●	
4. 6	Check the lifting, forward and backward tilt and left and right movement of the door frame		●		
4. 7	Check and adjust braking effect		●		
Energy supply					
5. 1	Check the voltage of the battery		●		
5. 2	Check that battery cables are securely connected and grease the electrodes if necessary		●		
5. 3	Check whether the battery cover is damaged		●		
5. 4	Check the main cable for damage			●	
5. 5	Check the start up protection program during charging			●	
Monolithic Construction					
6. 1	Check all labels for clarity and completeness	●			
6. 2	Check the frame for damage		●		
6. 3	Check the fixing condition of lifting door frame			●	
6. 4	Run a test run	●			

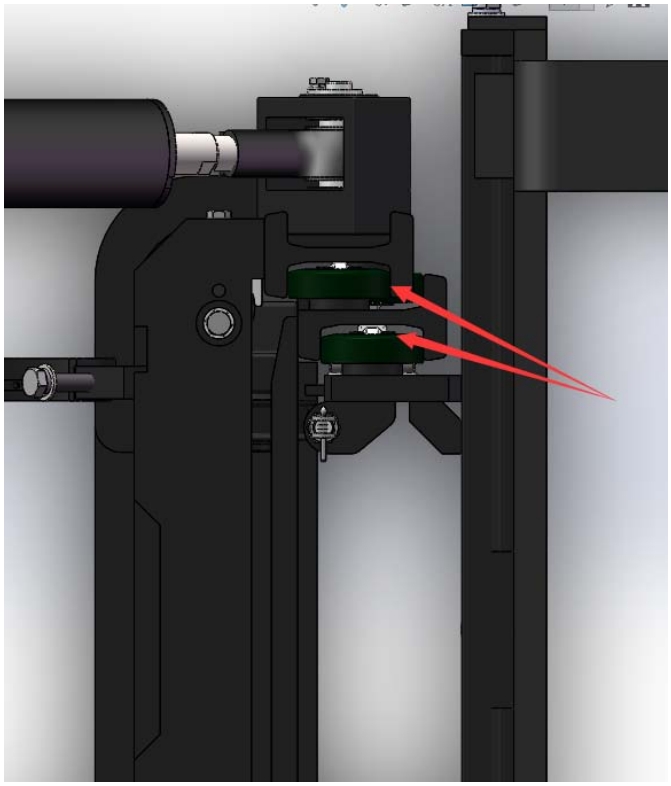
1.2 Lubrication point.

Lubricate marked points according to maintenance list.Required grease specification: DIN 51825 standard grease

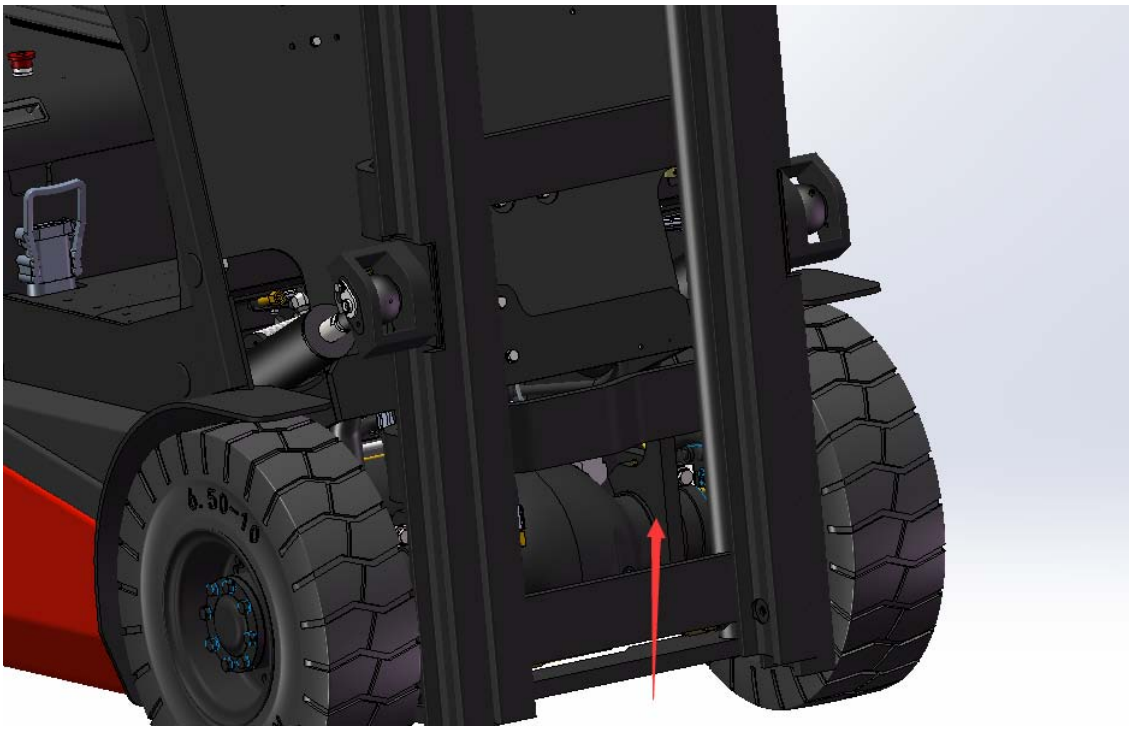
Pic1：transmission chain



Pic2：The rail of gantry



Pic3： Drive axle clamp



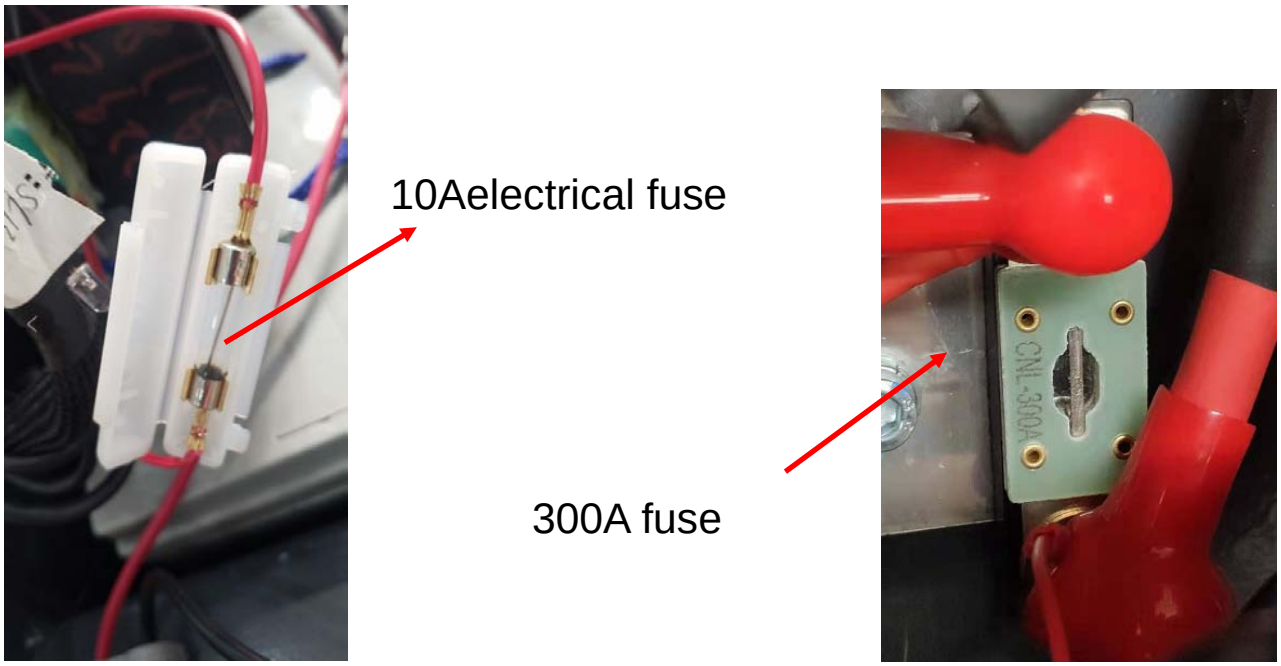
1.3 Check and refill hydraulic oil

Recommended hydraulic oil model according to temperature::

Ambient temperature	–5℃~25℃	>25℃
mark	HVLP 32， DIN 51524	HLP 46， DIN 51524
Viscosity	28.8-35.2	41.4 - 47
Oil	1.5 L	

Waste materials such as waste oil, waste batteries or other materials must be treated and recycled in accordance with national regulations, and returned to the recycling company for recycling if necessary.
The oil level should not be lower than the minimum amount required to start the vehicle.
Fill up to refueling point if necessary。

A. Check the electrical fuse



List 2: Fuse specification

	specification
Fuse 1	10A
Fuse 01	300A

2 Fault analysis

If the vehicle continues to malfunction, follow the instructions of the manual.

