



**TITANGREEN**

POWERED BY  **BigBattery**  
Your Source For Power

**Operation &  
Service Manual  
EP25K-Li**

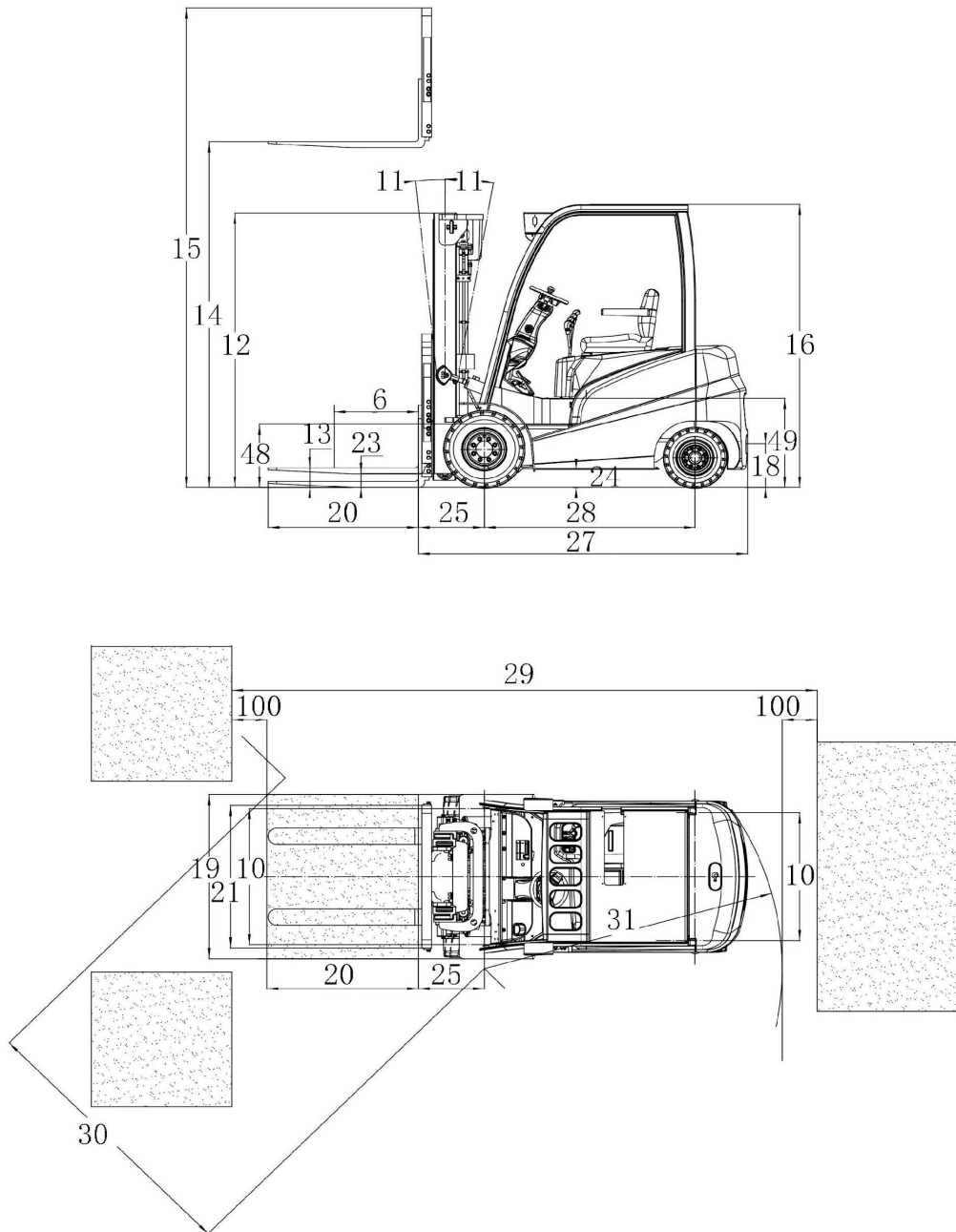


## Table of Contents

1.External view and technical parameters.....	4
2. Safe driving, operation and maintenance of forklift.....	6
2.1 Transportation,loading,unloading and lifting of forklifts.....	6
2.1.1 Forklift transportation.....	6
2.1.2 Forklift loading and unloading.....	6
2.1.3 Lifting of forklifts.....	6
2.2 Parking of forklifts.....	7
2.3 Preparation before use.....	7
2.4 Precautions for safe operation.....	8
2.5 Maintenance of lithium battery forklift.....	12
2.5.1 New forklift maintenance.....	12
2.5.2 Starting essentials.....	12
2.5.3 Charging of lithium battery.....	13
2.5.4 Maintenance Summary.....	13
2.5.5 Forklift oil and grease.....	14
2.6 Brief operating instructions.....	14
2.6.1 Control mechanism and instrument.....	14
2.6.2 Brief description of operation.....	16
2.6.3 Maintenance of control system.....	17
2.6.4 Special reminder.....	17
2.7 Warning sign.....	18
3.Structure, principle, adjustment, and maintenance of forklift.....	24
3.1. drive system.....	24
3.1.1 Summary.....	24
3.1.2 Hub installation.....	25
3.2. Braking system.....	27
3.2.1 Summary.....	27
3.2.2 Brake disassembly and adjustment essentials.....	33
3.3. Steering system.....	40
3.3.1 Summary.....	40
3.3.2 Adjustment and maintenance essentials.....	44
4. Electrical system.....	46
4.1 Summary.....	46
4.2 Electric control assembly.....	49
4.2.1 Electronic controller fault code.....	49
4.3 Instrument.....	51
4.3.1 Summary.....	51
4.3.2 Instrument interface.....	51
4.3.3 Instrument instructions.....	52
4.3.4 Operating Instructions.....	55
4.3.5 Instrument main menu and instructions.....	56
4.3.6 matters needing attention.....	61
5.Motor.....	61
5.1 Switched reluctance motor.....	61
5.1.1 Daily inspection and maintenance of motor.....	61
6.Lithium battery and charger.....	62
6.1 Use and maintenance of lithium battery.....	62

6.1.1 Instructions for use of lithium battery.....	62
6.1.2 Charging steps and precautions of lithium battery.....	63
6.1.3 Lithium battery storage.....	64
6.1.4 Treatment of lithium battery.....	65
6.1.5 Lithium battery safety precautions.....	65
6.1.6 Lithium battery maintenance.....	66
6.3 Charger.....	67
6.3.1 Use of charger and charging method.....	67
7. Hydraulic system.....	68
7.1 Summary.....	68
7.1.1 Multiway valve.....	71
7.1.2 Lifting cylinder.....	73
7.1.3 Speed limiting valve.....	76
7.1.4 Tilt cylinder.....	77
7.1.5 Hydraulic oil tank.....	77
7.2 Maintenance and adjustment of hydraulic system.....	78
7.2.1 Maintenance of hydraulic oil pump.....	78
7.2.2 fault diagnosis.....	81
8. Mast system.....	82
8.1 Summary.....	82
8.1.1 Internal and external mast.....	82
8.1.2 Fork carriage.....	83
8.1.3 Fork locating pin.....	84
8.2 Maintenance and adjustment of mast system.....	84
8.2.1 Lifting cylinder adjustment.....	84
8.2.2 Height adjustment of fork carriage.....	85
8.2.3 Replace the fork carrier roller.....	85
8.2.4 Replace the mast roller (Fig. 8-8).....	86

## 1. External view and technical parameters



Outline drawings of lithium forklift



## Performance parameters of lithium forklift (2.5T)

GENERAL	1	Manufacturer			TITANGREEN
	2	Model designation			2.5T
	3	Power Type			Electric
	4	Operation			Sit
	5	Rated capacity			lb(kg) 5512 (2500)
	6	Load center			in(mm) 24(610)
DIMENSIONS	7	Tire type—cushion, solid, pneumatic, etc.		Drive/steer	solid
	8	Tire size		Drive/steer	in Front 23×9-10 Rear 18×7-8
	9	Wheels - number			Front Driving - 2 Rear Steering - 2
	10	Wheelbase		Tires Std dr/steer	in(mm) Front 40.9(1040) Rear 37.4(950)
	11	Mast tilt		Std	degrees Forward 6° Aft 6°
	12	Mast - lowered height		Std mast	in(mm) 80.3(2040)
	13	Free lift - top of fork		Std 3 stg limited free lift mast	in(mm) 5(140)
	14	Lift height - top of fork		Std 3 stg limited free lift mast	in(mm) 118(3000)
	15	Mast - extended height		Std mast with / without LBR	in(mm) 189(4800)
	16	Overhead guard height		Std/drive in rack/opt/opt flat plate	in(mm) 83.6(2125)
	17	Sip to bottom std ohg		Susp at mid-point	Std/susp/swivel in(mm) 38.5(980)
	18	Tow pin height		Vertical center of pin	in(mm) 12.8(325)
	19	Overall width		Standard tread	in(mm) 49.8(1265)
	20	Forks		Thickness x width x length	in(mm) 18×4.7×42.1(45×120×1070)
	21	Standard carriage width		Class II	in(mm) 41.7(1060)
	23	Ground clearance		Lowest point	NL/RL in(mm) 4.13/3.35(105/85)
	24	Ground clearance		Center of truck	NL/RL in(mm) 5.5/4.72(140/120)
	25	Load distance		Center of wheel to face of forks	in(mm) 18.3(464)
	26	Battery compartment		Height	in(mm) 22(560)
				Width	in(mm) 47.32(440)
				Length	in(mm) 31.5(800)
	27	Length to face of forks		Chassis length	in(mm) 90.8(2306)
	28	Wheelbase			in(mm) 59(1500)
	29	Right angle stack			in(mm) 154(3915)
	30	Equal aisle		90° Intersecting aisle	in(mm) 78(1983)
	31	Outside turning radius			in(mm) 80.7(2050)
WEIGHT	32	Truck weight		Without battery (NL)	NL lb(kg) 8885(4030)
	33	Axle loading—drive		Static with max. wt. battery	NL/RL lb(kg) 387/13800 (990/6260)
	34	Axle loading—steer		Static with max. wt. battery	NL/RL lb(kg) 5379/1477 (2440/670)
PERFORMANCE	35	Voltage			76.8
	36	Travel speed		Extended shift off	NL/RL mph(km/h) 9.32/8.39(15/13.5)
	37	Lift speed		Std 2stg FFL mast	NL/RL ft/min(m/sec) 90.5/82.6(0.46/0.42)
				Std 3 stg FFL mast	NL/RL ft/min(m/sec) 84.6/76.7(0.43/0.39)
	38	Lower speed		Std 2stg FFL mast	NL/RL ft/min(m/sec) 78.7/98.4(0.4/0.5)
				Std 3 stg FFL mast	NL/RL ft/min(m/sec) 64.9/74.7(0.33/0.38)
	39	Gradeability		5 Minute rating	NL/RL ft/min(m/sec) 22/16
ACCESSORIES	41	Brake		Method of control	Service/parking ft/min(m/sec) Hydraulic/mechanical
				Method of operation	Service/parking ft/min(m/sec) Foot/foot
ELECTRICAL	42	Battery		Type	lithium-ion
	43	Traction motor		60 Minute rating	hp(kW) 10(7.5)
	44	Pump motor		15% Rating	hp(kW) 13.4(10)
	45	Traction motor		Type/control method	SRM/ transistor
	46	Pump motor		Type/control method	SRM/ transistor
	47	Number of speeds		Traction/pump	Infinitely variable
OTHER	48	Step height			in(mm) 18.5(470)
	49	Floor height		Lowest point	in(mm) 26(660)
	50	Attachment relief pressure(mech levers/mini-levers)			psi(bar) 2320(160)
	51	Sound level		Measured per ANSI B56.11.5	dB(A) 65

## 2. Safety, operation, and maintenance of the forklift

Operators must remember "safety" is the number one priority when operating heavy machinery. Before the first operation, please carefully read the Operation and Maintenance Manual, which will enable you to fully understand our forklift and operate it correctly and safely.

### 2.1 Transportation, loading, unloading, and lifting of the forklift

#### 2.1.1 Forklift transportation

(1) When the forklift is transported by container or truck, the parking brake pedal should be pressed after the forklift is parked in place.

(2) Fix the mast and the balance weight with steel wire and use jacks to prevent the forklift trucks from moving in the container.

(3) Pay attention to the overall length, width, and height when loading, unloading, and shipping, and conforming to the regulations is necessary.

(4) If necessary, the working device can be disassembled and transported separately.

#### 2.1.2 Forklift loading and unloading

(1) Use a properly sized and weight specified ramp to load the forklift onto the delivery vehicle or trailer.

(2) Apply the parking brake and use jacks to stop the wheel.

(3) Fasten the plate in the center of the cabin; there must be no grease on the plate.

(4) The left and right heights of the plate must be equal to make the loading and unloading smooth.

(5) To prevent any potential danger, please refrain from altering the direction of the plate.

(6) Reverse the forklift slowly when loading it on the freight car.

#### 2.1.3 Lifting of forklifts

(1) Only specially trained personnel can sling the forklift.

(2) Sling points should always be at the positions specified in the sling nameplate.

(3) The slinging cable must be enough to hang the forklift truck.

(4) Disassembled parts of the forklift truck must be slung in the appointed position.

Model	Mast	
	Dimensions(mm)	Weight kg (lbs)
2.5T	2115×1094×507	1493 (3292)

**Notice:**

**Dismantling and slinging the component should not be performed without the approval of our company. Under special circumstances, the appointed sling position should be used. The balance weight, fork, and mast of the forklift truck all have their appointed sling position. The above weights are for reference only and may be adjusted due to different counterweights or technical optimization.**

## **2.2 Parking of forklifts**

- (1) Lower the mast to the lowest position.
- (2) Turn left the key switch, press the emergency stop switch, place all control levers in the empty position, and unplug the power plug.
- (3) Tighten the handbrake lever.
- (4) Chock the front and rear tires.
- (5) When the forklift is out of service for a long time, the wheels should be overhead. Before long-term storage, confirm that the power of the battery system is not less than 50% and not more than 80%, and charge and maintain it every two months. After storage for more than two months, please confirm whether the power battery system has a fault alarm before reuse).
- (6) Forklifts should be stored in a dry and ventilated environment away from heat sources as far as possible after long-term shutdown.

## **2.3 Preparation before use**

- (1) Check whether all instruments are normal.
- (2) Check tire wear.
- (3) Check all handles and pedals.
- (4) (Before using the vehicle for the first time, it needs to be charged to 100% before use. After the vehicle is powered on, confirm that there is no battery system alarm message on the instrument panel. Please check the remaining power before use. It is recommended that the SOC be used between 50% and 100%. If the SOC is less than 15%, it is not recommended to continue to use. Please charge as soon as possible.)
- (5) Check whether the battery and vehicle power line connectors and signal line connectors are reliable.
- (6) Check the hydraulic oil and brake fluid for leakage.
- (7) Check the tightness of the main fasteners.
- (8) Check whether the lighting and signal are normal.
- (9) Release the parking brake.
- (10) Carry out the trial operation of mast lifting, forward and backward tilting, forklift steering, and braking.
- (11) The contamination degree of hydraulic oil is not greater than Grade 12.

## **2.4 Precautions for safe operation**

(1) Forklift belongs to special equipment. Only drivers who have passed the training and examination and hold a driving license can drive; The maintenance of the forklift should only be carried out by trained and qualified personnel to ensure the normal use of the forklift.

(2) Wear the safety guards, such as clothing, shoes, helmet, and gloves, while operating the forklift.

(3) When the center of gravity of the goods is 600mm from the front wall of the vertical section of the fork, the maximum load is the rated lifting weight, and the load should not exceed the specified value during handling. If the center of gravity of the goods is more than 600mm from the front wall of the vertical section of the fork, the lifting capacity should be reduced according to the value specified in the load curve, and overloading is strictly prohibited.

(4) Operate your forklift on hard ground. Operate on other ground; the lift capacity and travel speed must be decreased. Wipe off the oil and grease from the floor.

(5) Daily maintenance should be done before or after using the forklift. Anytime you find that the forklift is not functioning normally, the operation of the forklift should be halted and checked or repaired at once.

(6) When operating one lever, pay attention not to shift another lever. Don't operate the lever at any position out of the driver's seat.

(7) Don't handle unsecured or loose goods. To prevent the collapse of stacked goods, ensure that the goods are properly secured. Do not load loose goods without a pallet.

(8) Forklifts with accessories specially ordered by users can make their use more extensive. However, the forklift with attachments will reduce the payload and stability of the forklift. Do not use the accessories and special devices for other purposes. Please read the additional instructions we provide for you and use them strictly according to the requirements. Users are not allowed to modify without permission.

(9) Do not use a fork to pull the embedded object (if necessary, the pulling force should be calculated first).

(10) When loading goods, the distance between forks should be adjusted according to the size of the goods, and the weight of the goods should be equally shared by the two forks so as to prevent the goods from slipping to one side during eccentric loading or driving; It is prohibited to pick up goods with a single fork.

(11) When carrying a large volume of goods, the goods block the driver's sight, and the forklift should be driven in reverse.

(12) When loading goods, put the fork to the bottom. After the fork is inserted into the cargo pile, the front wall of the vertical section of the fork should be in contact with the goods, and then the gantry should be tilted back to the limit position, and the fork should be lifted 200 mm - 300 mm from the ground before driving

(13) When lifting or lowering goods, no one is allowed under the lifting frame; It is forbidden to lift people with a fork.

(14) When loading and unloading goods, keep the mast vertical and forklift in a braking state.

(15) Because the forklift turns by the rear wheels, the end counterweight may swing wide when turning. Use care in narrow aisles and other workplaces.

(16) During operation, pay attention to the performance and condition of the system of



machinery, hydraulic, electric and speed-adjuster, etc.

(17) Turn on the power, step on the brake, press the one-button start switch, select the position of the direction switch, turn the steering wheel to see if the vehicle turns normally, and slowly step on the accelerator pedal to maintain the proper starting acceleration.

(18) Pay attention to observing the SOC. When the forklift is working, if the SOC power is lower than 15%, it is recommended to stop the operation as soon as possible, charge the lithium battery, or replace the lithium battery with sufficient power. If the SOC power is lower than 10%, the forklift will be forced to operate with reduced power for the protection of the battery. At this time, it is necessary to go to the charger immediately for charging.

(19) The speed of cargo lifting or lowering can be controlled by the number of movements of the operating handle of the multi-way directional valve. The initial speed of cargo lifting or lowering should not be too fast.

(20) Before tilting the mast forward and backward, the forklift should be braked and should tilt slowly when tilting forward to prevent the goods from slipping out suddenly.

(21) Tilt the mast of the high-lift forklift as backward as possible when operating the forklift. Use minimum forward and backward tilt when loading and unloading. It is dangerous to travel or turn when lifting the goods at high levels.

(22) It is noted that the goods will fall down when the forks of the truck with a lifting height of more than 3m lift; take protection measures if necessary.

(23) The overhead guard is the main part which is strong enough to meet safety standards and protect the operator from falling materials. It's very dangerous to dismantle or rebuild the overhead guard because these conditions could lead to an accident.

(24) The shelf is a safety part. When the goods are stacked high on the fork, and the gantry is tilted backward, the goods should be prevented from sliding backward to avoid personal injury to the driver.

(25) The height of loading and unloading should be limited to the height of the shelf. If the height of the goods exceeds the shelf, it is easy to cause the goods to slide to the operator, which will lead to serious accidents.

(26) During outdoor operation, the wind has a great impact on the stability of the forklift, so please pay special attention.

(27) When driving on the wharf or temporary planking, be careful and drive slowly.

(28) When carrying goods, do not tilt the mast forward, do not load or unload, and do not brake to prevent the goods from slipping out.

(29) Forklifts should drive into the cargo pile at a low speed and pay attention to whether there are protruding hard objects near the cargo to avoid puncturing the tires.

(30) When driving, pay attention to pedestrians, obstacles, and potholes, and pay attention to the clearance above the forklift.

(31) When the forklift is running, the handle, foot, and other parts of the body are not allowed to extend out of the cab, and the vehicle is not allowed to carry people.

(32) Drive carefully on the ramp and do not turn; drive laterally or diagonally; otherwise, the forklift may roll over. When carrying goods on a large ramp, drive forward when going uphill and backward when going downhill. Please use foot brakes when going downhill and drive carefully. When driving on the ramp, it is prohibited to slide into neutral gear and use the emergency stop button carefully.

(33) Start, turn, drive, brake, and stop carefully, especially when turning on wet or smooth roads.

(34) It is forbidden to suddenly start, accelerate, stop, and turn the forklift. Improper operation may cause the forklift to roll over. If this happens, the driver should keep calm and avoid jumping. He should hold the steering wheel with both hands and lean in the opposite direction of the forklift.

(35) Forklifts with attachments should be operated as loaded forklifts when empty.

(36) During the use of the chain, it should be checked regularly to ensure that there are good lubrication conditions between the chain links and that the tightness of the left and right chains is consistent; If the chain is worn during use, and the change value of the chain pitch exceeds 2% of the standard value, the chain must be replaced to ensure safe loading.

(37) Before the forklift is safely decelerated and stopped, the reverse gear cannot be engaged to ensure the driver's safety.

(38) When the forklift is running with load, emergency braking should be avoided.

(39) When leaving the vehicle, lower the fork to the ground, place the shift handle in neutral, and disconnect the power supply. When parking on the ramp, pull the parking brake or step down the parking brake. If the parking time is long, chock the wheels.

(40) When the mast is tilted forward or backward to the limit position or the fork is lifted to the maximum height, the handle must quickly return to the middle position.

(41) The pressure of the multi-way valve and safety valve of the forklift has been adjusted before leaving the factory. Users should not adjust them randomly during use to avoid damage to the entire hydraulic system and hydraulic components due to excessive pressure adjustment.

(42) The tire inflation pressure should be the pressure value specified on the "Tire Pressure" label.

(43) During the operation of the forklift, additional noise values may be added due to different operations and the impact of the external environment, which may lead to higher or lower noise values.

(44) The driver will feel the vibration of the forklift when operating and driving. The total vibration value of the double arms transmitted by the forklift to the operator should not exceed 1.3m/s<sup>2</sup>, but the vibration frequency characteristics of the human body depend on the working conditions (such as road conditions, operation methods, etc.), so the actual vibration frequency characteristics are determined by the site conditions when necessary.

(45) In order to handle super wide goods, users can choose a "lengthened fork," but it is worth noting that the bearing capacity of the lengthened fork should work strictly according to the requirements of the load curve. Within the specified load center, its bearing capacity is the same as that of the standard fork. When the load center moves forward, the load must be lowered; It is strictly forbidden to lift or hit the goods with the fork tip. Pay special attention to safety when driving or turning.

(46) Be familiar with and pay attention to the functions of various signs on the forklift, and timely subsidize if lost.

(47) Forklifts are generally used in an environment below 1000m above sea level, with a temperature of 5°F-104°F (-15°C - 40°C) and a relative humidity of 95%; Use with caution in other harsh environments.

(48) In order to prevent fire, accidents, or other unpredictable events, fire extinguishers

should be set in advance and operated according to the use requirements of fire extinguishers.

(49) Without the written approval of our company, it is not allowed to modify the forklift or add any working device; otherwise, the rated load or safe operation may be affected.

(50) Pay special attention to safety during high maintenance.

## **2.5 Maintenance of lithium battery forklift**

While using the forklift, careful operation, reasonable use, regular inspection, and maintenance must be carried out to keep the forklift in good working condition for a long time.

### **2.5.1 New forklift maintenance**

The performance and service life of the forklift is closely related to the maintenance of the new car in the running period. During the running-in period, special attention should be paid to:

(1) The gear oil in the differential and reducer should be replaced after the first 100 hours of operation of a new forklift, and all fasteners should be retightened after replacement.

(2) After the first 200 hours of operation, readjust the clearance of the driving and driven gears in the reducer.

### **2.5.2 Starting essentials**

(1) Oil volume of hydraulic oil: the oil level should be in the middle of the oil level gauge scale.

(2) Check the pipes, joints, pumps, and valves for leaks and damage.

(3) Check the service brake: the idle stroke of the brake pedal should be 5mm. When the brake is effective, the gap between the front floor and pedal should be greater than 20mm.

(4) Check the parking brake function: when the parking brake is fully depressed, it should be stopped on the specified ramp (no load).

(5) Instruments and lighting fixtures: check whether the instruments, lighting, connectors, switches, and electrical circuits work normally.

### **2.5.3 Charging of lithium battery**

(1) When the lithium battery pack is charged for the first time and recharged, the provisions of the lithium battery manual should be strictly followed.

(2) When the forklift is working, when the SOC of the battery pack is lower than 20%, any single battery cell drops below 3.0 V, or the instrument alarms, the forklift should stop working immediately, and can continue to use after charging or replacing the battery pack.

(3) Check the charger display, forklift meter charging information, etc. at any time during charging.

(4) When the forklift is not used for a long time, after a full charge, check whether the vehicle can work normally once a month and deal with problems found in a timely manner.

**Refer to 6.2 Use and Maintenance of Lithium Battery for charging method, use and maintenance.**

## 2.5.4 Maintenance Summary

- (1) Forklifts need to replace some key safety parts regularly. Please use our pure parts.
- (2) The same type of oil must be used when replacing or refueling.
- (3) When the forklift is found to be damaged or faulty, stop operating the forklift and inform the qualified maintenance personnel of the forklift's condition in time. Do not operate the forklift until it has been thoroughly overhauled.
- (4) Refer to 5.1.1 Daily inspection and maintenance of motor 6.2 Use and maintenance of lithium batteries.
- (5) All connectors should be checked once a month.
- (6) Due to the large number of electrical components involved in the electric forklift, it is necessary to pay attention to waterproofing and avoid washing with a high-pressure water gun.
- (7) The surface of the lithium battery should be kept clean and dry, and dirt should be removed frequently.
- (8) After normal use, the forklift should be regularly maintained according to the table below.

No	Item	Maintenance content	Maintenance intervals	Note
1	Steering wheel bearing	Replace grease	1200 hours	
2	Drive wheel bearing	Replace grease	1200 hours	
3	Drive axle body	Replace gear oil	2400 hours	
4	brake fluid	Add	Anytime/1200 hours	
5	Tilt cylinder pin	Add lubricating grease	400 hours	
6	Knuckle kingpin	Replace grease	1200 hours	
7	Hydraulic oil tank and filter	Clean or replace the oil filter	1200 hours	
8	Hydraulic oil	replace	1200 hours	
9	Lifting Chain	replace	3000 hours	Replace at any time in case of damage
10	High-pressure rubber hose	replace	3000 hours	
11	Lifting motor switch	Decontamination	200 hours	

**Note: During maintenance and inspection, it is not allowed to use the forklift body as a step or the mast and shelf as a ladder. This is very dangerous. Unsafe actions may lead to serious accidents.**

## 2.5.5 Forklift oil and grease

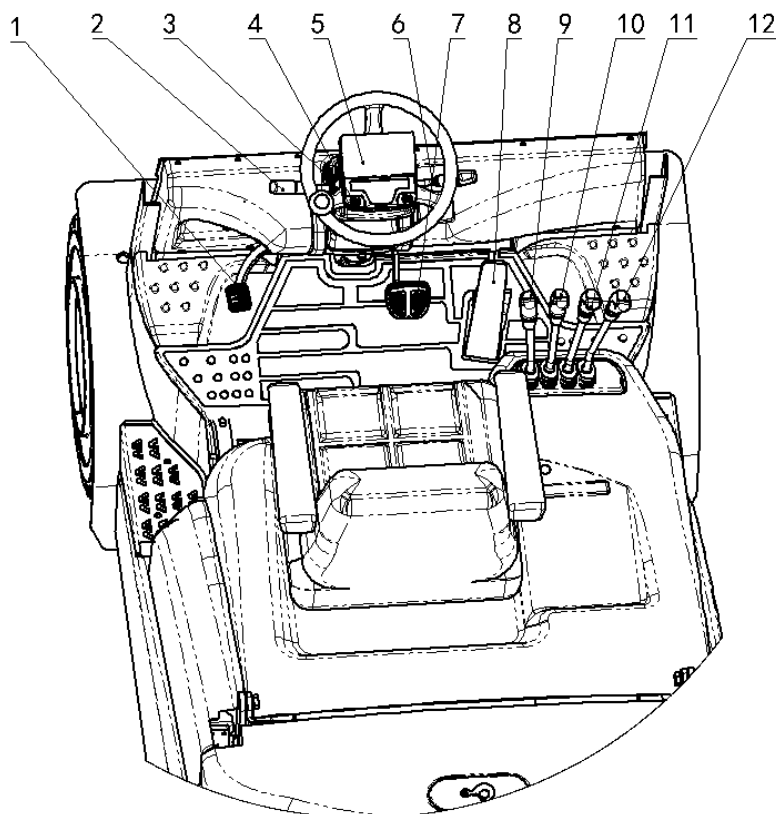
Name	Brand and code	Qty	Note
------	----------------	-----	------



	International	US	2.5T	
Hydraulic oil	HM32#(winter)orHM46#(summer)	ISOVG30	30L	Between the oil dipstick line
gear oil	GL-5 85W/90	SAE85W/90	6L	To oil level overflow
Brake fluid	DOT3 Synthetic brake fluid		0.4L	
grease	3#Dropping point of lithium base grease170	JISK2220/2#	appropriate amount	

## 2.6 Brief operating instructions

### 2.6.1 Control mechanism and instrument



### Function and use status of control mechanism

	Name	Function	Usage status
1	Parking brake control	Realize forklift parking brake	Step down to the maximum position

2	shift knob	Change the driving direction of the forklift	Push forward, reverse backward
3	Steering wheel adjusting handle	Adjust the front and rear angle of the steering wheel	
4	Horn button	Switch for controlling horn	The horn sounds when pressed
5	Instrument panel	See the specific introduction of instruments in the electrical system section of this manual	Display vehicle status
6	Centralized light and turn signal switch	Used to operate the two position light control and turn signal switch	Move the combination switch forward to turn left and backward to turn right.
7	pedal brake	Brake forklift	Press the brake
8	Accelerator pedal	Control controller output voltage	Step down and accelerate
9	Lifting cylinder joystick	Operating lifting cylinder	Pull the door frame backward to lift, and vice versa
10	Tilt cylinder joystick	Operating the tilt cylinder	Pull the mast backward to tilt backward and reverse to tilt forward
11	Side Shifter joystick	Operating side-shift cylinder	
12	Accessory joystick	Manipulating accessories	

## 2.6.2 Brief description of operation

(1) Start: the driver should correctly sit on the driver's seat and fasten the safety belt. Before starting the forklift, the parking brake switch should be placed in the braking position, the shift direction switch should be in the middle position, that is, the N position. Turn the emergency stop switch key to release the emergency stop.

Turn the key switch to the right, and after 1.5 seconds, the instrument panel will light up, the lithium battery will discharge, the forklift self-check will be completed and powered on, and the instrument panel indicator and electrical circuit power will be connected.

Push the shift direction switch forward, and the instrument will display the D gear; that is, in the forward gear, release the foot brake pedal, press the accelerator pedal, and the forklift will move forward. Pull the direction switch backward, and the instrument will display the R gear, that is, in the reverse gear. At this time, the reversing light will be on, and the reversing buzzer will sound. If the forklift is equipped with a reversing image, then the instrument will display the reversing image picture). Note that the instrument will display different fault codes in case of operation sequence errors or others.

### Light control switch:

The switch has two positions. The switch rotates at different positions, and the lamp

lights up, as shown below.

Lamp name	Phase 1	Phase 2
Headlamps	----	on
Turn Signal lamp	on	on

(2) Turn signal: pull the turn signal switch backward, the front small light and rear upper and lower combination light turn signal lights on the right side of the forklift are on, and push the turn signal switch forward, the front small light and rear upper and lower combination light turn signal lights on the left side of the forklift are on, and the corresponding instrument turn indicator lights will also flash at the same time.

(3) Brake signal: When the forklift is braking, step on the brake pedal, and the brake light (red) under the rear combination light will be on.

(4) Reversing signal: When the forklift is reversing, pull the direction switch backward, and the travel motor will reverse; the reversing light (white) on the rear combination light will be on, and the reversing buzzer will beep. If the forklift is equipped with a reversing image, the reversing image on the instrument panel will be on.

(5) The ESH key under the instrument is the switch key of the whole vehicle working mode, and the whole vehicle has three working modes: E, S, and H. E is the energy-saving mode, in which the battery life is the longest, S is the standard mode, with moderate power consumption and endurance; H High-performance mode, in which the power is strong.

### 2.6.3 Maintenance of control system

During the use of a lithium battery forklift, the control system should be regularly maintained as follows:

(1) Check the contact tip wear of the contactor and whether the contactor moves freely. The contacts should be checked every three months.

(2) Check the foot brake pedal and the multi-way valve microswitch. The opening and closing sounds of the microswitch should be very clear. The microswitch should be checked every three months.

(3) Check the connecting wires of the main circuit to ensure that the cables of the lithium battery, controller, and motor are well-insulated and firmly connected. Cables should be checked every three months.

(4) Check the spring of the pedal or handle. Ensure that the spring can deform normally and return to its original position. This should be checked every three months.

(5) Check the movement of the contactor. The contact of the contactor should move freely to ensure that the contact is not bonded. Check every three months.

#### Note:

Please do not open the controller by yourself; otherwise, the controller will be damaged, and the warranty will be invalid. Keep the controller clean and dry, and regularly check and eliminate the diagnostic history files. It is strictly forbidden to start the electric control for vehicles with incorrect installation.

Regular maintenance should be carried out by trained professionals. If damaged parts need to

be replaced, please use the original accessories provided by our company to ensure quality.

If any condition that may cause damage or endanger the safety is found during the inspection, the dealer should be informed immediately, and the dealer should decide the operation safety of the vehicle.

#### **2.6.4 Special reminder**

(1) As a special vehicle, the lithium battery forklift needs to be operated and maintained by qualified professionals, and attention should be paid to its use, characteristics, and working environment in order to avoid unnecessary failures of the electrical system (including instruments).

(2) As the vehicle power source, lithium batteries are different from traditional energy sources. Its actual capacity is directly related to the working condition and its own aging condition, and is somewhat different from the rated capacity. According to the general use of lithium batteries, when the power drops to 20% (1 grid), the lithium battery must be charged, which will help to extend the life of the lithium battery.

(3) Using a PC or handheld device to connect with the controller, users can access the powerful software setting interface within certain permission so as to more intuitively detect and understand the working conditions of the whole vehicle, such as the working current and speed of (AC) drive motors, and improve a series of system parameters such as the working current, speed, service time, fault list, etc. of the motor.

#### **2.7 Warning sign**

The warning board affixed to the vehicle is used to explain the use methods and precautions of the vehicle. Please read carefully before driving. This is for your sake as well as for the vehicle. If the warning sign falls off, please re-attach it immediately. After repair and maintenance, please check whether the nameplate is complete, and the handwriting is clear. If it is lost, please complete it.

**(1) Safety signs**

**or below the forks.**

**No one is allowed to stand on**





## (2) General information when operating

### GENERAL INFORMATION WHEN OPERATING

 Persons who have not been properly trained must not operate this forklift truck.  
Check all controls and functions before operation. Do not operate if malfunctioning.

 Drive and operate the truck smoothly at all times.  
Driver must apply handbrake, switch off engine and alight from truck during fuelling or battery charging.

  Do not carry unsecured loads	  Overloading is prohibited	  Take care not to unsecured loads at high levels	  Forks must be fully under load
  Only operate the truck when sitting in the seat	  Never tilt loads on a single fork	  Beware low heights	  Use minimum tilt at high levels

 • Slow down when driving in the wet.

 • Use caution when driving on slopes. When slopes are greater than 10%, drive forwards up the slope and backwards down the slope

 • Use caution when driving on uneven surfaces.

 • Never carry people on the forks.