2.1 Common fault analysis

- 2. 1. 1

Hand and foot brake common faults and troubleshooting methods

Failure	cause	maintenance
Poor braking	1. Improper position of brake pedal	Adjust
	2. Brake system leaks oil	Repair or replacement
	3. Air is mixed in the brake system	exhaust

	4. The brake shoe clearance is not adjusted well	Adjust
	5, the total pump pump bowl deformation, damage or excessive wear	Check the cause of damage and replace
	6. There are oil stains on the surface of brake drum hole	Clean up
Brake uneven	1. There are oil stains on the surface of the friction plate	Cleaning and replacement
	2. The brake drum hole is partial, and the big hole is different	Bright hole, ensure roundness, concentricity
	3. The brake shoe clearance is not adjusted well	Adjust
	4, brake shoe return spring damage	replace
	5. Sub-pump failure	Repair or replacement
	6, self-adjusting mechanism failure	Reset spring deformation, repair, replacement
Brake noise	1, friction plate surface hardening or impurities	replace
	2. Bottom plate deformation or bolt loosening	repair
	3, brake shoe deformation or installation is not correct	Replacement or repair
	4. Excessive wear of friction plate	replace
	5. Hub shaft is loose	replace
Other poor braking	1. Brake overheating	Check for skid
	2. Impurities are mixed into the brake fluid	Check and replace brake fluid
	3, hand brake position cable deformation, joint off	Repair, replacement

- 2. 1. 2

Steering system common faults and troubleshooting methods

Failure	cause	maintenance
steering hydraulic system problem	1. There is air in the hydraulic pipeline components of the steering system	exhaust
	2, the working oil oil level is too low, inhale air	Gas exhaust
	3. The shunt valve hole is blocked and the spool is stuck	Cleaning and replacement
	4. The piston rod of the steering cylinder is bent	Replace the piston rod
	5, knuckle and knuckle pin bite	Check method: lift the rear axle to see whether the swing is flexible Dismantle, repair
	6, other steering when the relative surface bite	
	7. The steel ball in the valve body of the steering gear fails and is blocked	Replacement spring
	8, steering reset failure, spring fracture	Check piston seal ring and replace
	9. Leakage in the steering cylinder is too large	Adjust pressure and flow
	10, the shunt valve pressure is lower than the working pressure, the flow is too low	Use specified oil
	11. The viscosity of oil is too large	replace
	12, spool, valve body excessive wear, clearance is too large	replace
	13. Excessive wear of oil pump	exhaust
oil leak	1, the joint is not pry tight	Pry tight
	2. There is dirt on the joint surface of the stator and rear cover of the valve body of the steering gear	cleaning
	3, oil cylinder leakage	Check guide sleeve seal joint seal
Abnormal sound	1, the oil level of the tank is too low, hydraulic noise	Refueling and exhaust
	2. Suction tank or oil filter is blocked	Cleaning and replacement

2.1.3 Lifting system common faults and troubleshooting methods

Failure	cause	maintenance
Lifting, falling is not smooth, loud noise	1. The gap between the upper side roller of the outer door frame and the channel steel of the inner door frame is too large > 1mm	Reduce adjusting gasket
	2. The gap between the lower side roller of the outer frame and the channel steel of the inner frame is too large > 1mm	Add adjusting gasket
	3. The gap between the side roller of the fork frame and the channel steel of the inner door frame is too large > 1mm	Reduce adjusting gasket
	4. Fastening bolts of side roller shaft are loose	fastening
	5. There are debris in the channel steel of the sliding frame and the inner door frame	Yeah, oil on the tracks regularly
The cargo fork frame is skewed	1, the left and right tire pressure is inconsistent	Air replenishment and air pressure are consistent
	2. The tightness of the left and right chains is inconsistent	The tightness adjustment is consistent
	3. The oil channel in the speed limiting valve is blocked	Cleaning and replacement
	4. The oil inlet of the lifting cylinder is partially blocked	Maintenance and cleaning
The left and right elevations are not synchronized	1, the left and right lifting cylinder stroke is inconsistent	Use cylinder head 180 degree adjustment
	2. The height of the left and right cylinders is inconsistent	Adjusting bolts on the oil cylinder
	3, the left and right cylinder stroke is too inconsistent to exceed the cylinder head adjustment range	Add adjusting gasket on lifting cylinder piston rod

The over lift speed at full load cannot meet the requirements Or fail to lift	1. Insufficient amount of working oil	Come on
	2, speed limit valve throttle hole is blocked by stolen goods	Unpick and wash
	3, the safety valve slide blocked, stuck	Cleaning and repairing
	4. Leakage of suction pipe weld at the filter screen in the tank	Repair welding, bottom leakage
	5. The pipe joint is loose	Pry tight
	6, oil pump gear and pump body excessive wear, clearance is too large	Check oil cleanliness, grade 9-11 required
	7, lifting cylinder sealing ring damage or excessive wear internal leakage	Replace seal ring
	8, multi-way valve body and spool valve gap is too large, the main valve pressure is too low	Replacement and adjustment
	9, the shunt valve shunt improperly	Adjust

2.1.4 Common faults and troubleshooting methods of electrical system

Failure	Fault cause and elimination method
Open key switch no voltage	1. Poor contact of key switch
	2, break
	3. Poor contact of the connector
	4. The battery connector is loose
Step on the accelerator pedal and the forklift will not walk	1, disconnect
	2. Poor contact of the connector
	3, the direction switch contact is poor
	4, thruster speed regulating device failure
The lifting motor does not work	1. Contactor coil is open or open
	2. The lifting switch does not work normally
	3, disconnect
	4. Poor contact of connectors
	5. The main contact of contactor is burned out
Turn over the hoist	1. The lifting switch does not work normally
The light is not working properly	1, the fuse is broken
	2. Poor contact of connectors
	3. Light bulbs are broken
Speakers don't ring	1. Poor contact of connectors

	2, the horn switch contact is poor
	The speaker is broken
Long horn ring	1, horn switch contact long
The reversing buzzer doesn't work	1. The buzzer is broken
	2. Poor contact of reversing switch
	3. Poor line connection and plug

2. 1. 5Gearbox fault causes and troubleshooting methods

Failure	Fault cause and elimination method
efficiency decrease	1. The friction plate is stuck or worn. Check for gluing, uneven contact or warping of the friction plate
	2, bearing damage. Replace the bearing
	3. Check whether the lubricating oil road is blocked
oil leak	1. The sealing pad is damaged. Replace gasket
	2. Rubber parts are aging or damaged. Replacement parts
	3, parts damage crack. replace

- 2.1.6 Multi-way valve fault causes and troubleshooting methods

Failure	cause	maintenance
External leakage	1, lip sealing parts wear	Replace seal ring
	2. The valve stem sealing part is damaged	Replace stem or disc sub assembly
	3. Foreign bodies such as paint and dust are embedded in the lip sealing part	Clean the paint and other foreign matters embedded in the lip sealing part, pay attention to not damage the valve stem and sealing surface
	4, O-ring damage (cut ring)	Replace the O-ring seal
	5. Aging and deformation of sealing ring between valve discs	Replace the new sealing ring
	6. The sealing plane of the valve plate is scratched (new valve) or there are foreign bodies	Remove foreign matter or replace valve disc
	7, valve body hole and sealing ring slot hole different heart (new valve)	Replace the valve plates
	8. Back pressure of oil return exceeds allowable value	Check the loop and lower the return oil pressure to the specified value

	9. The bolts between pieces are not evenly stressed or tightened	Tighten the stud bolts with specified torque
Stem cannot be reset	1, the control mechanism is not flexible	Check the control lever
	2, the valve stem is squeezed by dirt	Clean valves, fuel tanks and pipelines
	3, return spring deformation or fracture	Remove the back cover for inspection and replace the spring
	4. Stem deformation caused by external force	Refit stem or replace valve sub assembly
	5, the installation surface is uneven, the valve body deformation, resulting in stuck valve	Adjust the installation plane
Stem heavy drop in neutral position (leakage out of tolerance in neutral position)	1, stem and valve hole wear, gap increase serious internal leakage	Rein stall stem
	2, stem or valve hole scratch internal leakage increase	Refit stem or replace valve sub assembly
	3. Stem is not restored to neutral position	Check reversing mechanism
	4, overload valve or overload valve plug and valve body seal seal is not strict	Check whether the O-ring is cut. If damaged, replace it with a new O-ring
	5. Serious leakage in the cylinder	Check the cylinder piston seal for damage
	6. The groove size of valve body is out of tolerance and the length of sealing oil becomes smaller	Replace the valve plates
hard steering	1, the oil is not clean, the shunt valve core or the shunt safety valve core is stuck	Clean shunt valve core or shunt relief valve core and fuel tank and pipeline
	2. The opening and closing characteristics of the shunt safety valve are not good or the pressure regulation of the shunt safety valve is low	Replace the shunt relief valve or readjust the shunt relief valve pressure
	3. Insufficient flow of oil pump	Check why the oil supply system of the oil pump is insufficient

	4. Steering gear failure	Replace the steering gear
No action of oil cylinder (low pressure or no pressure)	1. There is foreign matter stuck between the overflow valve or overload valve main spool and valve seat	Clean valves, fuel tanks, pipelines, etc
	2. The damping hole is blocked	Hydraulic oil pollution is serious, clean the hydraulic system
	3, the cone spool has abnormal wear	Inspect for wear and replace relief valve assembly
	4, pressure regulating spring deformation	Check spring quality
	5. The adjustment screw of the relief valve is loose	After adjusting the pressure, tighten the nut according to the specified torque
	6. Oil pump failure	Replace the oil pump
The relief valve has vibration and dynamic and noise	1, the hydraulic system has air	The system will be discharged after repeated operation for a while
	2. The pump inhales air	Check oil absorption test of oil pump
	3, suction pipeline resistance is too large or the suction side of the oil pump produces negative pressure	Check the cause of negative pressure
	4. The oil suction filter is blocked	Clean the oil filter and filter the oil
	5, the relief valve has a pressure point vibration and noise	Adjust relief valve, slightly raise or lower pressure gauge 1 ~ 2 scale grid
There is no self-lock in forward tilt or the self-lock in forward tilt exceeds the standard	1, the oil is not clean, so that the forward control small spool stuck	Clean valves, fuel tanks, pipelines, etc
	2, the wrong oil port	Switch the wrong oil connection