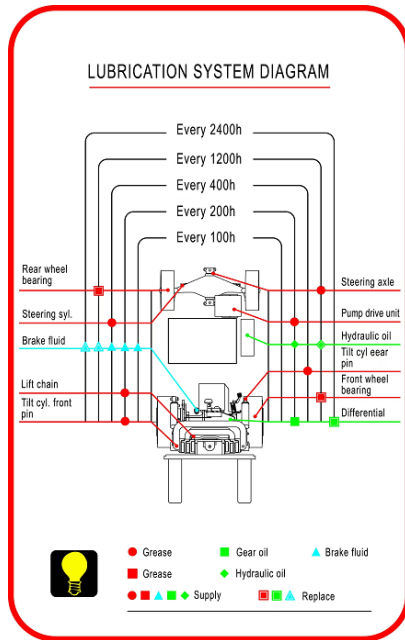
 • Do not turn on slopes.

 • Always lower load and tilt back when travelling

 When parking truck, lower forks to the ground, tilt the mast upright, apply the handbrake and turn off the engine. Never parking on a slope



## (3) Lubrication system



#### (4) Tipping safety sign



#### (5) Hood clamp label



#### (6) Tipping safety sign

**FOR SAFETY NOTICE FOLLOWING WARNINGS**

- 1 Lateral tipover can occur when unloaded if the combination of speed and sharpness of turn produces an overturning moment which exceeds the stability of the truck.
- 2 Lateral tipover can occur if overloaded or loaded within capacity and the load is elevated and if turning and/or braking when traveling rearward or if turning and/or accelerating when traveling forward produces an overturning moment which exceeds the stability of the truck.  
Rearward tilt and/or off-center positioning of the road and/or uneven ground conditions will further aggravate the above conditions
- 3 Longitudinal tipover can occur if overloaded or when loaded within capacity and the road is elevated if forward tilt, braking in forward travel, or

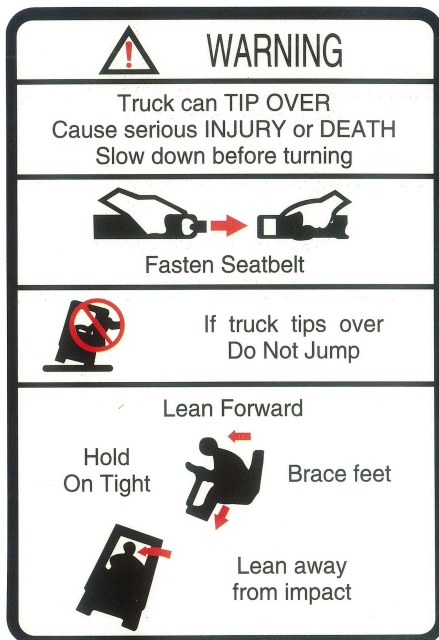
commencing rearward travel produces an overturning moment which exceeds the stability of the truck.

- 4 Serious injury or death can occur to the operator if he/she is trapped between the truck and the ground.

**IN CASE OF TIPOVER**

- 1 The operator should stay with the truck if lateral or longitudinal tipover occurs. The operator should hold on firmly to the steering wheel, brace feet, lean forward and lean away from the point of impact.
- 2 The operator should stay with the truck if it falls off a loading dock or ramp. There are other situations where the environment of the landing area presents a severe hazard. In those incidents, it may be prudent for the operator to leave the truck.

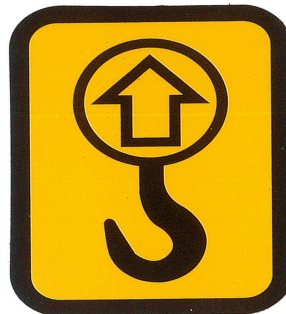
**(7) Safe driving sticker**



**(8) Do not enter the space behind the mast**

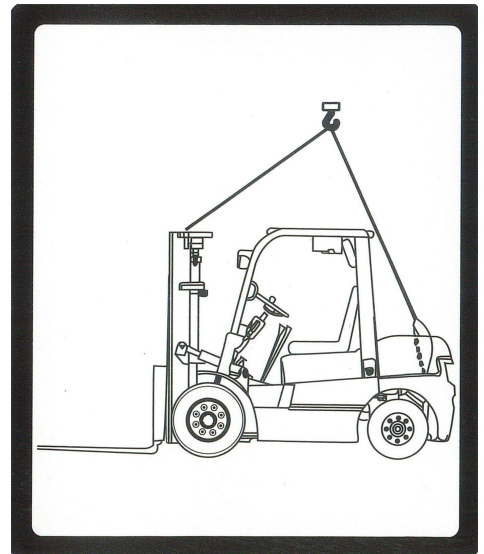


**(9) Lifting point indication**



**(10) No manned sign**

**(11) Lifting sign**

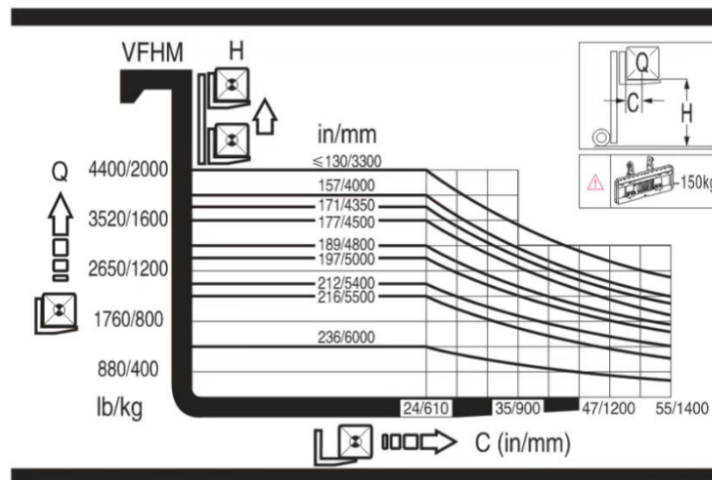
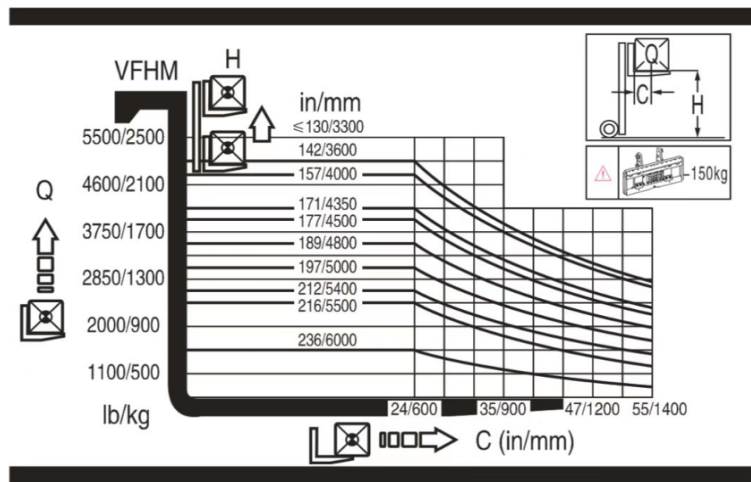


**(12) Pay attention to the warning sign of injured hands**



**(13) Load curve diagram**





### 3. Structure, principle, adjustment, and maintenance of forklift

## 3.1. Drive System

### 3.1.1 Summary

The drive system of a forklift consists of a reducer assembly, a differential assembly, and a drive axle. The driving gear of the reducer is directly connected to the traveling motor. The traveling speed of the forklift increases with the increase of the motor speed. A change in the driving direction is realized by changing the rotation direction of the motor.

#### 3.1.1.1 Reduction gearbox and differential

HYCPD type axle box integrated trolley axle box is a mechanical reduction box composed of three-stage cylindrical gear and differential device. The drive axle housing and the reduction box housing are integrated. The wheel can be directly connected with the reduction box through the half shaft to achieve the power output of the reduction box.

The gearbox is located between the drive axle and the traveling motor. The two pairs of cylindrical helical teeth of the mechanism reduce the speed of the output shaft of the traveling motor and increase the torque from the output shaft, and then transmit the torque to the differential.

#### 3.1.1.2 Drive axle

The drive axle is composed of axle housing, wheel hub, and wheels, and is installed in the front of the frame. See Fig. 1-4 (2-3t) for the structure of the drive axle.

The axle housing is an integral casting structure. The tire is poised on the wheel hub with studs and nuts through the rim. The wheel hub is supported on the axle housing by tapered roller bearings. Power is transmitted to the axle shaft through the differential. The wheel hub is driven by the axle shaft and drives the front wheel to rotate. The axle shaft only bears the torque transmitted to the wheel hub. An oil seal is installed inside the hub to prevent water, dust, or oil leakage. See Table 1-1 for the model and pressure of front wheel tires and rims.

**Table 1-1:**

Tonnage item		2.5t
Drive axle	type	Integrated bridge box
	tire	23X9-10
	rim	6.50F-10

**Note: 2.5t front wheels are equipped with solid tires as standard.**

### 3.1.2 Hub installation

- (1) Fill 1/3-2/3 volume lithium base grease (about 100cc) into the hub and then install it on the shaft.
- (2) Tighten the adjusting nut with a torque of ~1kg. m, then turn it back 1/4-1/3 times.
- (3) Hang the spring scale on the bolt to measure the starting torque of the hub. When it reaches the specified value, slowly lock the nut. Pickup torque: 5-15kg. m.
- (4) Install the lock plate and lock nut, pull up the lock plate, and lock it.
- (5) Tire assembly: Place the inner tube and gasket in the outer tube, and assemble the inner and outer rims together. Pay attention to the following:
  - (a) The valve stem faces outward, in the middle of the cut.
  - (b) When installing the rim bolts, the head of the rim bolt should be installed outward.
  - (c) When inflating, people should not stand nearby.
  - (d) When the tire pressure is inflated to about 98KPa (1 kgf/cm<sup>2</sup>), gently tap the tire to make the inner tube and liner enter the rim.

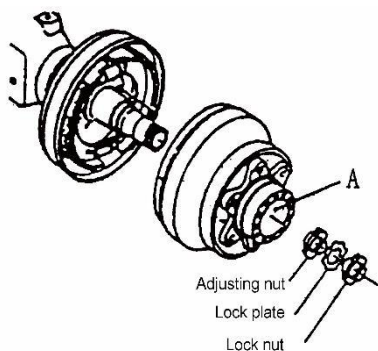


Fig. 1-5 Adding lubricating grease

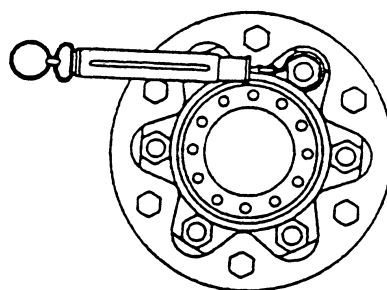


Fig. 1-6 Measuring the starting force distance

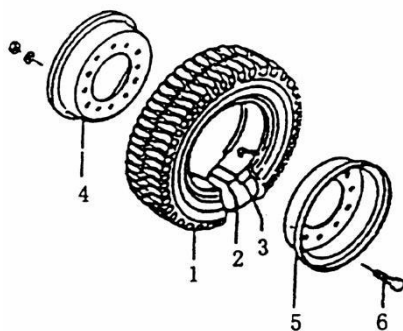
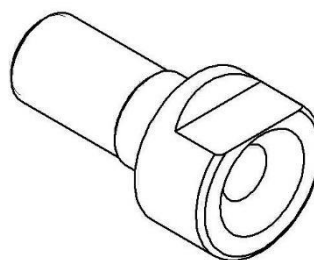


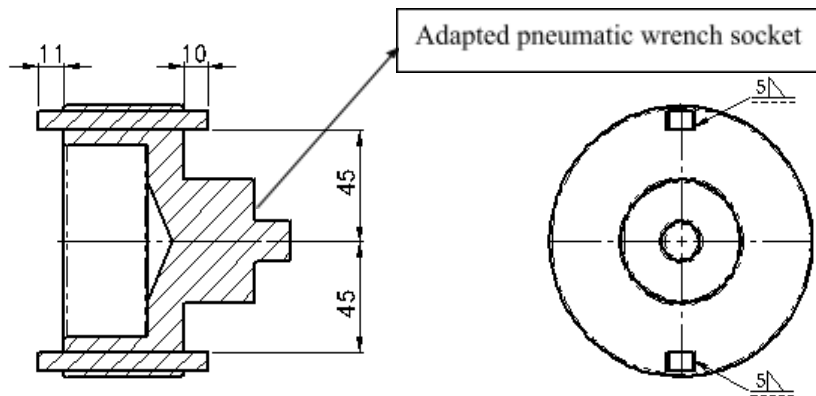
Fig. 1-7 Wheel assembly



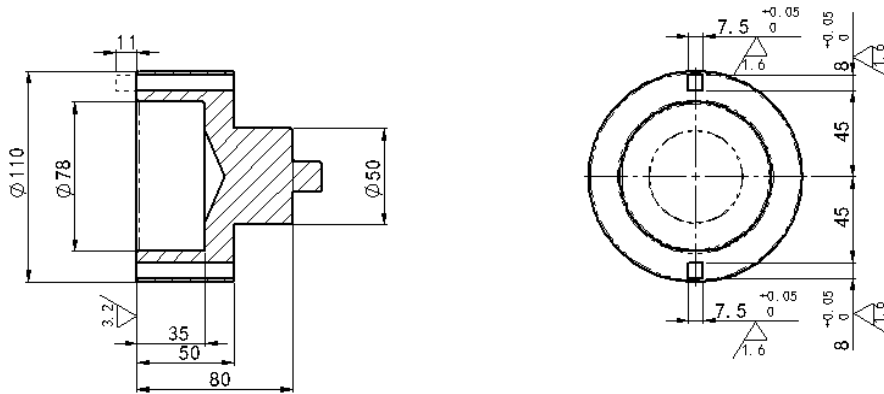
Rim bolt structure

1. Tire    2. Valve    3. Gasket    4. Inner rim    5. Outer rim    6. Rim bolt

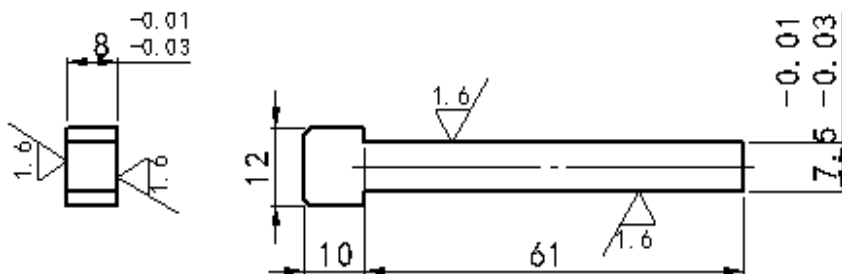
(e) The tooling in the following drawing can be used to remove the lock nut in Figure 1-5  
Tooling welding drawing



Part 1



Part 2



### 3.2. Braking System

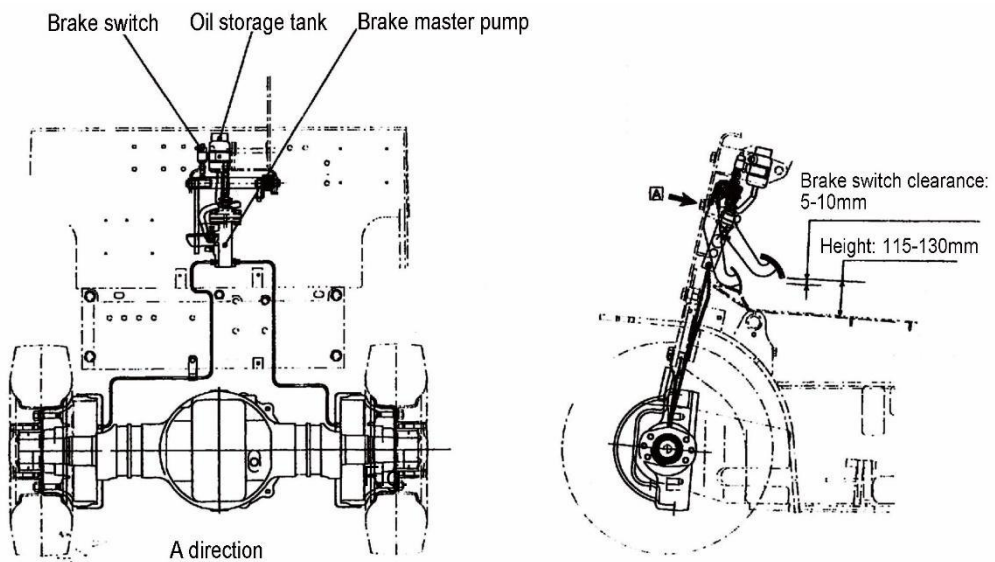
### 3.2.1 Summary

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

#### 3.2.1.1 Brake pedal

The structure of the brake pedal is shown in Figure 2-1, which is installed on the instrument frame through the bracket.

The pedal converts the pedal force acting on the pedal into brake oil pressure through the push rod of the brake master cylinder.



2-1 Brake pedal

#### 3.2.1.2 Brake master cylinder

The master cylinder consists of a valve seat, a check valve, a return spring, a leather cup, a piston, and an auxiliary leather cup. The end is fixed with a stop washer and a stop steel wire, and the outside is protected by a rubber dust cover. The master cylinder piston acts through a push rod by operating the brake pedal. When the brake pedal is depressed, 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 cup blocks the oil return port. After the main cup pushes past the oil return port, the brake fluid in the front chamber of the master cylinder is compressed, and the one-way valve is opened. Thus, it flows to the slave cylinder through the brake pipeline. In this way, each slave cylinder piston extends outward, making the brake shoe friction plate contact the brake drum so as to achieve the effect of deceleration or braking. At this time, the rear chamber of the piston is supplemented by the brake fluid from the oil return port and the 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 brake shoe so that the brake fluid returns to the master cylinder (piston front chamber) through the check valve. The piston returns to its original position. The brake fluid in the master cylinder flows back to the oil tank through the return port. The pressure of the check valve is adjusted to a certain proportion of the residual pressure in the brake pipeline and the brake wheel cylinder. Make sure that the rubber cup of the scoring pump is correctly installed to prevent oil leakage and eliminate the possible air lock during emergency braking.

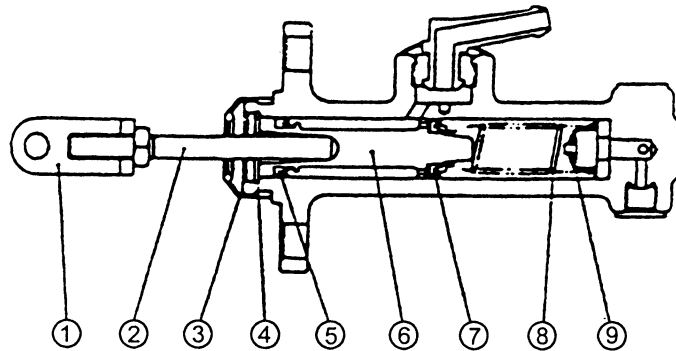


Fig. 2-2 Brake master cylinder

1. Connecting rod 2. Push rod 3. Dust cover 4. Circlip 5. Auxiliary leather ring  
6. Piston 7. Main leather bowl 8. Spring 9. Check valve

### 3.2.1.3 Brake

The brake is a double-shoe brake, which is installed on both sides of the drive axle. The brake is composed of two groups of brake shoes, brake wheel 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.

Contact and press the parking brake part against the return spring and spring compression rod.

In addition, the brake is also equipped with a parking brake mechanism and automatic Adjustment device. As shown in Fig. 2-3, 2-4, and 2-5 on the following page.

#### (1) Brake action

The brake wheel cylinder presses the brake drum with the same force to the main and auxiliary brake shoes until the upper end of the auxiliary brake shoe is against the fixed pin, and the brake shoe moves toward the rotation direction of the brake drum. After holding the fixed pin, the friction between the friction plate and the brake drum increases.

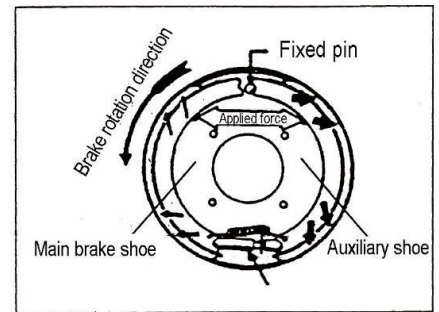
Because the main brake shoe gives the auxiliary brake shoe a much greater pressure than the brake wheel cylinder pressure, a large braking force is generated, as shown in Figure 2-3.

The brake action in reverse is opposite to that in forward, as shown in Fig. 2-4.

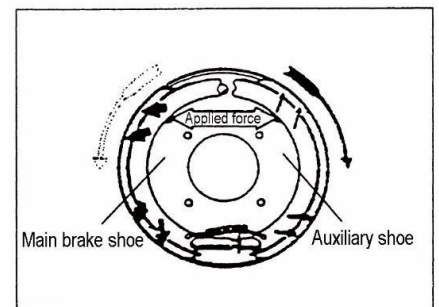
## (2) Parking brake

The parking brake device is assembled in the brake and consists of a pull rod and a push rod.

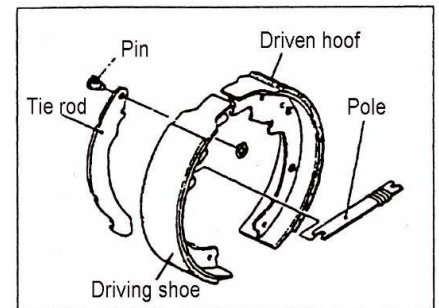
The pull rod is installed on the side of the main brake shoe by the pin, and the action of the pull rod is transmitted to the side of the auxiliary brake shoe through the push rod, as shown in Fig. 2-5.



**Fig. 2-3 Action when moving forward**



**Fig. 2-4 Action In Backward**



**Fig. 2-5 Parking brake device**

## (3) Clearance self-adjusting mechanism



The clearance self-adjusting mechanism can keep a proper clearance between the friction plate and the brake drum, as shown in Figure 2-6. The clearance self-adjusting mechanism only acts when reversing.

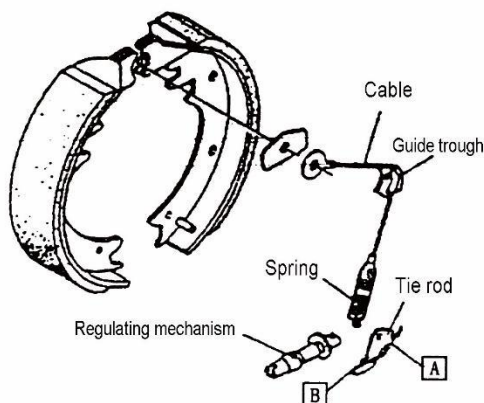


Fig. 2-6

#### ▲ Action of automatic clearance adjustment mechanism

Carry out braking operation when the forklift is retreating. The auxiliary brake shoe and the main brake shoe contact and rotate together to make the pull rod turn right around point A. As shown in Figure 2-6, point B is raised. After the brake is released, the pull rod turns left under the spring force, and point B drops. When the clearance between the friction plate and the brake hub increases, the vertical distance of point B rotation increases, the adjuster is moved by a tooth, the adjusting rod becomes longer (see Figure 2-7), and the clearance decreases. The clearance adjustment range is shown in the following table:

Dimension unit: mm

Model	2.0-2.5t
Clearance	0.35-0.55

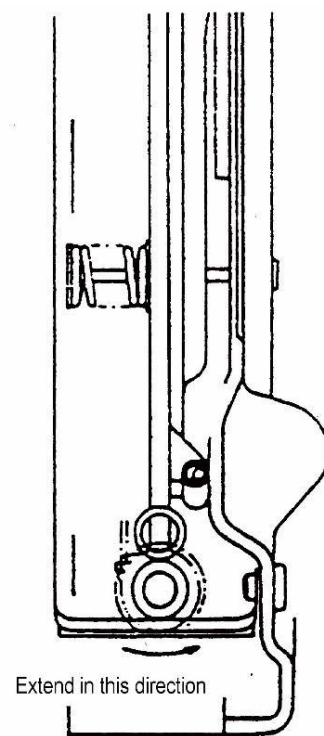


Fig. 2-7 Clearance

Self adjusting Mechanism

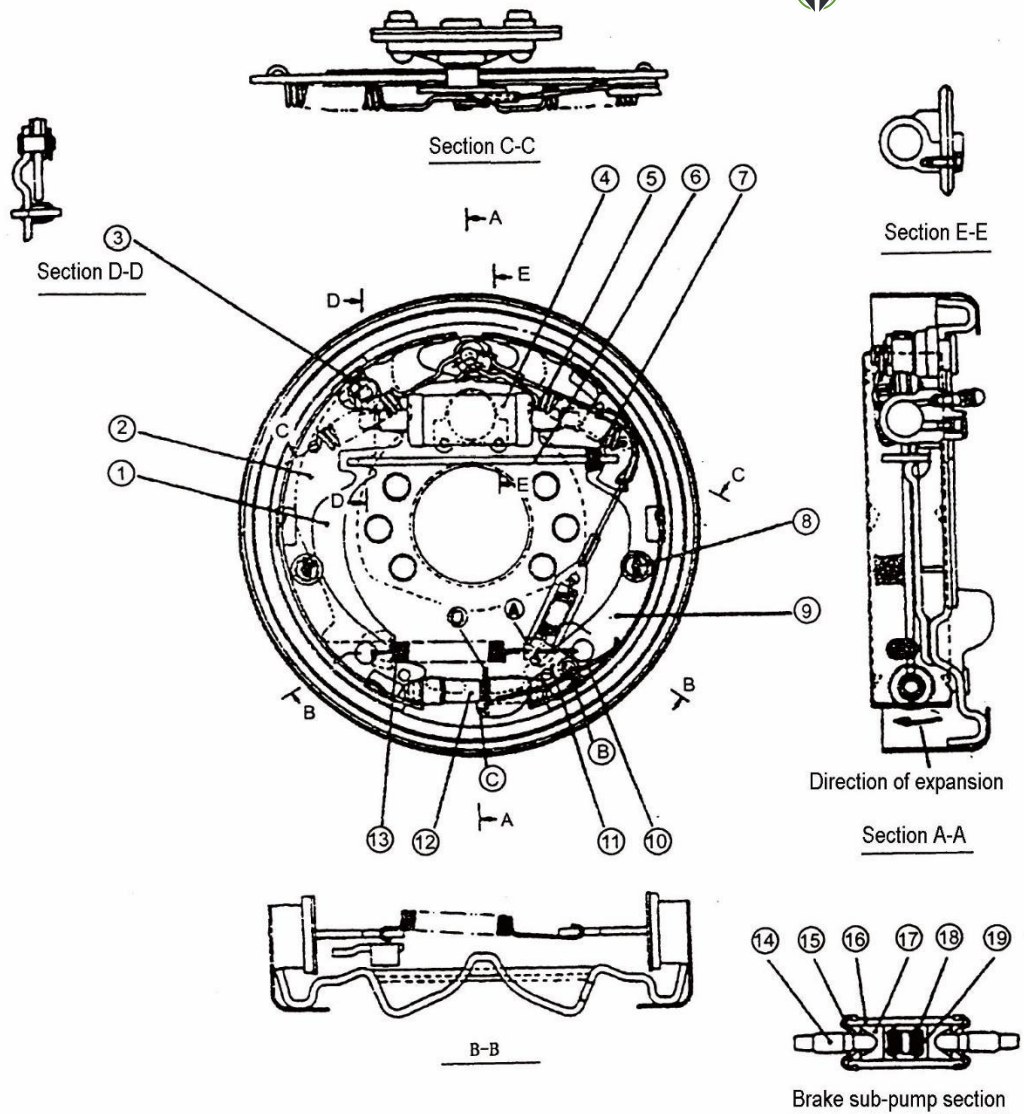


Fig. 2-8 Brake (2.0-2.5t)

1. Hand brake rod 2. Main brake shoe 3. E-type retaining ring 4. Brake wheel cylinder
5. Return spring 6. Hand brake push rod 7. Spring 8. Compression spring
9. Auxiliary brake shoe 10. Spring 11. pawl 12. Slack adjuster 13. Spring 14. Push rod
15. Dust ring 16. Pump body 17. piston 18. Spring 19. Leather bowl

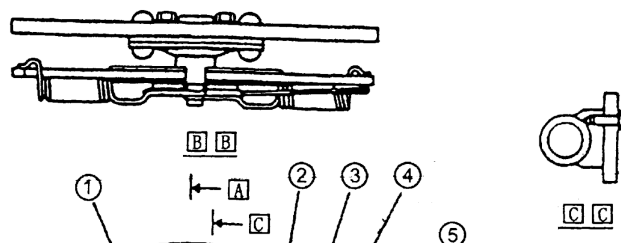


Fig. 2-9 Brake (3.0-3.5t)

1.brake cylinder	4. Auxiliary brake shoe	7.Compression spring	10.Slack adjuster	13.Main brake shoe
2.Spring	5. Baseplate	8. Spring	11.Spring	14. Return spring
3. Ejector rod	6.Hand brake push rod	9. pawl	12.Hand brake rod	

### 3.2.1.4 Parking brake control device

The parking brake device is of lever type. Lift the second cover on the left side of the instrument frame cover to see the adjuster. Adjust the braking force with a straight line.

Adjustment of braking force:

Turn the adjuster clockwise to increase the braking force; Turn the adjuster counterclockwise to reduce the braking force.

Pressure: 50kg

Operation mode: After turning off the key, step down the parking brake pedal with your left foot, and release it when you hear a "click". To release the parking brake, press the parking

brake pedal with your left foot again, and the parking brake will be released. See Figure 2-10 for the parking brake control device.

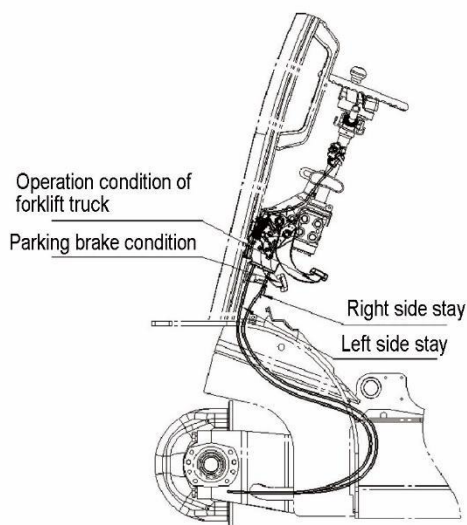


Figure 2-10 Parking Brake Operation

#### ▲ Switch adjustment (Fig. 2-11)

- (1) Install the microswitch to the parking brake bracket.
- (2) Release the parking brake.
- (3) Rotate the adjusting bolt. After hearing the sound of the switch action, rotate the adjusting bolt for 1-2 turns and fix it.
- (4) Step down the control lever again and confirm that the switch is "ON".

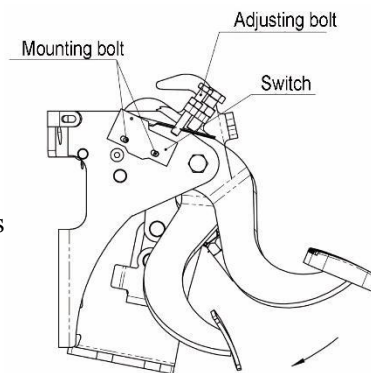


Figure 2-11 Parking Brake Switch

### 3.2.2 Brake disassembly and adjustment Essentials

This chapter describes the disassembly, assembly, and adjustment of the brake and the adjustment method of the brake pedal when the wheel and wheel hub are disassembled.

The contents of this chapter are applicable to 3t forklift brakes. Although the regulator structures of other models are different, the maintenance methods are basically the same.

#### 3.2.2.1 Brake disassembly

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

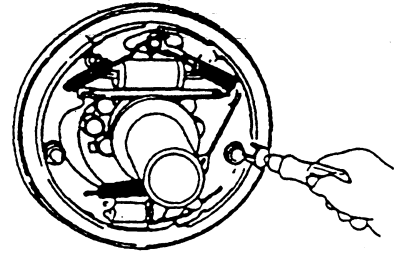


Fig. 2-12

- (2) Remove the shoe return spring.

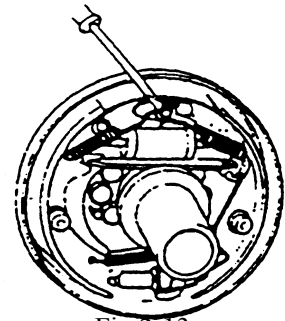


Fig.2-13

- (3) Remove the fixing spring from the main brake shoe.

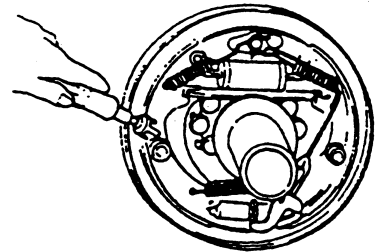


Fig.2-14

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

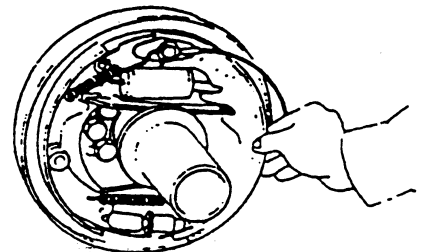


Fig.2-15

(5) Remove the brake pipe from the brake wheel cylinder, then remove the mounting bolts of the brake wheel cylinder, and remove the brake wheel cylinder from the brake backing plate.

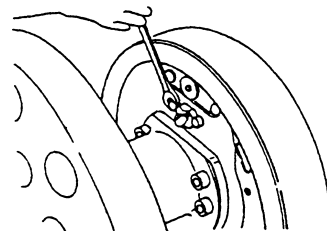


Fig.2-16

(6) Remove the E-shaped retaining ring used to fix the brake cable on the brake base plate. Then, remove the bolts for installing the brake backing plate and remove the brake backing plate from the drive axle.

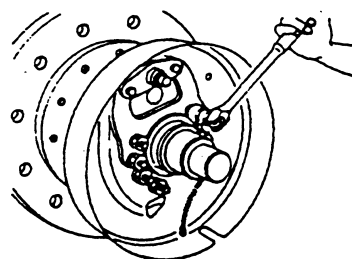


Fig.2-17

(7) Disassemble the brake wheel cylinder: remove the dust ring, press one piston with your finger to push out the piston the other side, and then press down the piston on this side.

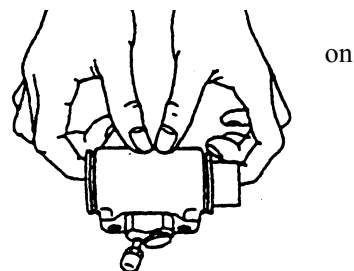


Fig.2-18

### 3.2.2.2 Brake inspection

Check all parts and components. Damaged parts and components must be repaired or replaced in time.

(1) Check the inner surface of the slave cylinder and the outer circumference of the piston for rust, and then measure the clearance between the piston and the pump body.

Standard size : 0.03-0.10mm

Ultimate dimension : 0.15mm

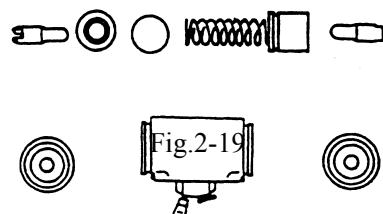


Fig.2-19

(2) Visually check whether the piston cup is damaged or deformed, and replace it if abnormal.

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

(4) Measure the thickness of the friction plate, and replace it when the wear limit is exceeded.

Unit: mm

	2.5t
Standard value	7.2
Limit value	5.0

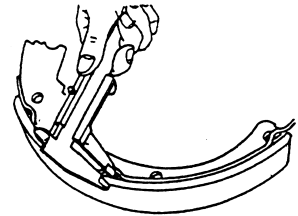


Fig.2-20

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

Unit: mm

	2.5t
Standard value	7.2
Limit value	5.0

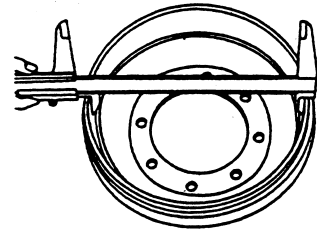


Fig 2-21

### 3.2.2.3 Brake assembly

(1) Coat the cup and piston of the brake wheel cylinder with brake fluid and assemble the spring, piston, and dust ring in sequence.