- 2.1.7 Gear pump failure reasons and troubleshooting methods

Failure	cause	maintenance
Pump suction oil or oil	1. The flow area of the oil suction filter is small or blocked by foreign bodies	Replace the filter with a suitable flow area or clean the blocked filter

absorption is not smooth	2. The tank level is too low	The tank is filled with hydraulic fluid as required
	3. The installation position of the oil pump is too high; Suction range exceeds specified	According to the suction range of the oil pump, it is within 500mm
	4, the oil temperature is too low, the oil viscosity is too high	Change oil or heat oil seasonally
	5, suction tubing is too thin or too long, too much resistance	Change the large diameter tubing, shorten the length of suction tubing
	6. The oil seal of the oil pump is damaged and the air is inhaled	Replace the new oil seal
	7. The rotation of the oil pump is not correct or the speed is too high	Change the oil pump rotation, make the speed to the specified value
	8, oil suction side leakage	Check the oil absorption part and its seal, and replace the failed seal
The oil outlet of the oil pump discharges oil but the pressure cannot rise	1. The side plate of the oil pump is severely worn and the volume efficiency is too low	Repair or replace the oil pump
	2. The cone spool of the relief valve is severely worn	Replace the new cone spool
	3. The overflow valve is stuck by stolen goods and loosely closed	Filter oil and remove dirt
	4. The pressure regulation of relief valve is too low	Adjust the overflow valve to the specified value
	5, oil suction air	Check whether the sealing ring at the oil suction port is damaged
Low volume efficiency of oil pump	1. The sealing parts in the oil pump are damaged	Replace seal ring
	2, side plate wear	Replace the side panel
	3. There are stolen goods or too large clearance in the oil pump	Remove stolen goods and filter oil; Replacement of new oil pump
	4. The oil pump speed is too low or too high	Make the oil pump run within the specified speed range
	5. Negative pressure appears in the tank	Increase the capacity of air filters

Oil pump noise	1. Most cases are caused by insufficient oil absorption of oil pump, such as blockage of oil absorption filter; Oil level is too low; Inhalation of air; Suction air at oil seal, etc	Keep oil level high and seal must be reliable to prevent oil contamination
	2. The return pipe is higher than the oil level, and there are a lot of bubbles in the oil	Immerse the return pipe below the oil level
	3. The viscosity of oil is too high and the oil temperature is too low	Choose oil with proper viscosity according to the season, or heat it up
	4. The coaxial of the pump shaft and prime mover shaft is too large	Adjust the coaxiality of the two axes
	5. After maintenance, the driven gear is inverted, and the meshing area becomes smaller	Disassemble the oil pump and turn the driven gear
Oil pump temperature rises too high	1, the pressure is too high, the speed is too fast, the side plate burns	Properly adjust the overflow valve; Reduce the speed to the specified value; Repair the pump
	2. The oil viscosity is too high or the internal leakage is serious	Change the appropriate oil and check the seal
	3. The back pressure of oil return is too high	Eliminate the cause of high return back pressure
	4, the fuel tank is too small, poor heat dissipation	Increase the fuel tank

2.1.8 Other common faults and troubleshooting methods

Failure	cause	maintenance
Abnormal sound during exercise	1, hydraulic oil, gear oil and other oil does not meet the requirements	Fuel until required
	2, front and rear hub bearings loose, broken	After tightening the bearing and locking the nut, retract about 1/8 turn, and the hub should be free to turn. Fracture will renew the bearing
	3, gearbox, gear, friction plate damage	replace
	4, differential and cross shaft damage	replace
	5. Fasteners are loose	Pry tight

1、Walk and lift controller fault code

Code	Fault name	Possible cause
1	Controller Over current	1, motor external U,V or W connection short circuit 2. Motor parameters do not match 3. The controller is faulty
2	Current Sensor Fault	1, motor U, V, W through the stator on the car body short circuit, resulting in leakage 2. The controller is faulty
3	Precharge Failed	1. Negative load is connected to the positive end of the capacitor, so that the capacitor can not be charged normally
4	Controller Severe Under temp	1The operating environment of the controller is too harsh
5	Controller Severe Over temp	1. The working environment of the controller is too harsh 2. Vehicle overload 3. The controller is incorrectly installed
6	Severe Under voltage	1. Battery parameters are incorrectly set 2. Power consumption of non-controller system 3, the battery impedance is too large 4. The battery is disconnected 5, the fuse is disconnected, or the main contactor is not connected
7	Severe Over voltage	1. Battery parameters are incorrectly set 2. The battery impedance is too high 3. Battery connection is disconnected during regenerative braking
8	Controller Under temp Cutback	1. The controller works under restricted conditions 2, the controller working environment is harsh
9	Controller Over temp Cutback	1, the controller working environment is harsh 2. Vehicle overload 3. The controller is incorrectly installed
10	Under voltage Cutback	1. The battery is low 2. Battery parameters are incorrectly set 3. Non-controller system runs out of power 4. Excessive battery impedance 5. The battery is disconnected 6. Fuse is disconnected or main Contactor is disconnected
11	Over voltage Cutback	1, regenerative braking process regenerative system The running current causes the battery voltage to rise 2. Battery parameters are incorrectly set 3, the battery impedance is too large 4. Battery connection is disconnected during regenerative braking
12	+5V Supply Failure	1, the external load impedance is too low
13	Digital Out 6 Failure	1, the external load impedance is too low
14	Digital Out 7 Over current	1, the external load impedance is too low

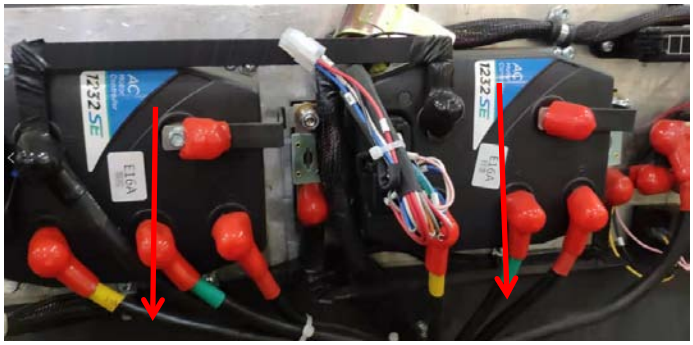
15	Motor Temp Hot Cutback	1. The motor temperature reaches or exceeds the alarm temperature set by the program, resulting in the reduction of current output 2. The motor temperature parameters are incorrectly set 3. If the motor does not use a temperature sensor, program parameters "Temp Compensation" and "Temp" Cutback must be set to OFF.
16	Motor Temp Sensor Fault	1. The motor temperature sensor is incorrectly connected If the motor does not use a temperature sensor, the programming parameters are "Temp Compensation and Temp" Cutback must be set to "OFF"
17	Coil 1 Driver Open/Short	1. Connect load open or short 2. The connecting pin is defiled 3. Wrong wiring
18	Main Open/Short	1. Connect load open or short 2. The connecting pin is defiled 3. Wrong wiring
19	Coil2 Driver Open/Short	1. Connect load open or short 2. The connecting pin is defiled 3. Wrong wiring
20	EMBrake Open/Short	1. Connect load open or short 2. The connecting pin is defiled 3. Wrong wiring
21	Coil3 Driver Open/Short	1. Connect load open or short 2. The connecting pin is defiled 3. Wrong wiring
22	Coil4 Driver Open/Short	1. Connect load open or short 2. The connecting pin is defiled 3. Wrong wiring
23	PD Open/Short	1. Connect load open or short 2. The connecting pin is defiled 3. Wrong wiring
24	Encoder Fault	1. Motor encoder failure 2. Wrong wiring
25	Motor Open	1, motor phase deficiency 2. Wrong wiring
26	Main Contactor Welded	1, main contactor contact fusion 2. Motor U or V is disconnected or phase is missing 3. The circuit charging capacitor connected to the B+ terminal exists
27	Main Contactor Did Not Close	1. The main contactor is not closed 2, the main contactor contact oxidation, melting Or the connection status is unstable 3. The capacitor is charged by external devices 4. The fuse is disconnected
28	Throttle Wiper High	1, accelerator potentiometer output voltage is too high

29	Throttle Wiper Low	1, accelerator potentiometer output voltage is too low
30	Pot2 Wiper High	1, potentiometer 2 output voltage is too high
31	Pot2 Wiper Low	1, potentiometer 2 output voltage is too high
32	Pot Low Over current	1, potentiometer impedance is too low
33	EEPROM Failure EEPROM	1. Failed to write to the EEPROM storage.This may be caused by VCL writing to EEPROM storage, or by CAN BUS, or by a parameter error programmed into the controller after the programmer parameters are adjusted.
34	HPD/Sequencing Fault	1. Incorrect setting of key start, interlock, direction and accelerator input sequence. 2, wiring, switch key, interlock, direction, or accelerator input failure
35	Emer Rev HPD	1. The emergency reverse operation has ended, but the accelerator, forward and reverse input and interlock have not been reset。
36	Parameter Change Fault	1. In order to ensure the safety of the vehicle, the modification of some specific parameters must take effect after the key switch is restarted.
38	VCL Run Time Error	1. The VCL code timed out
39	External Supply Out of Range	1, the external load in 5V and 12V power source current is too large or too small Checking Menu parameters are incorrect, for example, ExtSupply Max, Ext Named "Supply" Min"
40	OS General	1. The internal controller fails
41	PDO Timeout	1. The CAN PDO message receiving time exceeds the PDO time limit
42	Stall Detected	1. Motor blocking 2. Motor encoder failure 3. Wrong wiring 4. Power supply of the input motor encoder is faulty
43	Motor Characterization Fault	1, in the motor matching process of modern code comparison: 0 = normal 1= The controller receives the encoder number, But the impulse quantity is undefined. Please hand set Buy pulse value 2= Motor temperature sensor failure 3= High temperature reaction failure of motor 4= motor overheating reaction failure 5= Low temperature reaction failure of motor 6= low voltage response failure 7= high pressure reaction failure 8= The controller cannot detect the encoder message Alpha, channel signal is down 9= Motor parameter setting exceeds the range
44	Motor Type Fault	1. The motor type parameter value is out of range
45	VCl/OS Mismatch	1. The VCL program in the controller does not match the OS

		program
46	EM Brake Failed to Set	1. The vehicle is still moving after the electromagnetic brake command is set. 2, electromagnetic brake braking force is too small
47	Encoder LOS (Limited Operating Strategy)	1. Due to motor blocking or encoder The failure causes the restricted operating state to be The activation 2. Wrong wiring 3. Traffic jams
48	Emer Rev Timeout	1. The emergency reverse timeout is activated because the EMR Timer expires 2. The emergency reverse switch is always in the On position
49	Illegal Model Number	1. The controller model cannot be identified 2. Hardware and software do not match each other 3. The controller is damaged
50	Dualmotor Parameter	The Enable parameter of dual motors is set to ON, and the control Mode selection parameter is not set to (Speed Mode Express) or 1 (Speed Mode).