(2) Install the brake wheel cylinder on the brake backing plate.

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

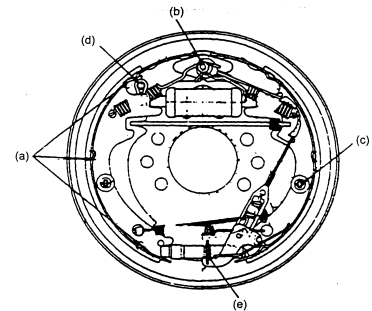


Fig .2-22

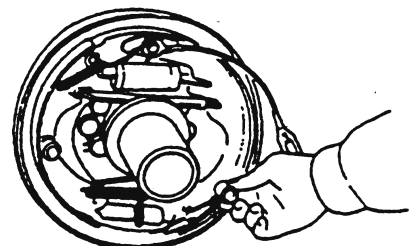
(4) As shown in Fig. 2-22, apply heat-resistant lubricating grease to all parts and be careful not to apply it to the friction plate.

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

(b) Fixing pin

(c) Contact surface between shoe and compression spring seat

(d) Hand brake pull rod support pin





(e) Adjusting mechanism screws and other rotating parts

(5) Clamp the E-shaped stop ring of the parking brake cable.

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

Fig.2-23

(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.

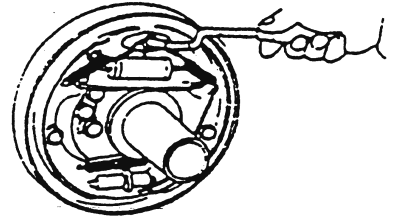


Fig.2-24

(9) Pay attention to the following points when installing the adjuster, adjuster spring, ejector rod, and ejector rod return spring:

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

(b) The Spring direction of the adjuster (it is not allowed for the tooth of the adjuster to contact the spring);

(c) Push rod return spring direction (the spring hook at the support pin end is fixed on the opposite side of the push rod)

(d) The lower end of the adjusting lever must contact the tooth of the adjuster.

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

(11) Measure the inner diameter of the brake drum, and the outer diameter of the brake shoe, and adjust the adjuster so that the difference between the inner diameter of the drum and the outer diameter of the brake shoe friction plate is 1mm.

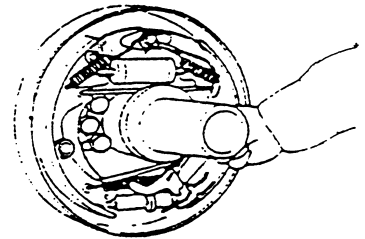


Fig.2-25

### 3.2.2.4 Operation test of automatic slack adjuster

(1) First, make the brake shoe diameter close to the specified installation size. 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.

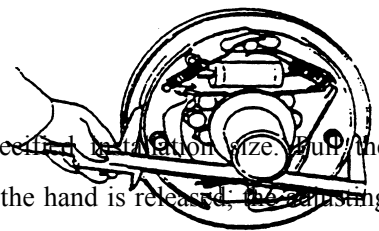


Fig.2-26

Note: Even if the adjuster gear returns with the adjusting lever when the hand is released, the adjuster can still work normally after loading.

(2) If the adjuster cannot perform the above actions when pulling the adjusting lever, the following inspections must be carried out:

(a) Firmly install the adjusting lever, ejector pin, ejector pin spring, and pressure spring seat.

(b) Check whether the ejector rod return spring and the adjuster spring are damaged, and then check whether the rotation of the adjuster gear and its engagement parts are excessively worn or damaged. Check whether the lever contacts the gear. Replace damaged parts.

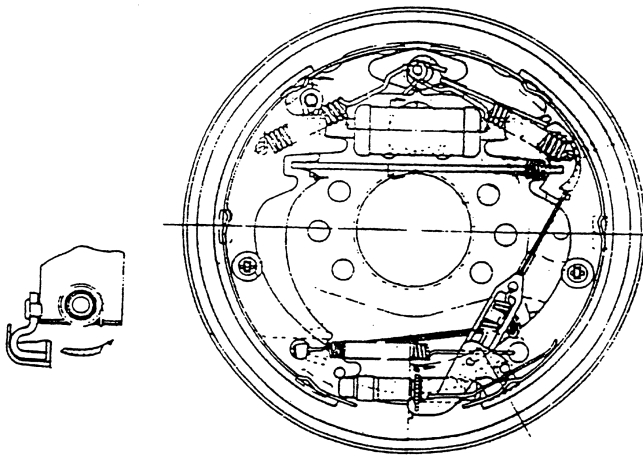
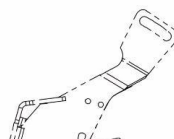


Fig.2-27

### 3.2.2.5 Brake pedal adjustment

- (1) Push the rod of the brake master cylinder outward;
- (2) Adjust the stop bolt, as shown in Fig. 2-28, and adjust the pedal height;
- (3) Step down the brake pedal and lengthen the push rod until the front end of the push rod contacts the master cylinder piston;



(4) Tighten the push rod lock nut.

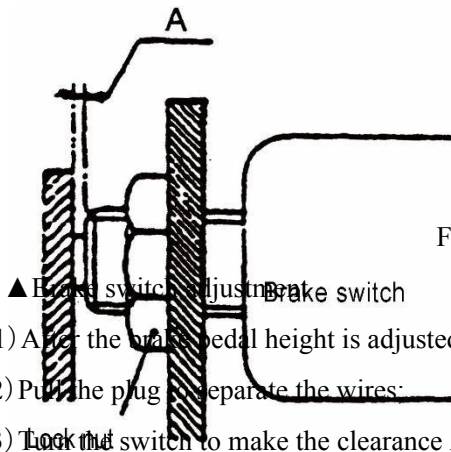


Fig.2-28

- ▲ Brake switch adjustment
- (1) After the brake pedal height is adjusted, loosen the lock nut of the brake switch;
  - (2) Pull the plug to separate the wires;
  - (3) Lock nut switch to make the clearance  $A=1\text{mm}$ ;
  - (4) Confirm that the brake light should be on when the brake pedal is depressed.

### 3.2.2.6 Fault diagnosis

Problem	Cause analysis	Exclusion method
---------	----------------	------------------

Poor braking	1、Oil leakage of brake system 2、Brake shoe clearance is not adjusted properly 3、Brake overheating 4、Poor contact between brake drum and friction plate 5、Impurities attached to friction plate 6、Impurities mixed in the brake fluid 7、Improper adjustment of brake pedal (inching valve)	Repair Adjustment adjuster Check for slipping Readjustment Repair or replace Check the brake fluid Adjustment
Brake noise	1、The surface of friction plate is hardened or impurities adhere to it 2、The base plate is deformed or the bolts are loose 3、The brake shoe is deformed or installed incorrectly 4、Wear of friction plate 5、Loose wheel bearing	Repair or replace  Repair or replace Repair or replace Replace Repair
Uneven braking	1、There is oil stain on the friction plate surface 2、Brake shoe clearance is not adjusted properly 3、Cylinder failure 4、Brake shoe return spring damaged 5、Brake drum deflection	Repair or replace Adjustment adjuster Repair or replace Replace Repair or replace
Weak braking	1、Oil leakage of brake system 2、Brake shoe clearance is not adjusted properly 3、Air mixed in the brake system 4、The brake pedal is not adjusted correctly	Repair or replace Adjustment adjuster air escape Readjustment

### 3.3. Steering system

#### 3.3.1 Summary

The steering system is mainly composed of a steering wheel, steering shaft, steering oil

pump, and steering axle. The steering shaft is directly connected to the steering gear, and the steering column can tilt back and forth to an appropriate position. The bogie axle is installed on the tailstock at the rear of the frame, and there is a knuckle on the left and right respectively. The knuckle is driven by the piston of the steering cylinder through the connecting rod to deflect the steering wheel and achieve steering.

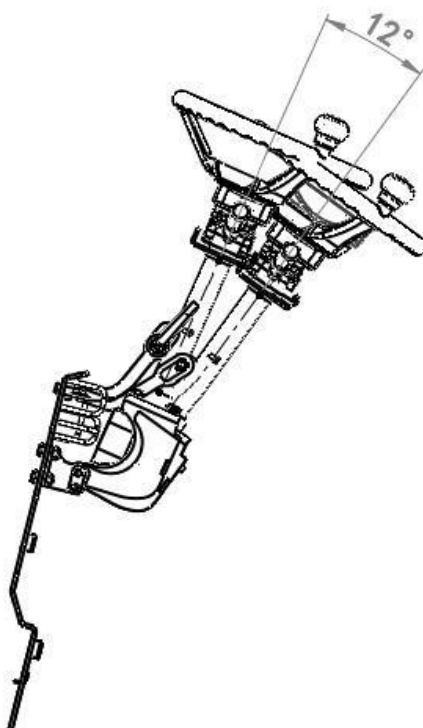
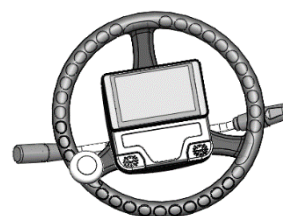


Fig. 3-1 Steering Control Device

### 3.3.1.1 Steering wheel

The forklift steering wheel is operated in the same way as usual, that is, when the steering wheel rotates to the right, the forklift turns to the right, and when the steering wheel rotates to the left, the forklift turns to the left. The steering wheel is installed at the rear of the forklift, which enables the rear of the forklift to swing outward during steering.



### 3.3.1.2 Full hydraulic steering gear

The full hydraulic steering gear (Figure 3-2) can measure the pressure oil from the steering oil pump according to the rotation angle of the steering wheel and transfer it to the steering

cylinder through the pipeline. When the oil pump cannot supply oil, it can be turned manually.

The steering gear is composed of a general steering gear and a combination valve. The hole at the upper cover of the combination valve is the system safety valve. In addition, there is a two-way overload valve in the valve body. It is used to protect the forklift from damage to parts when the wheels are impacted by unexpected external forces during driving, causing high pressure in the hydraulic system. The safety valve and two-way overload valve have been adjusted by the manufacturer, and users should not adjust them randomly.

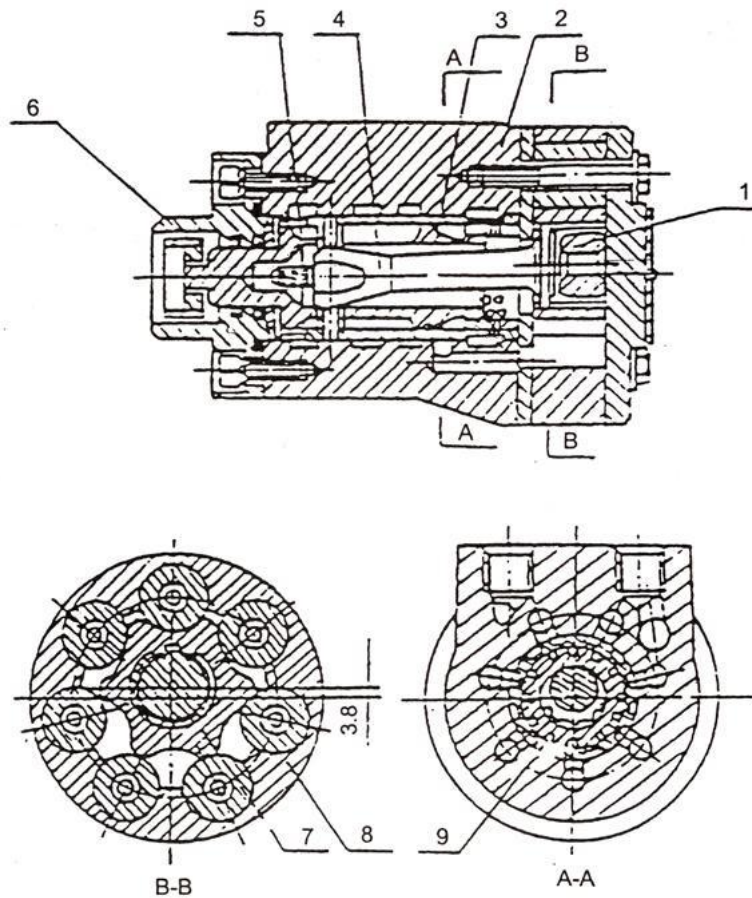


Fig. 3-2 Full hydraulic steering gear

1. Limit post 2. Valve body 3. Spool 4. Linkage shaft 5. Leaf spring 6. Connection block  
7. Rotor 8. Stator 9. Valve sleeve

### 3.3.1.3 Steering axle

The steering axle is a welded structure with a box cross-section (as shown in Fig. 3-3), which is composed of the steering axle body, steering cylinder, connecting rod, steering

knuckle, steering wheel, and other parts. The steering axle adopts a crank slider mechanism, and the pressure oil is driven by the cylinder piston rod through the connecting rod to turn the steering knuckle, so as to offset the steering wheel and realize steering. The steering axle is pried onto the tailstock at the rear of the frame by the front and rear pins through the bearing pedestal with bolts to enable the axle body to swing around the pin shaft. There is a knuckle on the left and right sides of the steering axle respectively. The rear wheel hub is mounted on the knuckle shaft with two tapered roller bearings. The wheel is pried onto the hub through the rim. The inner side of the bearing is equipped with oil seals to keep the grease in the hub and the knuckle cavity.

See the table for steering axle tires, rim models, and tire pressures :

tonnage	2.5t
Tire	18×7-8
Rim	4.33R*8
Tire pressure	0.9MPa
Steering gear pressure	9MPa

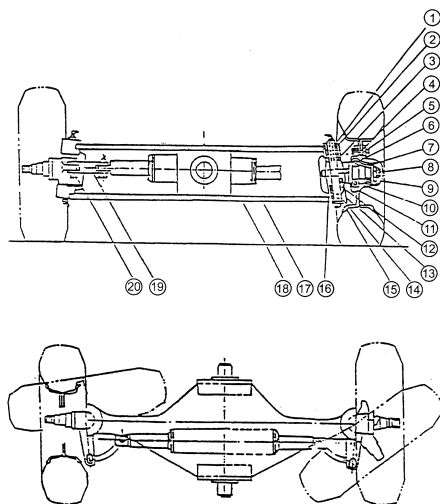


Fig. 3-3 Steering axle

1. Oil seal 2. Needle bearing 3. Thrust bearing 4. Oil seal 5. Hub nut 6. Tapered roller bearing 7. Tapered roller bearing 8. Lock nut 9. Hub cover 10. Steering hub 11. Locking bearing 12. Locking bearing 13. Locking bearing 14. Locking bearing 15. Locking bearing 16. Locking bearing 17. Locking bearing 18. Locking bearing 19. Locking bearing 20. Locking bearing



pin 12. Adjusting washer 13. Needle bearing 14. Oil seal 15. Knuckle Kingpin  
16. Steering knuckle 17. Steering cylinder 18. Steering axle 19. Pin 20. Pin

### (1) Steering knuckle

The steering knuckle is installed between the upper and lower ends of the steering axle body with the steering kingpin, tapered bearing, dust cover, and "O" ring. The upper end of the kingpin is fixed on the axle body with the retaining pin, and the lower end of the kingpin is fixed on the axle body with the cotter pin, which is supported by the tapered bearing pressed on the axle body.

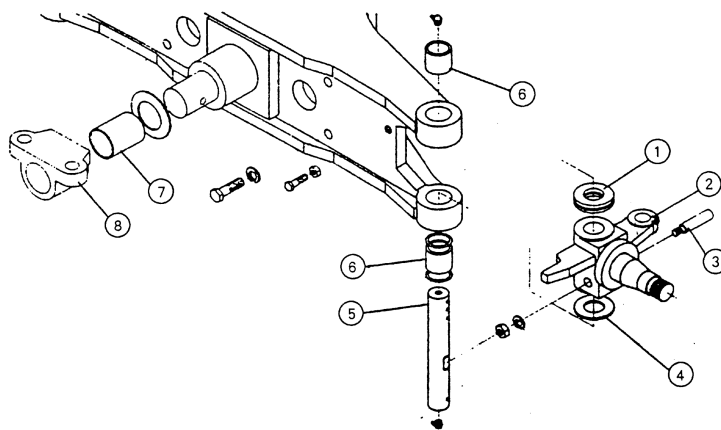


Fig. 3-4 Steering Knuckle

- |                    |                     |               |                                   |
|--------------------|---------------------|---------------|-----------------------------------|
| 1. Thrust bearing  | 2. Steering knuckle | 3. Fixing pin | 4. Steering knuckle adjusting pad |
| 5. Knuckle Kingpin | 6. Needle bearing   | 7. Bushing    | 8. Rear axle mount                |

### (2) Steering cylinder

The steering cylinder is a double-acting piston-type cylinder. Both ends of the piston rod are connected to the steering knuckle through a connecting rod. The pressure oil from the full hydraulic steering gear moves left and right through the piston rod of the steering cylinder to achieve left and right steering. The piston seal adopts the combined seal of the backup ring and O-ring. Yx ring axial seal is used between the cylinder head and piston rod, and the cylinder is fixed on the steering axle through the cylinder heads on both sides.

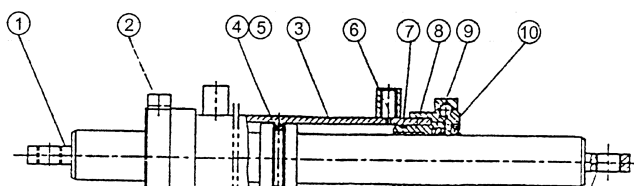


Fig. 3-5 Steering cylinder

1. Thrust bearing 2. Cylinder cover 3. Cylinder body 4. O-ring 5. Support ring 6. Axle sleeve
7. O-ring 8. Axle sleeve 9. Yx seal ring 10. Gasket 11. Dust ring 12. Bushing 13. Blank

### (3) hub

The hub is installed on the knuckle with two tapered roller bearings. The wheel is pried onto the hub through the rim. The inner side of the bearing is equipped with an oil seal to keep the grease in the hub and knuckle cavity. The nut is used to adjust the tightness of the bearing.

### 3.3.2 Adjustment and maintenance essentials.

#### 3.3.2.1 Adjustment of warning load of the steering wheel bearing

- (1) As shown in Fig. 3-6, apply grease to the hub, inner and outer bearings, and the inner cavity of the hub cover, and also apply some grease to the oil seal lip;
- (2) Fix the outer ring of the bearing on the hub and install the hub on the steering shaft;
- (3) Install the flat washer and tighten the castellated nut with a torque of 206-235N. m (21-24 kg. m). Loosen the castellated nut and then tighten the nut with a torque of 9.8N. m (1 kg. m);
- (4) Knock the wheel hub gently with a wooden hammer and rotate the wheel hub for 3-4 turns to ensure that the wheel hub is not loose;
- (5) Tighten the slot nut to align the slot with the split pin hole on the steering knuckle;
- (6) Knock the wheel hub gently with a wooden hammer, rotate the wheel hub for 3-4 turns by hand to ensure smooth rotation, and measure the rotational torque of the wheel hub, which is 2.94-7.8N. m (0.3-0.8kg. m);
- (7) When the rotating torque is higher than the specified value, it can be returned for 1/6 circle and then measured;
- (8) When the specified turning torque is reached, lock the castellated nut with a cotter pin.

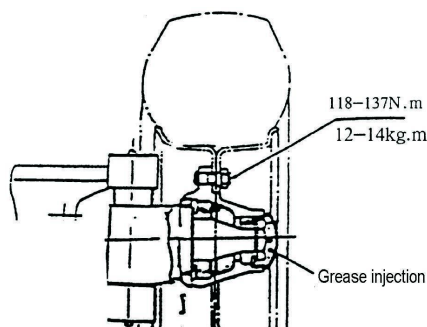


Fig. 3-6 Pre Tightening Load Adjustment

### 3.3.2.2 Inspection after reassembly of steering system

- (1) Turn the steering wheel from side to side and turn it to the bottom to see whether the force is even and whether the rotation is stable;
- (2) Check whether the oil pressure pipeline is correctly arranged and whether the left and right steering directions are correct;
- (3) Jack up the rear wheel, slowly turn the steering wheel left and right, and repeat several times to remove the air in the hydraulic pipeline and cylinder.

### 3.3.2.3 Steering system fault diagnosis

Problem	Cause analysis	Exclusion method
Steering wheel not rotate	The oil pump is damaged or faulty	Replace
	The rubber hose or connector is damaged, or the pipe is blocked	Replace or clean
Heavy steering wheel	Pressure of safety valve is too low	Adjust pressure
	There is air in the oil circuit	Exhaust air
	Steering gear fails to reset, positioning spring plate is broken or elasticity is insufficient	Replace the spring plate
	Excessive internal leakage of steering cylinder	Check the piston seal
The forklift snaked or swung	Broken or no spring force	Replace
High working noise	Oil level of oil tank is too low	Add oil
	The suction pipe or oil filter is blocked	Replace or clean
Oil leakage	The steering cylinder guide sleeve seal is damaged or the pipeline or connector is damaged	Replace

#### Attention :

The hydraulic motor of the forklift is started by the direction switch. Only when the direction switch is set to the forward or backward position can the hydraulic motor start to

work.

Start the hydraulic motor and turn the steering wheel slightly (if there is any abnormal phenomenon, turn off the power immediately to find out the cause and eliminate the fault). The hand sensing is convenient and flexible, and the steering wheel will also deflect accordingly so that the gas in the system can be exhausted by repeatedly turning left and right.

## 4. Electrical system

### 4.1 Summary

The electrical system mainly includes a lithium battery pack, traveling motor, lifting motor, multi-functional integrated electronic control assembly, control switch, instrument, and lighting device.

The electrical system structure of the lithium battery forklift is shown in Figure 4-1.

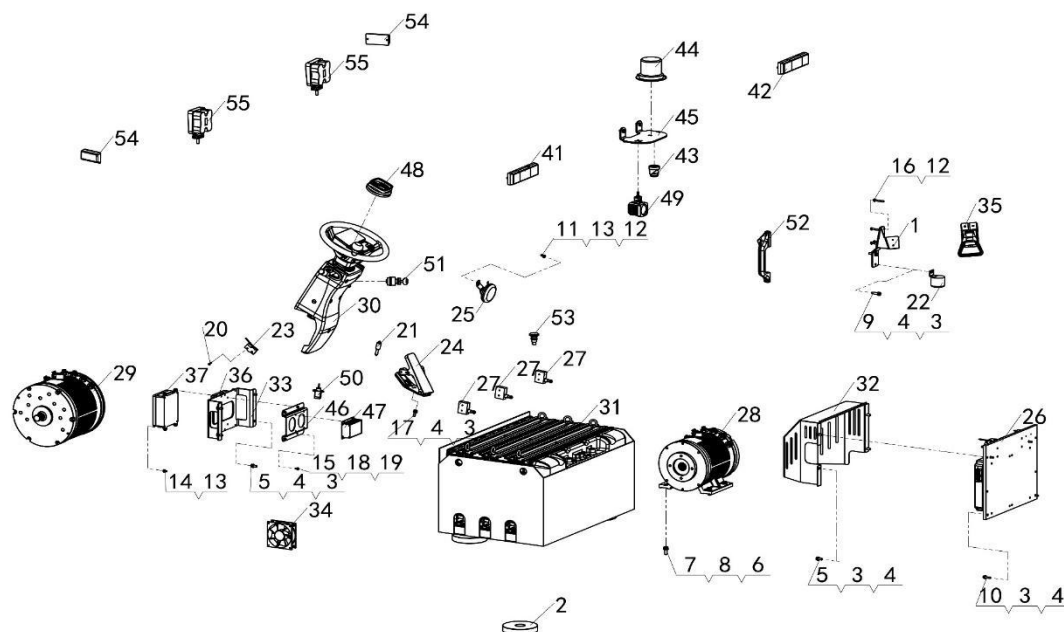


Figure 4-1 Structural Diagram of Electrical System

1	Power plug fixing plate	2	Battery shock pad
3	Standard elastic gasket 8	4	Flat washer 8
5	Hexagonal head bolt full thread M8 × 20-8.8	6	Standard elastic gasket 10

7	Hexagon head bolts fully threaded M10×30-8.8	8	Flat washer 10
9	Hexagon head bolts fully threaded M8×35-8.8	10	Hexagon head bolt fully threaded M6×30-8.8
11	Hexagon head bolt fully threaded M6×16-8.8	12	Standard elastic gasket 6
13	Flat washer 6	14	Screw M6X12-8.8
15	Screw M5X12-8.8	16	Hexagon head bolt fully threaded M6×45-8.8
17	Hexagon head bolt fully threaded M8×25-8.8	18	Standard elastic gasket 5
19	Flat washer 5	20	Screw M4X25-8.8
21	brake light switch	22	The reverse buzzer
23	Parking brake switch	24	Accelerator assembly
25	Horn	26	Blue light warning light
27	microswitch	28	oil pump motor
29	Drive motor	30	Intelligent instrument assembly
31	Battery assembly	32	electric cabinet
33	Control box assembly	34	cooling fan
35	power connector	36	Fuse block assembly(2-3.5T)
37	Control box assembly(2-3.5T)	38	Main wire harness (2-2.5T)
39	Cable (2-2.5T)	40	Lead wire (2-3.5T)
41	LED three-color tail light (long line)	42	LED three-color tail light (short line)
43	Reverse image camera	44	Warning light
45	Warning light mounting bracket assembly	46	DC converter bracket
47	DC power supply	48	sheath

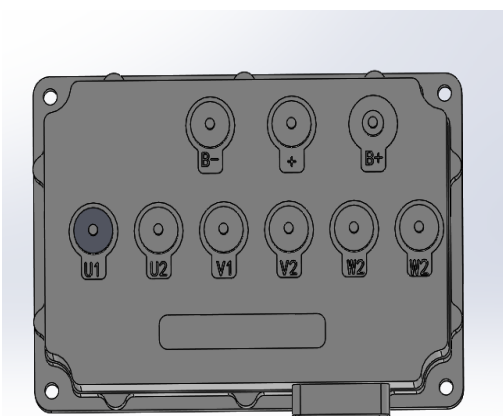
49	Blue light warning light	50	Lifting speed control sensor
51	key switch	52	Handle with horn
53	40mmEmergency stop	54	Turn signal with width indicator
55	Working light	56	Inching switch assembly

## 4.2 Electric control assembly

### (1) Summary

The lithium battery fork control assembly is composed of two main controllers, DC contactor, heat dissipation aluminum plate, etc. The main controller is directly connected to the power supply and controls two motors respectively.

### (2) Controller structure



#### 4.2.1 Electronic control

Item	Alarm mode	Description	Appearance	Treatment
------	------------	-------------	------------	-----------



1	1 long beep 1 short beep	Accelerator pedal failure	Shutdown	Repair or replace the accelerator pedal This fault may be caused by the short circuit between the throttle signal and the 5V power supply, which causes the throttle voltage to be too high
2	1 long beep 2 short beep	Both forward and backward gears are effectively broken	Shutdown	Check the circuit wiring of the gear lever. Generally, it is caused by a short circuit.
3	1 long beep 3 short beep	Overcurrent alarm	Shut down if frequent overcurrent occurs	Replace the motor controller
4	1 long beep 4 short beep	Power-on pre-charge fault	Shutdown	Repair and replace the controller: the failure causes are as follows The power-on circuit is damaged Pre-charge circuit damaged
5	1 long beep 5 short beep	Motor position encoder fault	Shutdown	Repair or replace the motor position encoder: the fault causes are as follows Encoder disconnection No power supply for encoder power supply Incorrect installation of motor encoder
6	1 long beep 6 short beep	Battery Undervoltage fault	Shutdown	Check the battery voltage
7	1 long beep 7 short beep	Battery Undervoltage fault	Shutdown	Check the battery voltage.
8	1 long beep 8 short beep	Controller overheat alarm	Shutdown	Check the controller temperature to prevent false alarms due to damage to the temperature sensor. When the temperature shows 168 °C, it means that the temperature sensor is disconnected.
9	1 long beep 9 short beep	Motor overheat alarm	Shutdown	Check the motor temperature to prevent false alarms due to temperature sensor damage The broken wire of the temperature sensor can also cause this fault
10	1 long beep 10 short beep	Motor phase failure	Shutdown	Because the switched reluctance motor can operate in phase loss, the motor can be started and operated in normal phase line after phase loss, and the phase loss fault can be reported only when the phase loss phase line is started.
11	1 long beep	EEPROM memory failure	Shutdown	Control parameter memory failure

	11 short beep			
12	1 long beep 12 short beep	CAN communication connection failed	Shutdown	For the occasions where the whole vehicle control uses CAN communication to control the motor system, this error means that the motor controller has not received the CAN upper computer cycle count
13	1 long beep 13 short beep	Lithium battery failure	Shutdown	Check CAN communication with lithium battery Check lithium battery
14	1 long beep 14 short beep	Battery over-voltage fault	Shutdown	Check the battery voltage.
15	1 long beep 15 short beep	Forward switch self-test failure	Shutdown	When the key switch is closed, it is detected that the forward gear switch is closed. Check the forward gear switch.
16	1 long beep 16 short beep	Reverse switch self-test failure	Shutdown	When the key switch is closed, it is detected that the reverse gear switch is closed. Check the reverse gear switch.
17	1 long beep 17 short beep	Brake switch self-test failure	Shutdown	The throttle signal is detected when the gear switch and brake switch of the motor at zero speed are closed.1). Check the gear switch; 2.) Check the brake switch; 3). Check the throttle signal
18	1 long beep 18 short beep	U phase current sensor fault	Shutdown	Repair U-phase current sensor
19	1 long beep 19 short beep	V phase current sensor fault	Shutdown	Repair V-phase current sensor
20	1 long beep 20 short beep	W-phase current sensor fault	Shutdown	RepairW -phase current sensor
22	1 long beep 22 short beep	The hand brake switch is not released	Shutdown	Shielding can be selected by changing the switch status through parameter 5 If the handbrake has been released, check the handbrake signal circuit.
23	1 long beep 23 short beep	Seat switch not closed	Shutdown	Shielding can be selected by changing the switch status through parameter 6 If you are seated, check the seat signal circuit
24	1 long beep 24 short beep	Vehicle speed self-test fault	Shutdown	When the key switch is closed, the motor speed s greater than 50 rpm, If the motor speed is less than 50rpm, check the position encoder wiring.

25	1 long beep 25 short beep	Zero position error of motor position encoder	Shutdown	Check the zero position of the motor and perform the zero calibration again.
29	1 long beep 29 short beep	Motor overspeed protection	Shutdown	The motor speed exceeds the set value Check whether the parameter value is appropriate
30	1 long beep 30 short beep	Motor lack of U phase fault	No shutdown during phase loss operation	Because the switched reluctance motor can operate in phase loss, the motor can start and operate in normal phase line after phase loss
31	1 long beep 31 short beep	Motor lack of V phase fault	No shutdown during phase loss operation	Because the switched reluctance motor can operate in phase loss, the motor can start and operate in the normal phase line after phase loss.
32	1 long beep 32 short beep	Motor lack of W phase fault	No shutdown during phase loss operation	Because the switched reluctance motor can operate in phase loss, the motor can start and operate in the normal phase line after phase loss.

## 4.3 Instrument













### 4.3.1 Summary

The lithium battery forklift adopts an LCD color screen combination instrument and uses high-definition LCD to display in real-time. The instrument is connected to the battery and electric control through a CAN cable. The instrument adopts an embedded 32-bit ARM core master chip and a 4.3" color LCD screen with a resolution of 480 \* 272 and 160000 colors; Chinese/English language display, multi-level menu operation; Working voltage+8~+32V adaptive; Working temperature: -22°F-176°F (- 30°C~+80°C)

### 4.3.2 Instrument interface

#### Instrument interface description

DISPLAY TYPE	TECHNICAL DESCRIPTION
WORKING VOLTAGE	+8~+32V
WORKING TEMPERATURE	-22°F-176°F (- 30°C~+80°C)
DEGREE OF PROTECTION	IP65

No	Icon	Icon Description
1		Turn left
2		Turn right
3		Seat indication
4		Parking brake
5	<b>D</b>	Forward gear
6	<b>R</b>	Reverse gear
7	<b>N</b>	neutral gear
8		Width lamp
9		Working light
10		Battery voltage
11		Battery current
12		Vehicle speed display
13		SOC display
14		E/S/H Mode
15		Running time











### 4.3.3 Instrument instructions

No	Function	Note
1	Logo	
2	Left turn indicator	The green icon flashes when turning left is enabled
3	Seat indicator	Yellow icon when leaving the seat
4	Parking brake indicator icon	Red icon when parking brake
5	Work light icon indicator	Display whether the work light is working
6	Position light indicator	Displays whether the position lights are

		working
7	Right turn indicator	Green icon flashes when turning right
8	Power battery voltage display	Numerical display
9	Power battery current display	Numerical display
10	Vehicle speed display	Pointer scale display
11	ON-ST gear	Display power on gear ON or start gear ST
12	Vehicle gear	Display N, D, R gear
13	Fault alarm text	When there is no alarm, the display text: it works normally; When there is an alarm, the alarm text is displayed. For example: “BMS:XXX” “Travel controller:XXX” “Oil pump controller:XXX”
14	Battery level display	Pointer scale display, red value display when less than 10%
15	Operating mode	Three operating modes E, S and H are displayed, and E mode is the default when power on
16	Running time	Display controller running time



Key definitions are shown in the following table

	Double jump light button
ESH	Three operating modes
	Warning light button
	Reversing camera switch button
	Select button up
	Select button to the left
	Right selection button
	Select button down
	Menu button
	Back button
	confirm button

#### 4.3.4 Operating Instructions

(1) Check before power on:

- 1、The lithium battery discharge plug and the vehicle discharge plug are fully and firmly inserted;
- 2、The emergency stop button is released;
- 3、The direction gear is in neutral
- 4、Adjust the seat, sit on the seat and fasten the safety belt;

## (2) Power on in working state

Turn the key switch to the right, and after 1.5 seconds, the instrument panel will light up, the lithium battery will discharge, the vehicle self-check will be completed and powered on, and the instrument indicator and electrical circuit power will be connected.

### 4.3.5 Instrument main menu and instructions

(1) Turn the key switch to the right to power on the instrument panel, the buzzer inside the instrument will make a sound of "drop", and the instrument will display the startup interface. The instrument power on the interface displays for 2 seconds, completes hardware initialization and automatically displays the main working interface. The main interface displays various parameters of the current machine, such as high and low beam lamps, left and right turn signals, position lights, seat indicators, foot brake indicators, power battery voltage, power battery current, battery SOC, driving speed, gear indicator, working mode, time indicator, etc.



Startup interface

main interface

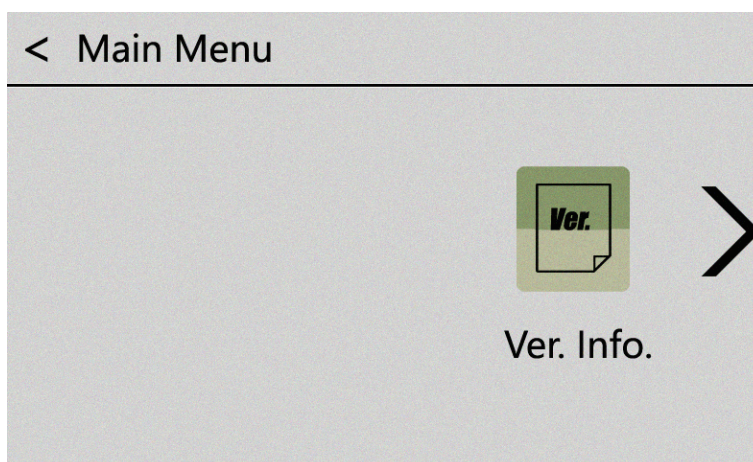
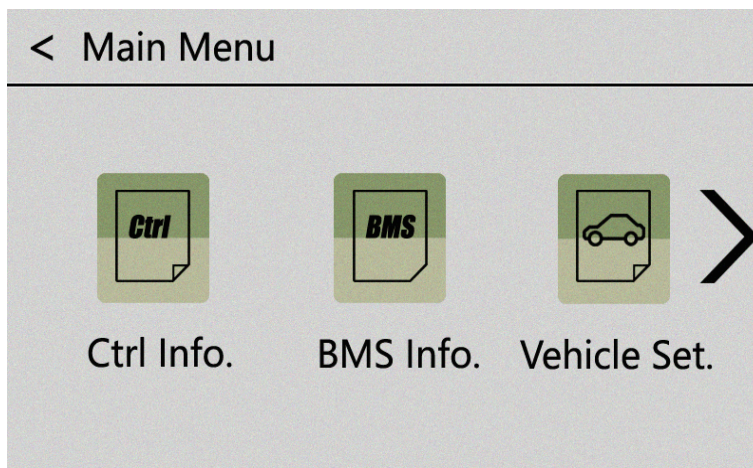
(2) When the steering switch is turned forward or backward, the left and right steering marker lamps will flash. When the headlight is turned on, the light indicator lamp will be on.