2.1 Electrical troubleshooting reference:

The car has two controllers, respectively corresponding to the walking and lifting functions, see the specific performance of the fault, determine the direction of the search.



The pump controller

Travel controller

2.2 If the instrument shows a fault, you can read the fault content by simply operating the instrument. The operation steps are as follows:

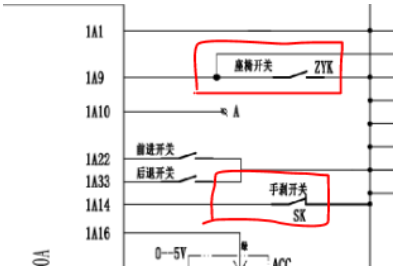
Instrument display failure

Press this button to read the fault content

2.3 If the instrument does not display the fault, according to the principle diagram to find the input signal is normal, such as vehicle without walking, need to make sure the input of the accelerator and the direction switch is normal, the accelerator signal lines 1 a16, direction of signal is a22 1 and 1 a33, multi meter measuring controller plug place are available, and between the signal and the cathode, the corresponding switch operation,Whether there is voltage change is shown as follows:

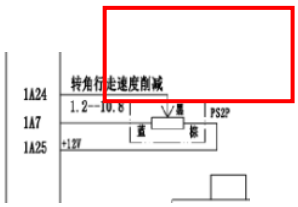
Controller plug

If the input signal is correct, check the switch with the limitation of walking function. According to the schematic diagram, it can be found that seat switch 1A9 and handbrake switch 1A14, as shown below



This type of switch can be measured at the controller plug whether there is a signal input.

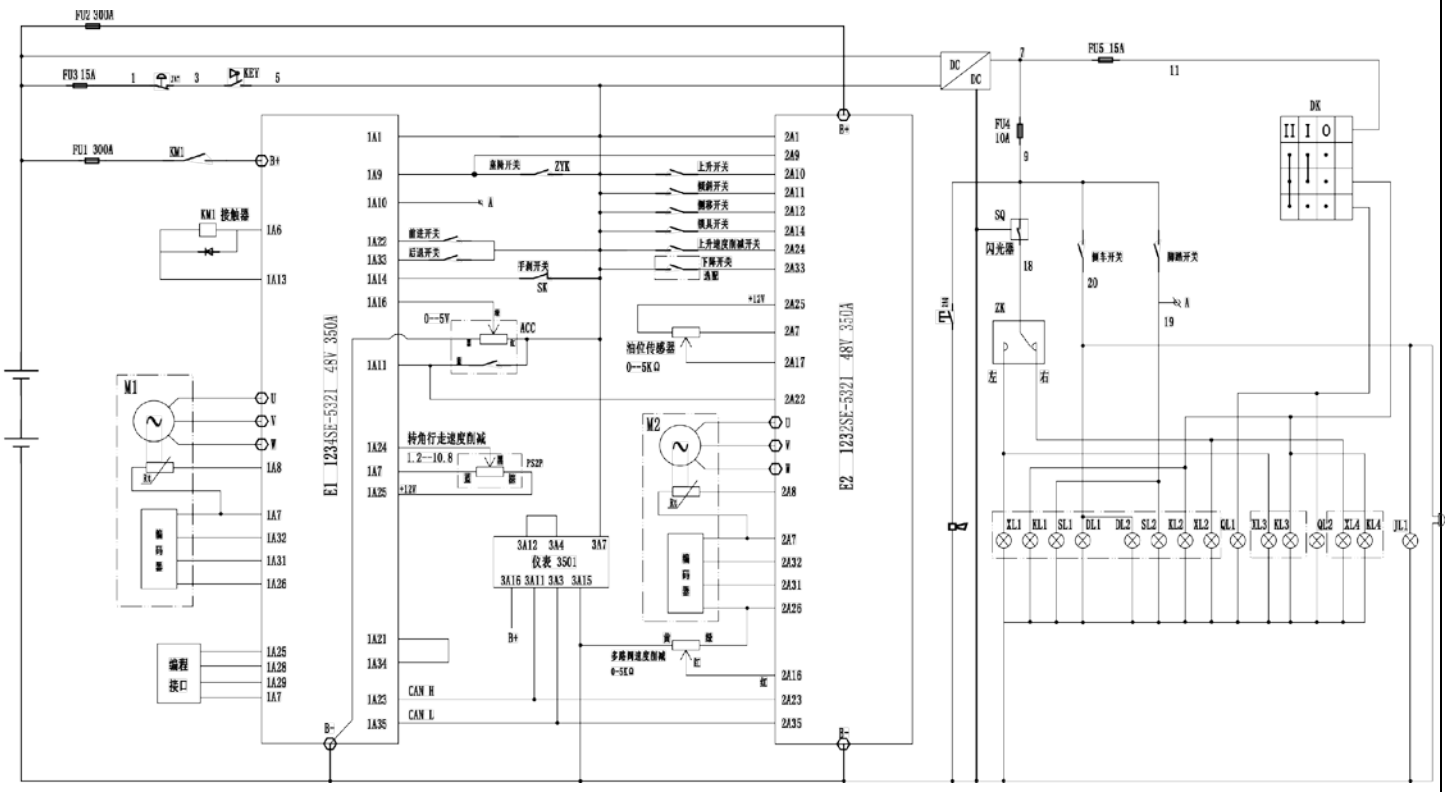
2.4 Other limited functions of the fault, such as slow vehicle speed, slow lifting and so on.If the speed is slow, first observe whether the speed mode of the instrument is in the state of H. The instrument can switch the speed mode. If the speed mode is correct, according to the schematic diagram, it can be found that the Angle sensor is the speed restricted, and whether the input of the sensor is normal can be measured.