(3) Brake display

When the parking brake is used, the graphic [P] light is on; When the parking brake is released, the marker lamp goes out.

#### 4.3.5.1 Parameter Description

(1) Press the menu key on the main interface to enter the main menu, including controller parameters, BMS information parameters, vehicle setting parameters, and version information parameters, as shown in the following figure:





(2) Enter the control parameters in the main menu, as shown below:

< Ctrl. Info.		1/2
Run Time	0.0	h
Main Motor Speed	1234	rpm
Main Motor Current	12	A
Main Motor Temp	40	°C
Main Motor Ctrl Temp	40	°C
Hydr. Pump Speed	1234	rpm
Hydr. Pump Current	12	A

< Ctrl. Info.		2/2
Hydr. Pump Temp	40	°C
Hydr. Pump Ctrl Temp	40	°C
Contaoller Err-code	12	

The specific values of 10 parameters including running time, traveling motor speed,

traveling motor current, traveling motor temperature, traveling controller temperature, oil pump motor speed, oil pump motor current, oil pump motor temperature, oil pump motor controller temperature and controller fault code are displayed.

(3) Enter BMS parameters in the main menu, as shown below:

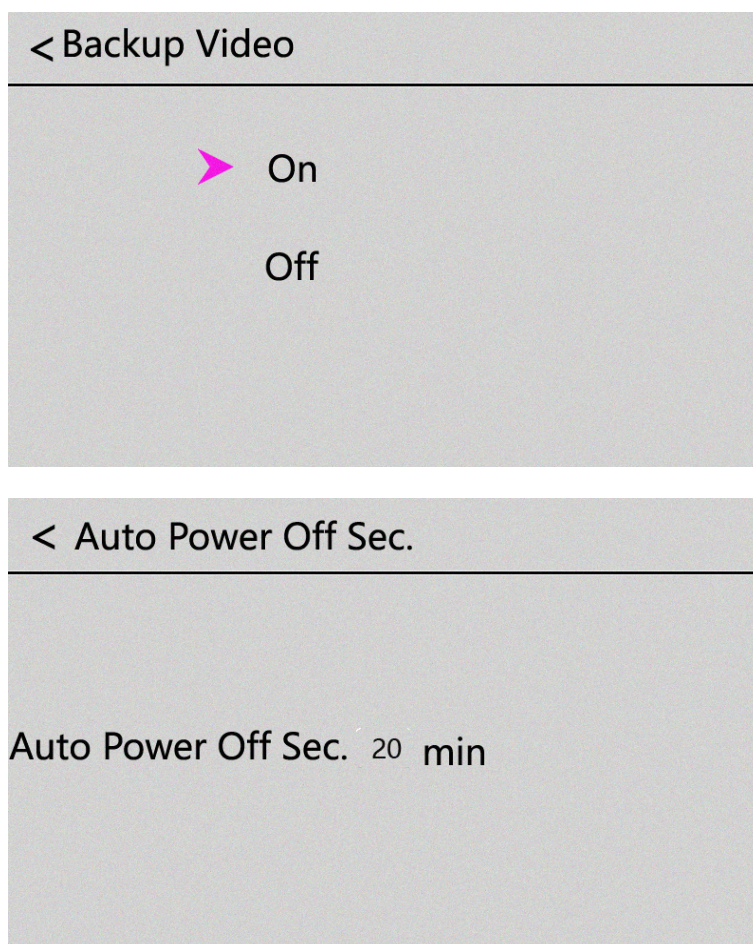
< BMS Info.		1/2
Total Battery Voltage	60	V
Total Battery Current	12	A
SOC	100	%
Cell Max. Voltage	3	V
Cell # of Max. Voltage	12	
Cell Min. Voltage	1	V
Cell # of Min. Voltage	13	

< BMS Info.		2/2
Cell Max. Temp	40	°C
Cell # of Max. Temp	12	
Cell Min. Temp	40	°C
Cell # of Min. Temp	12	
Battery Pack Charged Times	40	

Display the specific values of 12 parameters, including total battery voltage, total battery current, SOC, and cell max. voltage, cell # of max. voltage, cell min. voltage, cell # of min. voltage, cell max. temp, cell # of max. temp, cell min. temp, cell # of min. temp and battery pack charged times.

(3) Enter vehicle settings in the main menu, as shown below:

< Vehicle Set.	

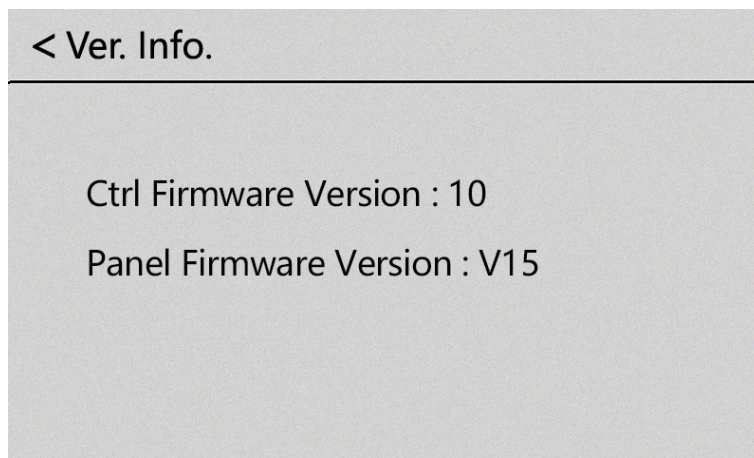


Two parameters are displayed: reversing image and automatic power-off. The reversing image switch can be set in the reversing image option, and the automatic power-off time can be



set in the automatic power-off time option.

(5) Enter version information in vehicle's main menu, as shown below:



Display control box software version and instrument software version parameters.

#### **4.3.6 matters needing attention**

(1) It is forbidden to use high-pressure water guns to wash instruments when users wash vehicles.

(2) Do not plug or unplug the plug of the instrument and harness frequently to avoid loose contact.

(3) Do not strike or scratch the instrument.

(4) If the instrument does not work normally, please contact our company for maintenance.

## **5. Motor**

## **5.1 Switched reluctance motor**

The whole power system of the forklift consists of two switched reluctance motors, which have speed-sensing and temperature-sensing functions. The whole motor has a simple structure, reliable performance, maintenance free and high efficiency.

### **5.1.1 Daily inspection and maintenance of motor**

- (1) The motor should always be kept clean, and no water drops, oil stains or dust are allowed to fall into the motor.
- (2) Regularly check the bearing for heating, oil leakage, etc.
- (3) The load current of the motor should not exceed the rated value of the motor.
- (4) In case of friction, squealing or other noises during the operation of the motor, stop the motor immediately for inspection. The motor can continue to operate only after the fault is eliminated.

## **6. Lithium battery and charger**

## **6.1 Use and maintenance of lithium battery**

The correct use and daily maintenance of lithium batteries have a great impact on the performance and service life of lithium batteries. Therefore, the user must carry out maintenance in accordance with the provisions of this manual and the actual situation, make a good charge record of the lithium battery forklift, and carefully fill in the record card. This card can be copied as the basis for daily spot-check records. See the attached table at the back of the book for the lithium battery forklift charging record card.

### **6.1.1 Instructions for use of lithium battery**

(1) Before using a new lithium battery, clean the surface and check for damage.

(2) The lithium battery installed on the forklift is also used as a counterweight. When it is lower than the minimum weight, it will affect the lifting capacity of the forklift. When a lithium battery is installed on the forklift, it must be limited by a lithium battery anti-stripping plate to prevent it from falling out when the vehicle is overturned. After replacing the lithium battery, the lithium battery anti-stripping plate must be installed in its original position.

(3) During the use of the lithium battery, it should be charged in time in strict accordance with the instructions of the instrument, and try to avoid over-discharge (that is, the voltage drop of the single lithium battery is below 2.8V), because the over-discharge of the lithium battery will seriously affect the service life and performance of the lithium battery. When the SOC of the lithium battery of the vehicle drops below 15% and is greater than 10%, the instrument buzzer will beep for 1s and stop for 5s, and the charging indicator yellow icon will light up. At this time, the user needs to finish the current work as soon as possible and drive to the charging place for charging; When the SOC drops to less than 10% and more than 5%, the buzzer will beep for 1s and stop for 1s, and the red icon of the charging indicator will light up. At this time, the user needs to immediately drive to the charging place to charge; When the SOC drops to 5%, the buzzer will ring long, and the red icon of the charging indicator will light up. The user should immediately drive the car to the charging place for charging; When  $0 < \text{SOC} \leq 10\%$ , the traveling motor and oil pump motor will operate at reduced power and will automatically resume normal power operation when the charging  $\text{SOC} \geq 15\%$ .

(4) Warning: When the SOC is less than 15%, if the battery is not charged in time, long-term storage may cause irreversible damage to the battery.

## **6.1.2 Charging steps and precautions of lithium battery**

### **Charging procedure:**

#### **Step 1: Charging preparation**

1. Park the forklift in the charging area and turn off the vehicle key switch
2. Confirm that the battery button switch is open
3. Check the battery charging interface for foreign matters
4. Confirm the status of the charger and check the charger plug for foreign matters

#### **Step 2: Start charging**

1. Connect the charger interface with the battery system charging connector correctly
2. Observe the charging connection and display the status of the charger display
3. Wait for charging confirmation for about 15 seconds, the charging current is normal, and charging begins

#### **Step 3: End of charging**

1. Press the charger stop button
2. After confirming that the charging current in the charger is 0A, correctly unplug the charger charging plug
3. Close the protective cover of the battery charging port or the forklift seat, and place the charger charging connector in a standard manner

### **Charging precautions:**

1. Turn off the vehicle key and charge it,
2. Please choose a safe environment for charging (avoid liquid, fire source, etc.),
3. Necessary safety fire extinguishing devices should be equipped around the charging equipment so that emergency fire extinguishing can be carried out in extreme cases,
4. Before charging, it is necessary to confirm that there is no dust, water and other foreign matter in the charging gun and charging socket. If there are any foreign matters, it is necessary to clean them before charging, otherwise, it will lead to poor contact between the charging gun and charging socket, resulting in heat and even fire,
5. Do not modify or disassemble the charging port and charging equipment, which may cause charging failure and cause fire,
6. After charging, do not disconnect the charging equipment with wet hands or standing in water, which may cause electric shock and personal injury,
7. If it is necessary to end the charging process, please press the stop button first and

disconnect the charging plug only when the current drops to 0A; otherwise, the cut-off with load will cause relay damage and plug-in terminal burn,

8. When the battery power is lower than 15%, it should be recharged in time. Overdischarge of the battery is strictly prohibited (20 charging is recommended),

9. The battery should be charged in time after use and fully charged every two months. Especially in low-temperature environments, please charge and fully charge the battery immediately after use,

10. Do not pull or twist the charging cable,

11. Do not subject the charging device to impact,

12. Do not use the charging device in an environment with a temperature higher than 55 °C,

13. It is forbidden to plug and unplug the charging plug-in directly when the charging device has current output, which may cause an electric arc, property damage, and personal injury,

14. Do not place the charging device near the heater or other heat sources,

15. Note that the matters not mentioned above are mainly safety.

### **6.1.3 Lithium battery storage**

(1) According to the characteristics of the battery, the lithium-ion battery pack should meet the environmental conditions of its storage during storage and transportation to maximize the protection of the battery,

(2) During the storage and transportation of lithium-ion batteries, proper protection should be provided to maintain the SOC level of about 50% to ensure that there will be no short circuit and liquid will not enter the tank so that the battery pack will be immersed in liquid (such as water, oil, etc.).

(3) Check the battery total voltage, single string voltage, quantitative relationship between single string and total voltage, and differential pressure level once every two months. Timely maintenance and handling problems found.

(4) In the process of loading and unloading, the battery should be handled with care and placed in order to prevent rolling and heavy pressure. The storage battery should not be stored upside down, and mechanical impact or heavy pressure should be avoided. To preserve the operation lifespan of the product, it is best to prevent long-term exposure to outdoor extreme sun exposure and rain.



(5) A special storage area must be set up in the warehouse. It is forbidden to store other inflammable and explosive materials in the area. The battery should be at least 2m away from the heat source;

#### **6.1.4 Treatment of lithium battery**

**When disposing of waste lithium batteries, please properly dispose of them according to relevant laws and regulations. You may also go through our lithium disposal partner BigBattery, Inc.**

#### **6.1.5 Lithium battery safety precautions**

(1) Keep the battery or battery pack away from dangerous goods or materials, such as corrosive chemicals, dangerous mechanical equipment, high-temperature environment, etc.

(2) Improper use of this series of products may cause smoke, such as external short circuit, overcharge, high ambient temperature, etc. In case of smoke, please cut off the power supply in time, use a carbon dioxide or dry powder fire extinguisher for treatment, and bury it with sand or soil. During the whole process, the crowd must be evacuated, and the alarm must be given in time (if necessary).

(3) It is forbidden to disassemble, extrude, puncture, lay, or bake the battery at high temperatures to avoid excessive vibration, external force impact, high drop, etc. This operation may cause personal injury or property loss;

(4) It is forbidden to directly short circuit the positive and negative poles of the battery, and avoid any metal or other conductive objects other than the battery pole pressing bolts and the conductive belt from contacting the positive and negative poles of the battery. This operation may cause personal injury or property loss.

(5) It is forbidden to expose or store the battery in an environment above 50 °C for a long time. It is forbidden to try to heat or put the battery on fire. This operation may cause personal injury or property damage

(6) It is forbidden to charge the battery without installing a reasonable charging protection device (lithium-ion battery protection circuit board, battery management system, etc.) or using charging equipment not approved by the company (charger, DC power supply, etc.). This operation may cause personal injury or property loss.

(7) It is forbidden to use this series of products in series or parallel with other models or types of batteries, which may cause personal injury or property damage; It is prohibited to conduct series or parallel operation on the complete power supply system containing

lithium-ion battery protection circuit board or battery management system. This operation may cause personal injury or property damage. If necessary, please contact the relevant technical department of the company to obtain correct technical support

(8) Non-professional personnel should not dismantle or modify the battery without authorization. The charging and discharging should not exceed the maximum current specified in the technical parameters. Charging in direct extreme heat outdoors is not advised. This operation may cause personal injury or property damage.

(9) It is forbidden to disassemble and maintain the battery pack without the presence of our after-sales technical personnel.

### **6.1.6 Lithium battery maintenance**

#### **Preparation before maintenance operation**

1. The site should be spacious, flat, safe, and equipped with charging equipment
2. Adjust the battery power to ensure that the battery SOC is between 25% - 40%
3. Stop the vehicle stably, turn off the power supply, check all electrical equipment in the vehicle, and ensure that it is closed.

#### **Maintenance content**

1. Check the appearance of the outer box: check the outer box of the battery system for sundries, obvious deformation, corrosion, and other abnormalities
2. Charging port: under power-off condition, check whether there are sundries, rust, and other abnormalities in the interface
3. Connector: check whether the connector is loose, damaged, or other abnormal conditions when the power is off
4. Parameter detection: before charging and discharging, check the battery voltage, temperature, and other status displayed on the display to ensure that all values are within the normal range

**To ensure personal safety, professional personnel must wear insulating shoes, insulating gloves, goggles, and other protective equipment before performing regular inspection. Non-professional personnel are not allowed to disassemble or repair without authorization.**

**If any abnormality is found, please contact our after-sales service department for handling. It is not advised to operate without permission.**

## **6.3 Charger**

The charger is composed of a three-phase rectifier, DC/DC conversion, monitoring board, auxiliary power supply, input/output detection, and protection circuit. The charger adopts full bridge phase-shifting technology and is specially designed for lithium battery charging power conversion. The CAN bus of the charger communicates with the battery BMS to track and adjust the charging parameters in real time so that the charger can always work in an efficient and reliable charging state, improving the charging efficiency and saving power. Its LCD display can intuitively understand the real-time charging state and fault information.

### **6.3.1 Use of charger and charging method**

When the warning of low lithium battery voltage is displayed on the LCD after the forklift operation is stopped or during the operation, please charge in time according to the following tips:

(a) Stop the forklift at the designated position, press the one-button start button to turn off the power supply of the whole vehicle, and open the charging compartment door cover. When the lithium battery needs to be replaced, the lithium battery can be lifted out of the forklift as required.

(b) Confirm the input power voltage and frequency of the charger, and select the charger matching the lithium battery to be charged.

(c) Remove the charging gun, and connect the straight gun cable with the lithium battery charging socket correctly.

(d) Turn on the air switch, the charger will display the current system version, the current lithium battery voltage, and the maximum charging current, and the charger will enter the automatic detection state.

(e) After the detection process is completed, the charger enters the formal charging process, and the LCD screen of the charger displays the real-time charging voltage and current.

(f) When the "Full" indicator is on, the lithium battery is full.

(h) After charging, close the air switch and disconnect the lithium battery cable plug from the charger.