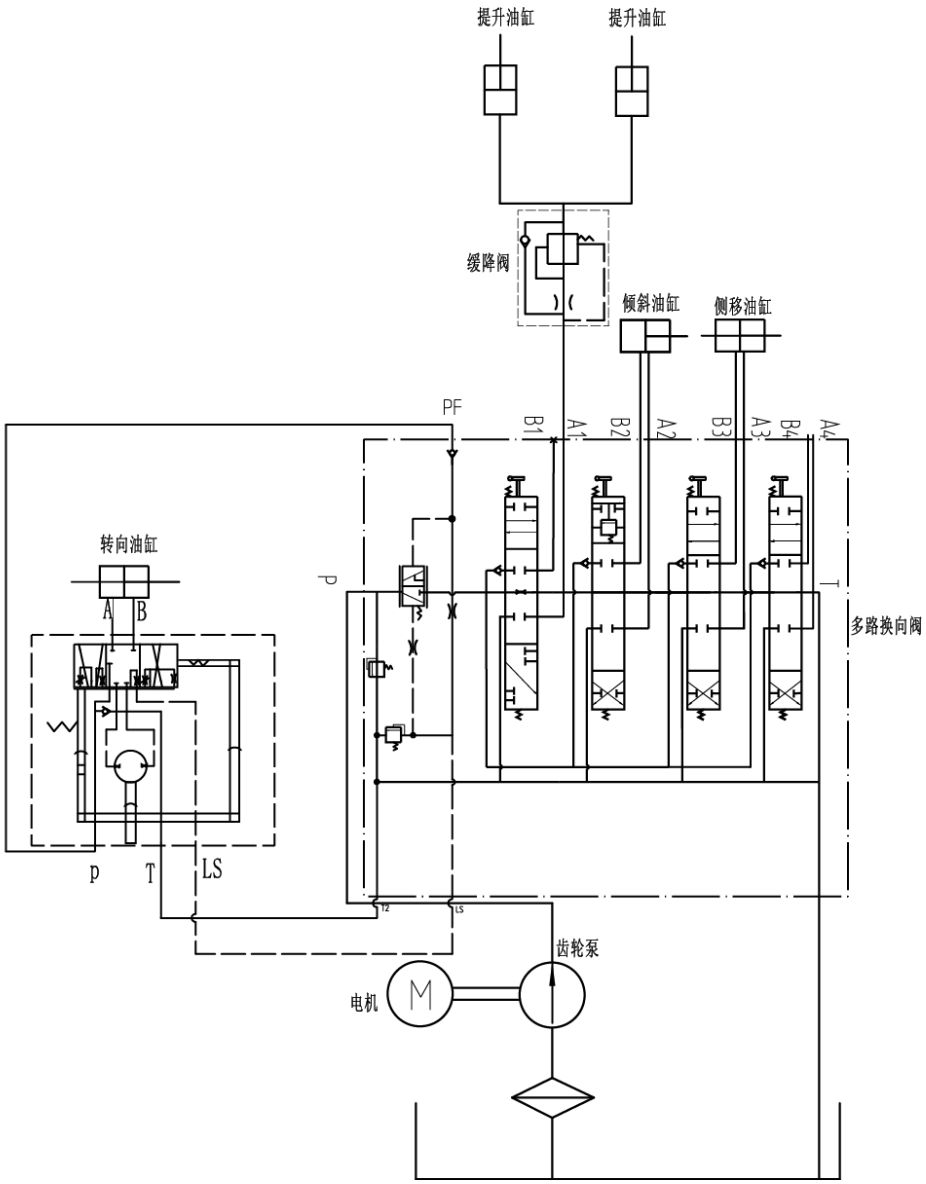
Speed mode H

3Circuit/circuit diagram

3.1Electrical schematic diagram



3.2 液

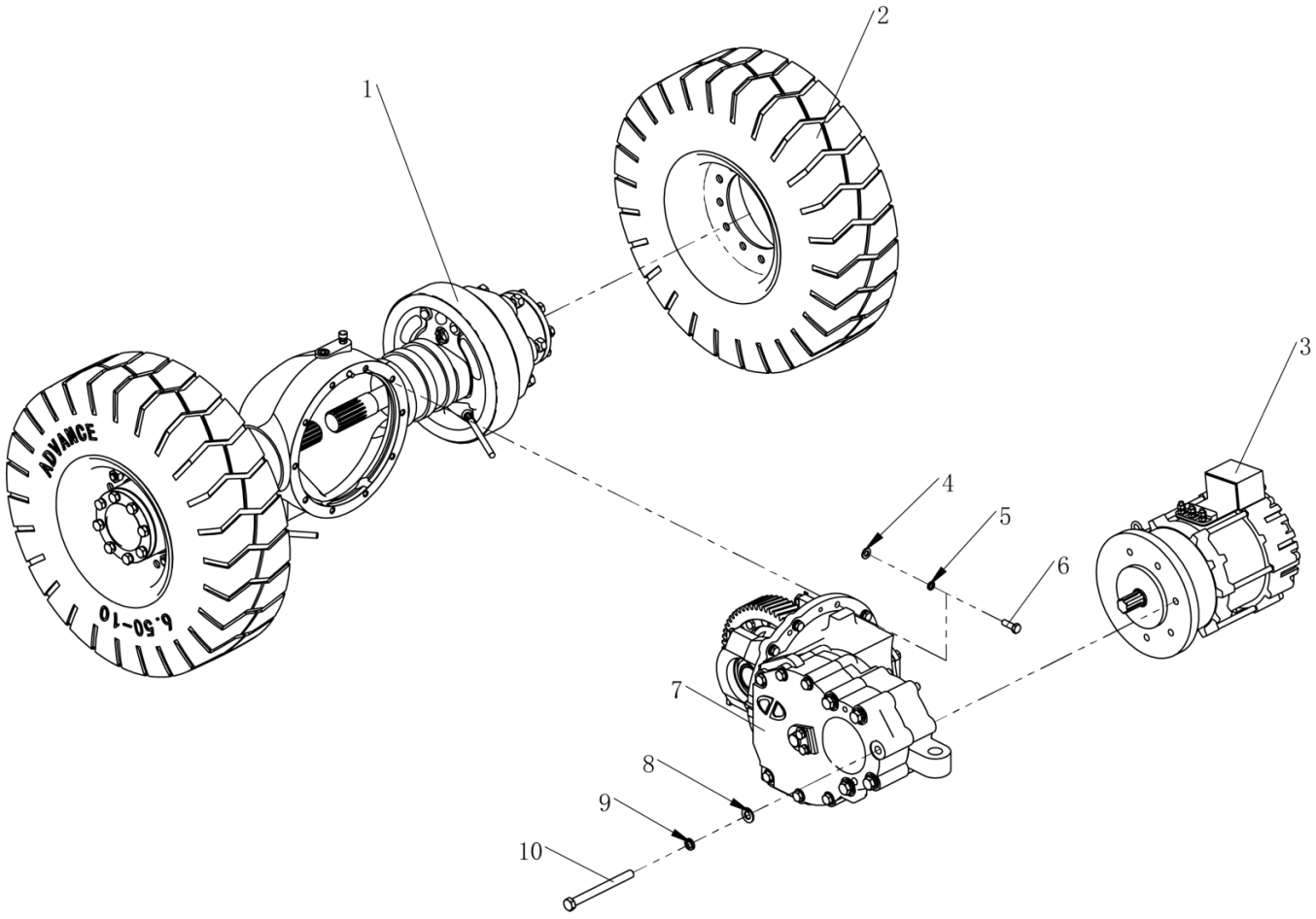

提升油缸
提升油缸
缓降阀
倾斜油缸
侧移油缸
PF
B1
A1
B2
A2
B3
A3
B4
A4
转向油缸
A
B
P
T
多路换向阀
全液压转向器
p
T
LS
齿轮泵
电机
M

Hydraulic oil inspection

Appearance	odor	condition	results
Clear not discoloration	good	good	can be used
color transparency	good	with other oil mix	check viscosity, if qualified can continue to use
Color changes like milk	well	mixed with air and water	to separate moisture or replace hydraulic fluid
The color becomes dark brown	not good	for oxidation	replacement of hydraulic oil
Clear color but small black spots	good	mix with other particles	can be used after filtering

4 drive system

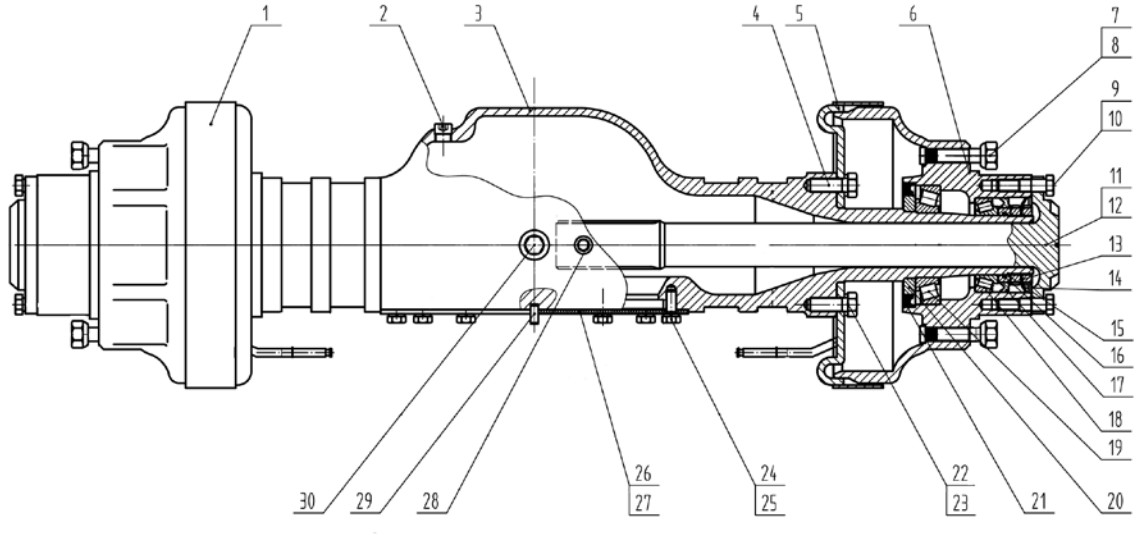
The moving of forklift truck is powered by batteries, and the direct current is converted into alternating current by frequency conversion system, which is realized by controlling the AC motor on the driving wheel. The AC motor converts the high speed and low torque into low speed and high torque through the gear reduction box, and finally the drive wheel performs the action. The speed of walking is realized by frequency conversion control of motor speed, which is controlled by the accelerator.



1. Drive axle 2. Tire 3. Motor 4.Flat washer 5. Spring washer 6.Screw 7. Gearbox 8. Flat pad 9.Spring washer 10. Screws

4. 1 Drive axle structure drawing

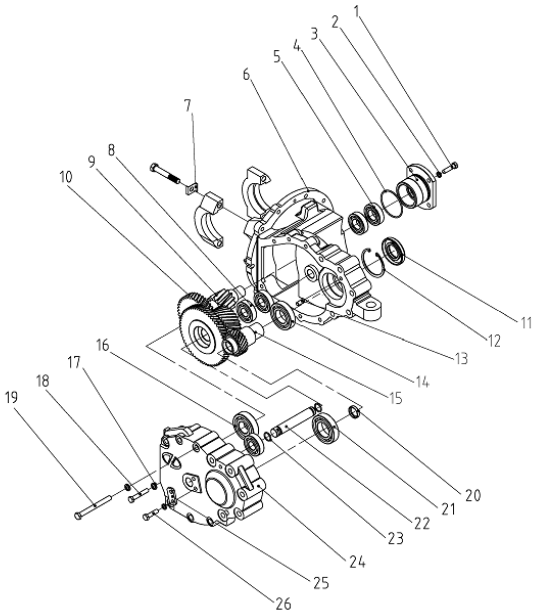
Drive axle is mainly composed of bridge shell, wheel, axle, brake and tire, bridge shell is integrally cast structure, tire through the rim fit with stud bolt and nut on the wheel hub, power through a differential drive axle shaft, finally by the wheel turns the front wheel, wheel hub by taper roller bearing is loaded on the axle housing, so only bear the torque of driving wheel, axle shaft inside the wheel is equipped with oil seal, Prevent water and dust from entering and oil leakage。



1.Brake assembly left	2. Inner hexagon plug	3. Axle housing	4.Hex bolt	5. Brake assembly right	6. Brake hub
7.Hub bolts	8. Hub nuts	9. Bolts	10.Spring cushion	11. Half axle	12. Half axle cushion
13.Small round nut	14. Stop washer	15.Small oil seal retaining ring	16. O-ring	17. Skeleton oil seal	18.Bearing
19. Bearing	20. Oil seal ring	21.Oil seal	22. Bolt	23. Spring washer	24.Hex bolts
25. Spring washer	26. Bridge housing cover	27.Axle housing gasket	28. Vent plug assembly	29. Cylindrical pin	30.Hexagonal screw

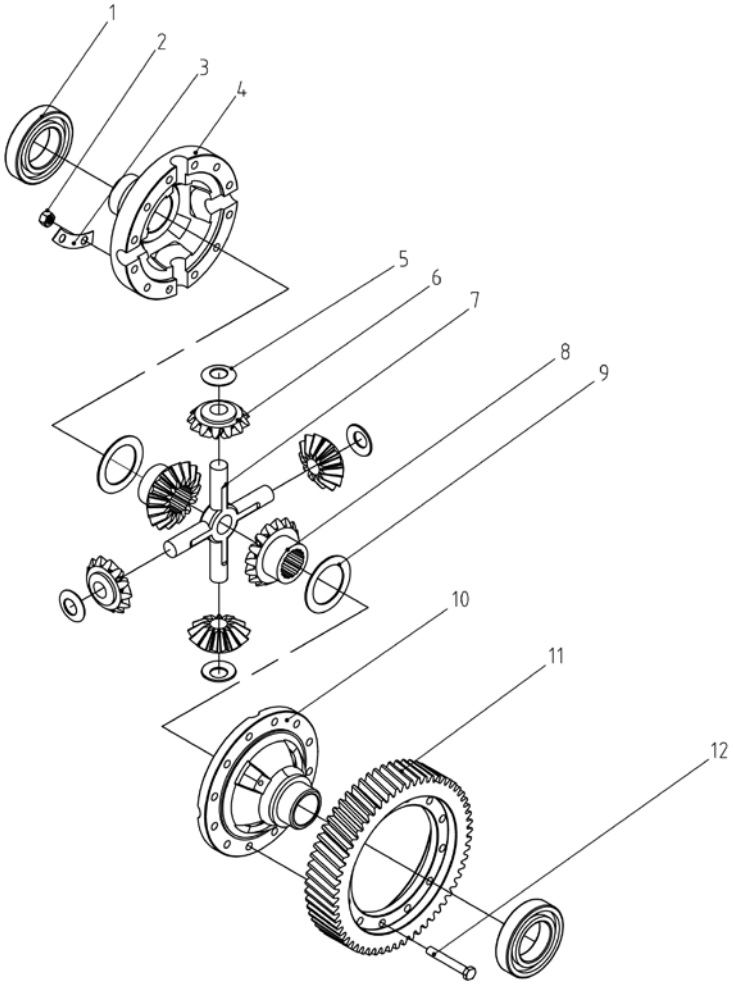
4.2 Transmission diagram

The gearbox is partially located between the drive axle and the travelling motor, and the mechanism's two pairs of cylindrical helical gears reduce the speed from the travelling motor's output shaft and increase the torque from the transmission shaft, which is then transmitted to the differential. Maintenance: permanent lubrication of rotary platform。



1.Bolt 2. Gasket 3. Bearing cover 4. O-ring 5.Deep groove ball bearing 6. Box assembly 7. Lock plate of bearing seat 8.Deep groove ball bearing 9. Gear shaft 10. Double gear 11.Oil seal 12. Elastic retainer 13. Cylindrical pin 14.Deep groove ball bearing 15. Input shaft 16. Deep groove ball bearing 17.Spring washer 18. Bolt 19. Bolt 20.Seal cover 21. Deep groove ball bearing 22. Shaft 23. O-ring 24.Box cover 25. Baffle 26. Bolts

4.3 Differential structure drawing



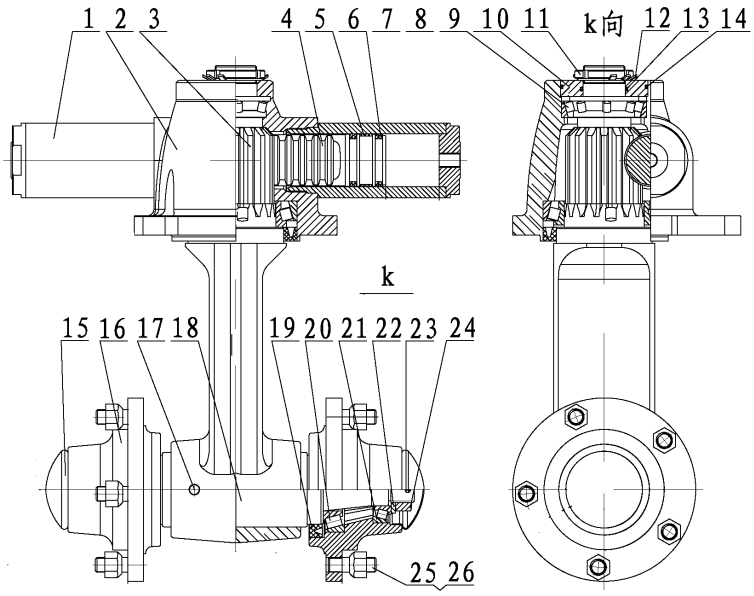
1. Deep groove ball bearing 2. Nut 3.Left differential case 5. Washer 6. Gear 7. Shaft 8.Half shaft gear 9. Half shaft washer 10. Right differential housing 11.Gear ring 12. Bolts

5 steering system

The steering system consists of steering wheel, steering shaft, steering gear, steering oil pump and steering bridge. Steering shaft through the universal joint connected to the steering gear and the connecting shaft through the universal joint connected with the steering wheel, steering column can be tilted to the appropriate location, steering axle in the tail at the back of the chassis frame, left and right sides respectively have a steering knuckle, driven by steering cylinder piston rod through the connecting rod steering knuckle steering, the steering wheel deflection, implementation.

5.1 steering axle

The steering bridge is a box-shaped cross-sectional welding structure, which is composed of steering bridge body, steering cylinder, connecting rod, steering knuckle and steering wheel and other parts. The steering trapezoid adopts a crank slider mechanism, which is driven by the piston rod of the oil cylinder through the connecting rod to turn the steering knuckle, so that the steering wheel is offset, so as to achieve steering. To bridge the pin before and after the fixed plate by damping pad bolted to the frame on the tail at the back of the shelf, make bridge physical swing around the pin shaft, steering axle sides of a steering knuckle hub after using two loaded on the steering shaft taper roller bearing, wheel by fixed onto the wheel rim, bearing inside containing oil seal, keep the grease in the body cavity wheel and steering knuckle.



1.Cylinder 2. Rotary support 3. Supporting gear shaft 4.Piston rod body 5. Support ring 6.U seal ring 7.Skeleton seal ring 8. Bearing 9. Bearing 10.Bushing 11. Round nut 12. Return gasket 13. O-ring 14.Hub cap 16. Hub 17. Pin 18.Steering wheel shaft 19. Skeleton seal ring 20. Bearing 21.Bearing 22. Flat washer 23. Split pin 24.Slotted nuts 25. Hub bolts 26. Hub nuts

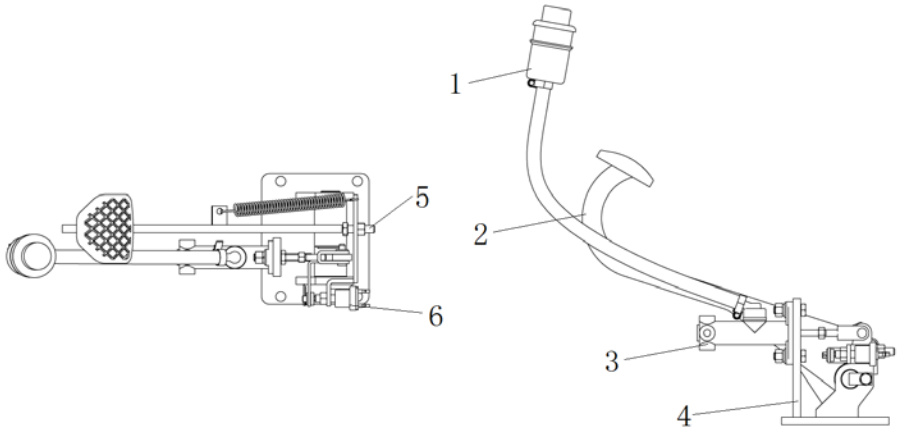
6 The braking system

The braking mode of forklift truck consists of two forms: service braking and parking braking. Service braking refers to the braking method used by forklift truck in the process of operation, using foot brake braking. When the brake pump to the main brake shoe and auxiliary brake shoe with the same force on the brake drum, until the upper end of the auxiliary brake shoe and the fixed pin against the brake shoe, the brake shoe to move in the direction of the drum rotation. Against the fixed pin,

friction between the disc and the brake drum increases, because the main brake shoe to the secondary brake shoe a much greater pressure than the brake pump pressure, so as to produce a lot of braking force. Parking brake is mainly used in the parking state to prevent accidents caused by sliding slope. The parking brake is equipped with a travel switch and the control circuit is disconnected during parking. The parking brake must be released before the forklift starts to walk, and the control circuit can be connected. Parking brake has the function of adjusting tension.

6.1brake pedal

Part of the brake pedal structure is shown in the figure. The pedal converts the stepping force acting on the pedal to the brake oil pressure through the push rod of the brake master pump.

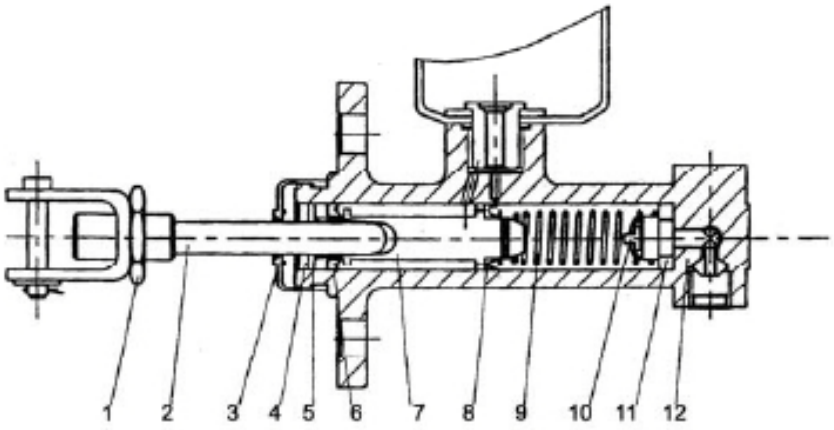


1.Brake oil cup 2. Brake pedal 3. Brake pump 4.Brake support 5. Limit bolt 6. Brake sensor

6.2 brake master cylinder

The master pump consists of a seat, a one-way valve, a return spring, and a main leather bowl, piston and auxiliary leather bowl. The end is fixed with a stop washer and a stop steel wire, and the exterior is protected by a rubber dust cover. The piston of the master pump is operated by the brake pedal through the push rod. When the brake pedal is pressed down, 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 rubber bowl blocks the oil return hole. After the main leather bowl is pushed through the oil return port, the brake fluid in the front cavity of the main pump is compressed and the one-way valve is opened, which flows to the sub-pump through the brake pipeline. In this way, each sub-pump piston extends outward, so that the brake shoe friction plate and the brake drum contact, to achieve the effect of deceleration or braking. At this point, the piston back chamber is supplemented by brake fluid from the oil return port and the oil intake port. When the brake pedal is released, the piston is pressed back by the return spring, and the brake fluid in each brake sub-pump is also

compressed by the return spring of the brake shoe, so that the brake fluid returns to the master pump (piston front chamber) through the one-way valve, the piston returns to the original position, and the brake fluid in the master pump flows back to the oil storage tank through the oil return port. The pressure of the check valve is adjusted to a certain proportion of the remaining pressure in the brake line and the brake sub-pump, so that the sub-pump leather bowl is placed correctly to prevent oil leakage, and eliminate the possible air resistance phenomenon during emergency braking.

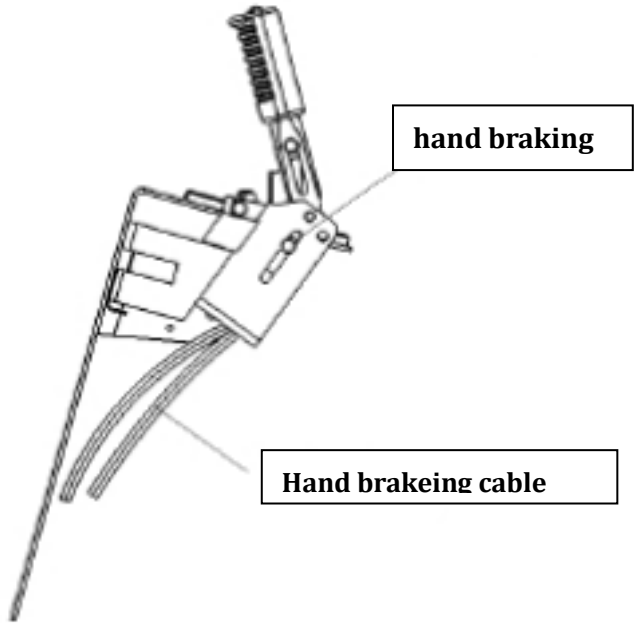


1. Lock nut 2. Push rod 3.Dust cover 4. Stop steel wire 5.Stop washer 6. Auxiliary leather bowl 7.Piston 8. Main leather bowl 9.Spring 10. Check valve 11.Seat 12. Pump body

6.3 parking braking

The parking brake handle is CAM type and the braking force can be adjusted by an adjuster located at the end of the brake handle.

Braking force adjustment: clockwise turn the regulator, braking force increase; Turn the regulator counterclockwise to reduce braking force. Tension: 200N ~ 300N



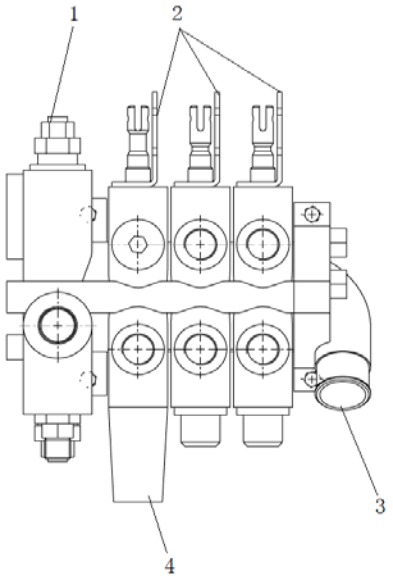
7. Hydraulic system

The hydraulic system is composed of main oil pump, multi-way valve, lifting cylinder, inclined cylinder and oil channel.

The oil pump motor drives the gear pump to provide hydraulic power, two lifting cylinders are responsible for the lifting of the fork, two inclined cylinders complete the front and back tilt action of the door frame, and one side cylinder completes the left and right side movement of the tray frame. The control of lifting, tilting and lateral oil passage is controlled by three handles on the triplet valve, the lifting action is controlled by the single acting oil passage on the triplet valve, and the tilting and lateral movement is controlled by the double acting oil passage on the triplet valve. The hydraulic system pressure of this model can only be adjusted on the triple valve, which has been debugged before leaving the factory. After leaving the factory, non-after-sales personnel or professional maintenance personnel of our company are strictly prohibited to adjust themselves, in order to avoid safety accidents.

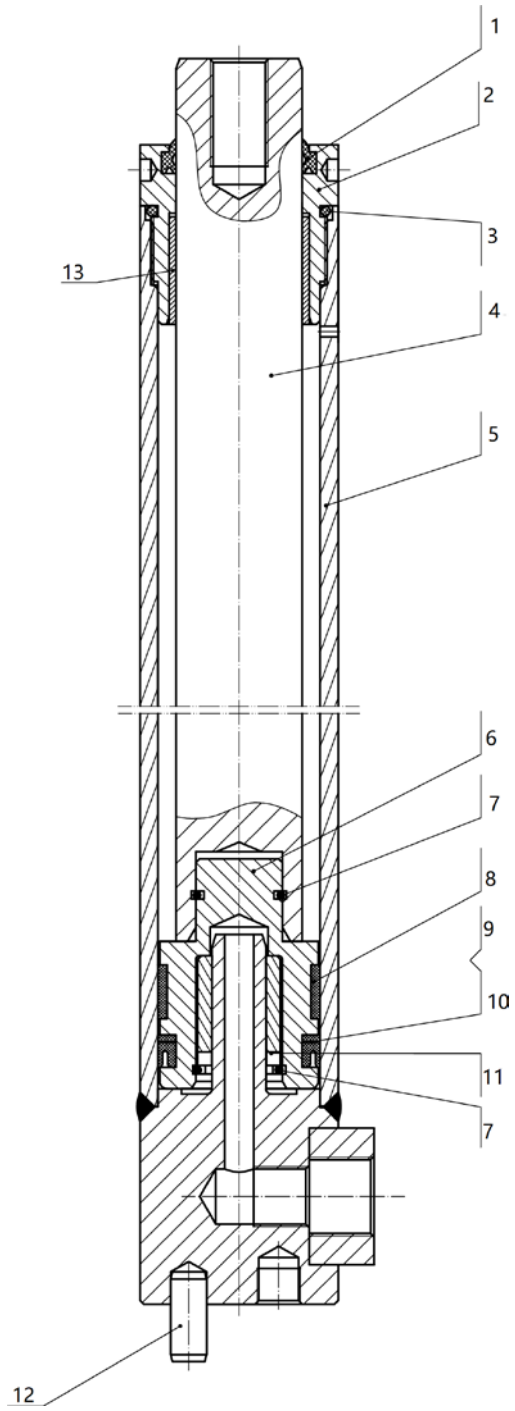
7.1 Multitandem valve

Multi - way valve by valve body, slide valve, relief valve.The valve body is assembled together by bolts and nuts. The pressure of the main safety valve has been adjusted before leaving the factory. Users are not allowed to adjust it casually.

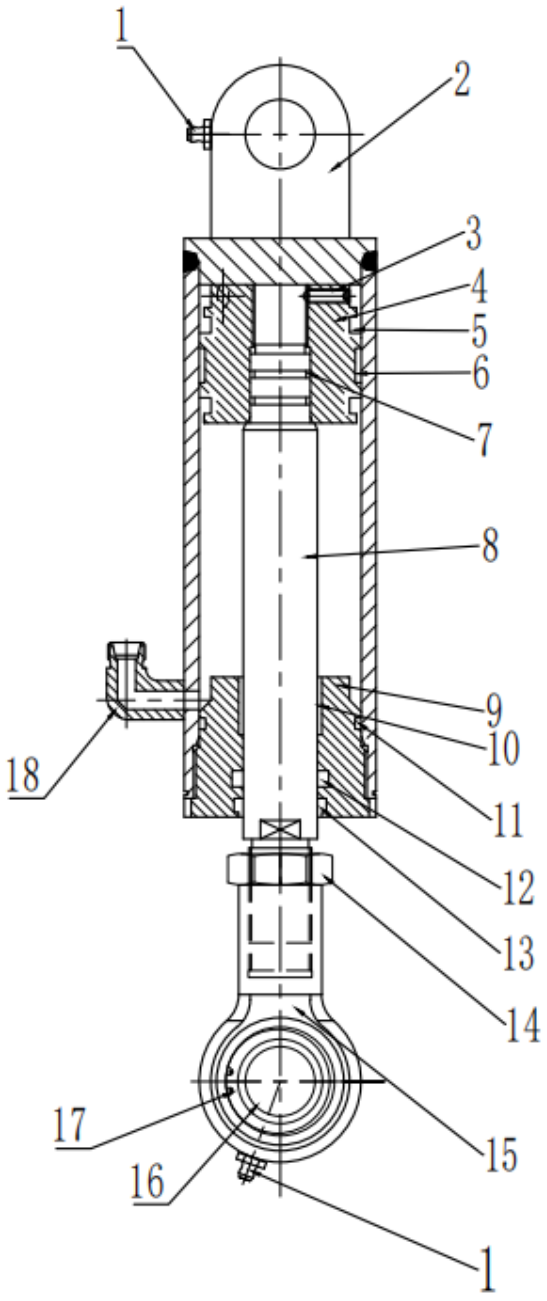


1, safety valve 2, micro switch bracket 3, oil return port 4, lifting speed sensor

7.2 Schematic drawing of lifting cylinder and tilting cylinder



1. Dust ring 2. Cylinder head 3.O ring 4.Cylinder block 6 piston 7 steel wire retainer 8 support ring 9.Sealing ring 10. Baffle 11. Buffer sleeve 12. Cylinder pin 13.bearing



1. Oil cup 2. Cylinder block 3.Piston 5. Sealing ring for hole 6. Supporting ring for hole 7.Piston rod 9. Guide sleeve 10. Bearing 11. O-ring 12.Seal ring for shaft 13. Dust ring 14. Nut 15.Joint bearings 17. Elastic retainers for holes 18. Right Angle joints

8 Jacking system

The lifting system consists of internal and external door frame, cargo fork frame, retaining shelf, lifting cylinder, inclined cylinder, lifting chain and so on. It is the holding mechanism of forklift truck for loading and unloading operations. Forklifts are standard with a two-stage wide view frame.

8. 1 Inside and outside the door frame

The two-stage wide-view gantry consists of an outer gantry that cannot be lifted or lowered and an inner gantry that can be stretched up and down. The lower part of the outer door frame is connected with the drive axle, and the weight is mainly supported on the axle housing. The middle and outer inclined cylinder support of the outer door frame is connected with the piston rod of the inclined cylinder, and the door frame can be tilted forward and backward by operating the multi-way valve. The inner frame is a welded piece, through the roller, side roller to bear the longitudinal and transverse load, and make the frame with smooth movement.

8. 2 fork arm carrier

Fork frame is equipped with rollers and adjustable gap side rollers, so that the fork frame along the inner edge of the channel steel smooth up and down movement, fork frame each side of the roller has three groups, fork mountain to the maximum height, above a pair of rollers will extend out of the inner door frame edge. Fork by hook hanging on the fork frame, and lock pin locked in the fork frame beam groove, fork spacing available manual adjustment, fork and fork frame using international standards (ISO) in order to universal and interchangeable.

8.3 Adjustment method of chain tightness

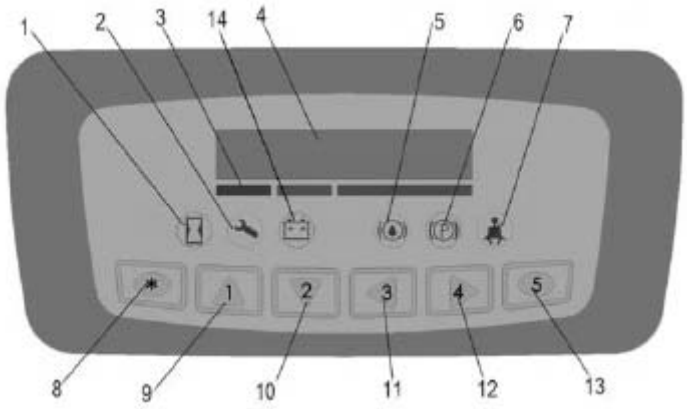
-Drive the forklift to a flat surface and lower the fork to the ground.
- Position with hinge bolts on one side of slide frame.
- After adjusting the length of chain section of hinge bolt on one side of lifting cylinder, tighten the nut on one side of lifting cylinder.
- At 1 meter above the ground, push the chain with your finger (about 5 kg force) so that the chain can move 20 mm.

9 Electric System

Electrical system mainly includes battery, traction motor, pump motor, traction motor controller and pump motor controller, steering combination switch, multi-way valve block controller, display instrument, combined control switch, instrument and lighting device, etc

9.1 display

The display has six built-in red liquid crystal displays, which provide the operator with some easy information about the operation of the vehicle's mechanism.



1. Waiting time indicator 2. Fault alarm indicator 3.Electric quantity mark 4. Speed, electric quantity and time display 5.Temperature alarm light 6. Hand brake light 7. Seat light 8.Instrument function key 9.Function selection key (Up) 10. Function selection key (Down) 11. Parameter Adjustment key (Down) 12.Parameter Adjustment button (Up) 13. Exit button 14. Battery indicator

9.2 The battery

First open the cover of the electric bottle, and then use the lifting equipment to load and unload the battery. Ensure that the lifting equipment has sufficient load capacity. The lifting device must be pulled vertically to avoid damage to the battery case. The hook of the lifting device must be safe and reliable. The hook must not fall on a single cell in the battery pack.

- Press the emergency stop switch and power key switch to the OFF position so that it is in the cut OFF position.
- Remove the connector of the battery cable.
- Connect lifting device to lifting hole.
- Lift the battery from above and remove it with handling equipment.

5、CURTIS Hand held unit

Precautions for operation:

The attention function of the hand-held unit is to facilitate vehicle inspection and maintenance. It is not allowed to adjust the controller parameters without the approval of the vehicle manufacturer, so as to avoid vehicle and personal safety accidents.

The hand-held unit will automatically save the modification parameters, just need to close the key switch, restart.

The CURTIS hand held unit can be connected in the event of a controller power or power failure

Vehicle fault reading process:

1. After connecting the hand held unit with the controller, open the key switch

2, From the menu list of CURTIS hand held units, find: Faults...

3. When the vehicle is running and the hand-held cursor flashes, there will be English fault content, which can be interpreted by referring to the fault code table

Vehicle signal detection:

1. After connecting the hand held unit with the controller, open the key switch

2, According to the menu list of CURTIS hand held unit, find: Monitor.....

3. According to requirements, open the corresponding sub-item of the detection menu, run the vehicle, and observe the change of the hand-held value.

CURTIS Contents of hand held unit menu:

The Curtis 1313 hand held programmer is used to configure the Curtis electric control system. Through this programmer, you can adjust and save the set parameters, real-time monitoring of controller data and

fault diagnosis

Warning: The control system can affect the vehicle's acceleration rate, deceleration rate, hydraulic system and braking.A dangerous situation can occur if the vehicle control system is not programmed correctly or exceeds safety.Only the vehicle manufacturer or an authorized service agent can program the control system

The programmer has two interfaces, one is used to communicate with the electric control, the other is used to communicate with the PC, the programmer has a battery box and a memory card slot

当编程器加载完控制器的信息后，编程器上会显示主菜单。

The programmer is powered on

The connection line of the hand held programmer can be connected to the controller by inserting the programming port of the controller. After connecting the controller, the hand held programmer will be powered on automatically and the control information will be displayed on the programmer.

The function keys

Since the function of the three keys is determined by the specified content, the three keys are blank.At any given time, the function of the button is displayed on the LCD screen above.

Direction arrow key

The displayed information can be selected up, down, or left by four directional buttons.

+ / - buttons

You can add and subtract parameters by using these two keys.In addition, "+" can mean "Yes" and "-" can mean "No".In some cases, it can also be used as a scrolling option.

Power key

When the programmer inserts a controller that has been powered on, the programmer does not have to press the power button to use it. The programmer wil

Collect keys

There are two ways to enter the Favorites menu. You can enter Favorites from the main menu or press this key

-The menu structure

The main menu consists of nine sub-menus, and each sub-menu is displayed with a specific icon. Each item in the sub-menu is arranged by hierarchy.

Some menus contain only one item of information, but most menus contain more than one item of information, and open each item folder to access the next level of sub menus.Expand the table through the grid option, enter a group of execution commands through the dialog box option, and return to the upper menu regardless of the interface by pressing the left direction button.

The names of all nine sub menus are shown in bold on the main menu and below the icon.When entering the stepped menu, the name of the sub menu or the path you are in is displayed at the top of the screen.

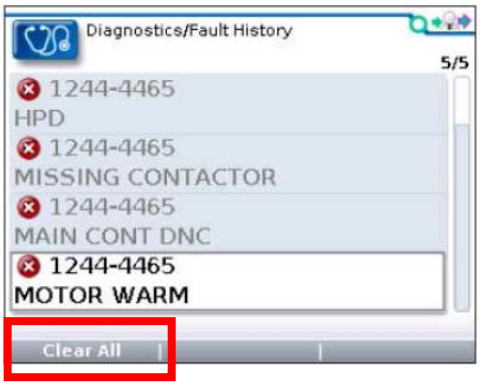
Nine menu

Fault Diagnosis menu

On the main menu, Select Diagnostics and press Select to access the Fault diagnosis menu. The Fault diagnosis menu contains Present Errors current faults and Fault History historical faults

Note: Sometimes a fault caused by a temporary event captured in the circuit is not a system fault. You can determine whether the fault exists by restarting the system and observing whether the fault disappears automatically.

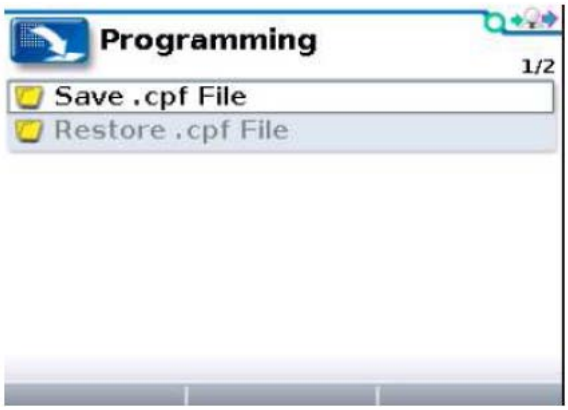
The historical faults folder lists all faults encountered after the last historical fault is cleared. By clearing the fault content in the entire folder, you can record the historical faults again.



Clear All is used to Clear historical fault folders.A function key is highlighted only when there are historical failures in the historical failures folder and grayed out when there are no historical failures.

Programming menu

On the main menu, Select The Programming icon and press Select to access the menu. Save and restore parameter Settings files (.cpf files) through programming menus



Save.cpf File (Save.cpf File)

Use the save. CPF file function in the programming menu to back up the currently set parameters. You can save as many.cpf files as you want, and you need to name each.cpf file differently

Restore. CPF File (Restore.cpf File)

Restore. CPF File The. CPF File saved earlier can be used to replace the CPF File of the current controller. When the data recovery is complete, a dialog box is displayed asking you to restart the system.