## **7. Hydraulic system**

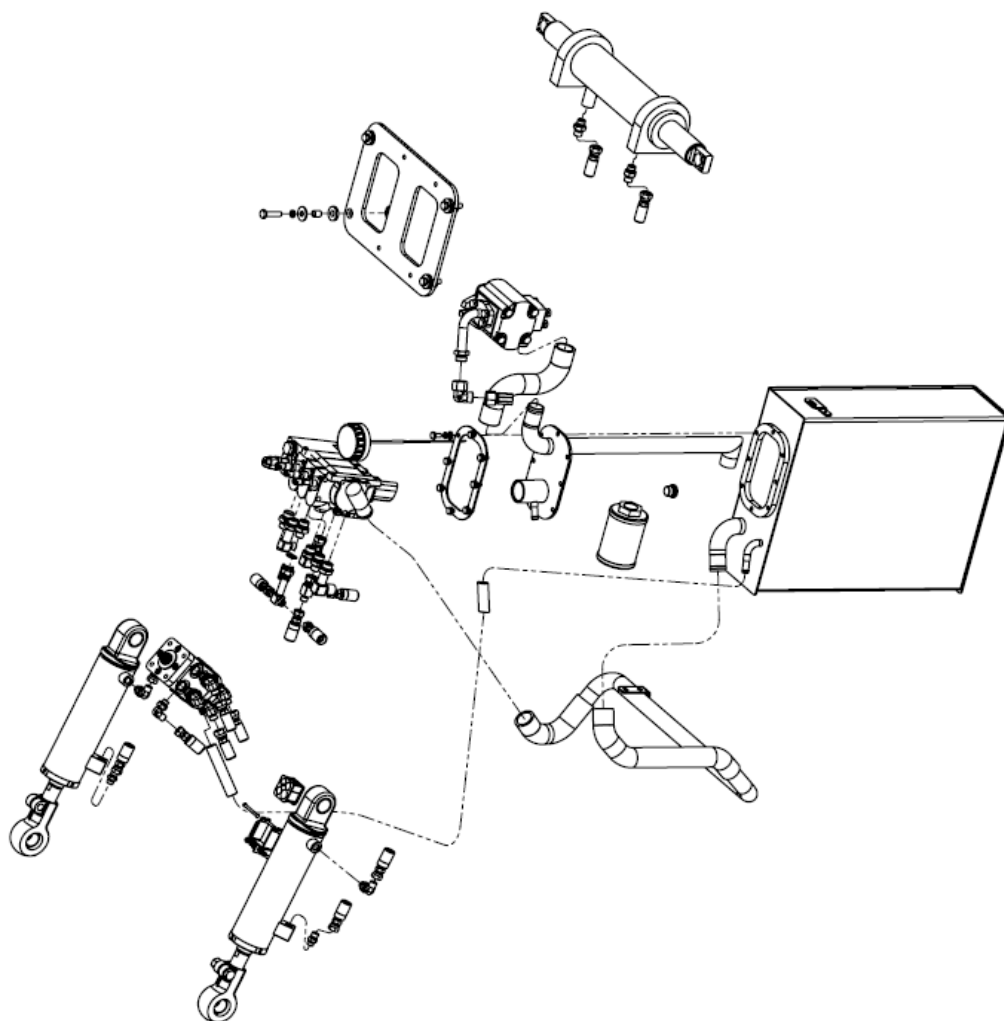
## 7.1 Summary

The hydraulic system is composed of a working oil pump, multi-way valve, lifting oil cylinder, tilt oil cylinder, pipeline, and other parts. The hydraulic oil is directly supplied by the oil pump connected to the motor, and the multi-way valve distributes the hydraulic oil to each oil cylinder.

### 1. Component performance parameters

Forklift type		2.5t
Main pump	Type	Gear type
	displacement	20ml/rev
	Drive mode	Motor connection
control valve	Type	Plunger type
	Name	CBT-F15D
	Adjust pressure	17.5MPa
Lifting cylinder	Type	Single acting cylinder with cut-off spool valve
	Cylinder inner diameter	Φ50mm
	Outer diameter of piston rod	Φ40mm
	trip	1495mm (lifting height 3000mm)
Tilt cylinder	Type	Double acting oil cylinder
	Cylinder inner diameter	Φ70mm
	Outer diameter of piston rod	Φ32mm
	trip	117mm
Steering cylinder	Type	Double acting oil cylinder
	Cylinder inner diameter	Φ70mm
	Outer diameter of piston rod	Φ50mm
	trip	160mm
Hydraulic oil tank	capacity	28L-32L

### 2. Schematic diagram of hydraulic system



### 3. Hydraulic system pipeline diagram

### **7.1.1 Multiway valve**

The multi-way valve adopts a 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 valves and self-locking valves inside the multi-way valve. The safety valve is arranged 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 the tilt cylinder from causing serious consequences due to the misoperation of the control lever when there is no pressure source. A check valve is installed between the oil inlet and the oil suction port of the lifting valve slice, and between the oil inlet of the lifting valve slice and the oil inlet of the tilt valve slice. The outline of the multi-way

valve is shown in Figure 7-1.

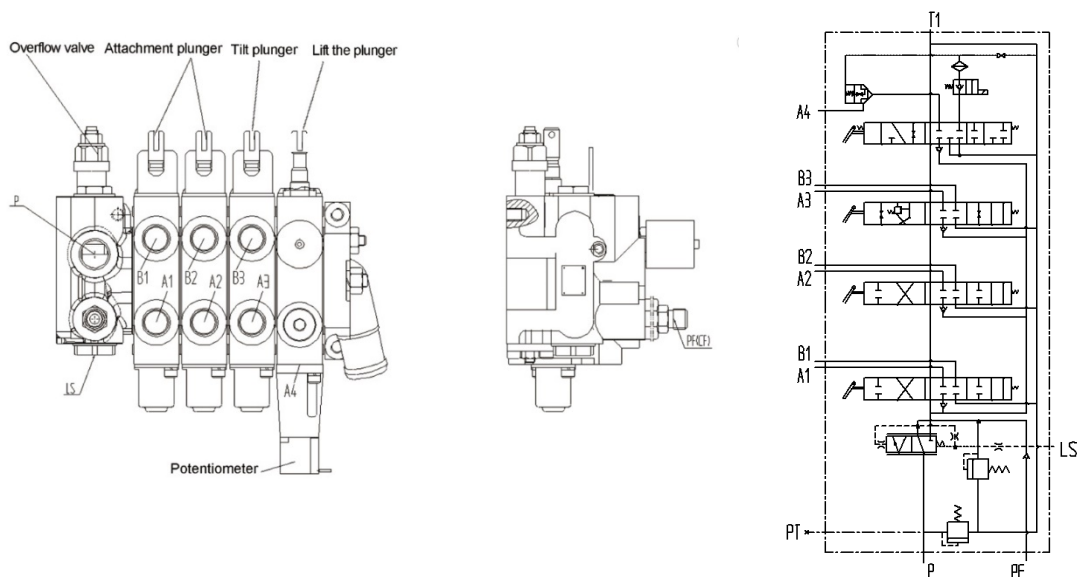


Figure 7-1 Outline Drawing of Multi-way Valve

## (1) Multi-way valve operation

The multi-way valve is operated by a control lever. All control levers are installed on a connecting shaft. The shaft is fixed on the instrument panel through a bracket. The control lever operates the spool valve through a connecting rod.

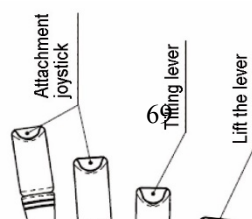


Figure 7-2 Multi way valve control

### ▲ Installation of microswitch

First, ensure that the center of the microswitch ball head is consistent with the center of the concave shaft and that the ball head surface is tangent to the reel. Then ensure that the stroke of the operating valve rod to press the microswitch ball head in is  $\geq 0.8 \pm 0.1\text{mm}$ , so that it is in the [ON] state. Adjust the clearance properly to make the microswitch open and close freely.

### (2) Adjustment method of safety valve pressure (Fig. 7-3)

The pressure of the safety valve has been set when leaving the factory, and the user should



not adjust it at will, otherwise, it will easily bring danger to the system and vehicle safety; If the oil pressure is not consistent with the specified value (see the table below), it should be adjusted by professionals according to the test method specified in JB/T3300 standard as follows:

(a) Unscrew the screw plug of the measuring hole at the inlet of the multi-way valve, and install an oil pressure gauge that can measure 20MPa.

(b) Operate the tilt handle to measure the pressure when the cylinder stroke reaches the end.

(c) When the oil pressure is different from the specified value, loosen the locknut of the relief valve, and turn the adjusting screws left and right to adjust to the specified value. Swing to the left when the pressure is high, and swing to the right when the pressure is low.

(d) Tighten the nut after adjustment.

Pressure adjustment	2.5t
Pressure regulating value of safety valve	17.5MPa
Steering gear pressure setting	9MPa

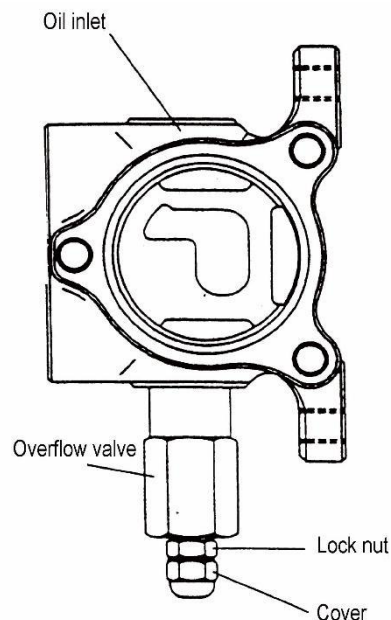


Fig. 7-3 Pressure Adjustment of Safety Valve

### **7.1.2 Lifting cylinder**

The lifting oil cylinder is a single acting piston type, which is composed of cylinder block, piston rod, piston, cylinder head, etc. For this series of forklift, two lifting cylinders are installed behind the outer mast, the bottom is fixed on the support of the outer mast lifting cylinder with pins and bolts, and the top of the cylinder (i.e. the top of the piston) is connected with the upper beam of the inner mast.

The piston is fixed on the piston rod with elastic steel wire, and the outer ring of the piston is equipped with an oil seal and support ring.

A shut-off valve is installed at the bottom of the cylinder. If the mast is raised, the sudden rupture of the high-pressure pipe can play a role in safety protection.

Steel back bearing and oil seal are installed on the cylinder head to support the piston rod and prevent dust from entering.

The structure of the lifting cylinder is shown in Figure 7-4.

1. Upper crossbeam
2. Adjusting pad
3. Dust ring
4. Oil seal
5. Guide sleeve
6. O-ring
7. Cylinder head
8. Steel back bearing
9. Cylinder block
10. Piston rod
11. Piston
12. Piston Seal
13. Oil seal
14. Seat ring
15. Circlip
16. Shut off valve
17. Spring lock ring
18. Cotter pin
19. Lock nut
20. Adjusting nut
21. End joint
22. Chain
23. Sprocket

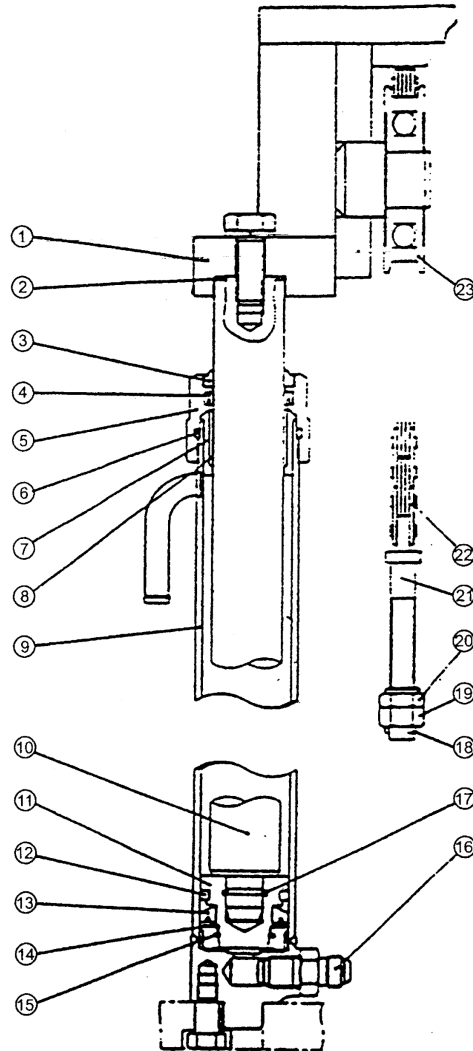


Fig. 7-4 Lifting cylinder

### ▲ Operation of shut-off valve

There are all shut-off valves at the bottom of the lifting cylinder (Fig. 7-5). When the high-pressure rubber hose breaks suddenly, it can prevent the goods from dropping sharply. The oil from the lifting cylinder passes through the cut-off slide valve, and the oil hole around the slide valve causes a pressure difference between the two chambers. When the pressure difference is less than the spring force, the slide valve does not act. For example, the high-pressure rubber tube breaks, forming a large pressure difference, so that the slide valve moves to block the oil hole around it, allowing only a small amount of oil to flow through the small hole at the end of the slide valve so that the fork slowly drops.

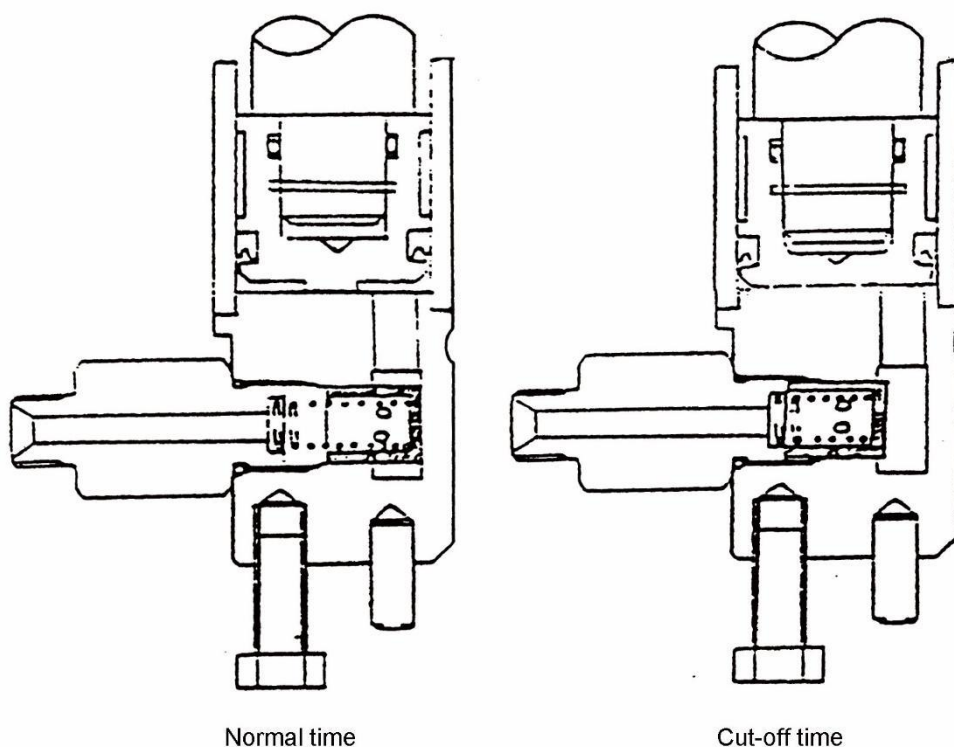


Fig. 7-5 Operation of shut-off valve

### 7.1.3 Speed limiting valve

The speed limiting valve controls the lowering speed of the fork and plays a safety role in unexpected situations such as high-pressure rupture. Refer to Figure 7-6 for the installation of the speed limiting valve.

#### ▲ Operation of speed limiting valve (Fig. 7-7)

The return oil of the lifting cylinder enters the valve G and returns to the multi-way valve through the FEDCB and A.

When a large amount of oil flows through the spool hole C, the pressure difference generated by the spool moves the spool to the right.

In this way, the passage between holes D and C becomes narrower, the oil return is reduced, and the lowering speed of the fork becomes slower.

If the fork is to be lifted, the high-pressure oil from the multi-way valve enters the lifting cylinder through A B C D E F, and G.

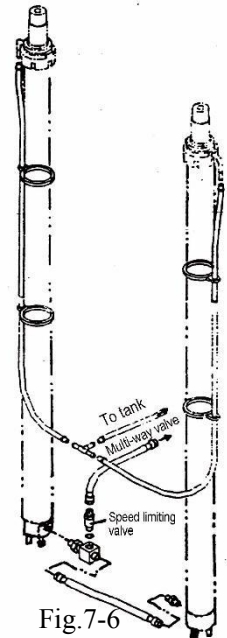


Fig.7-6

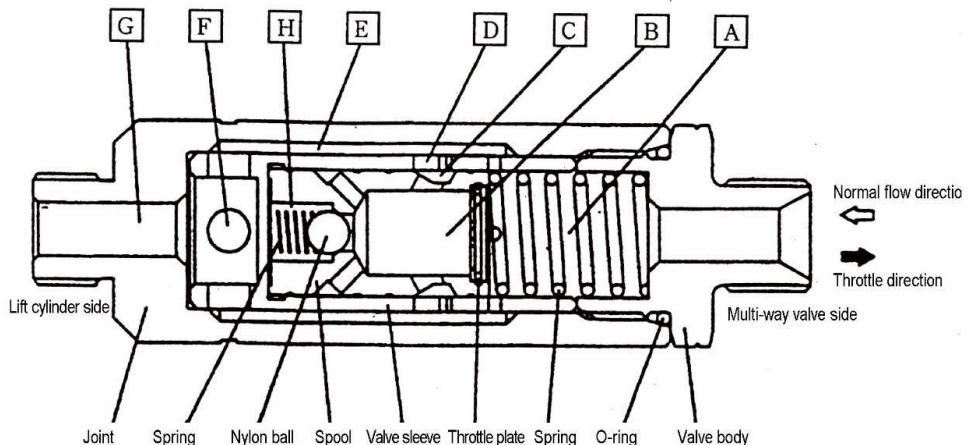


Fig. 7-7 Speed limiting valve

### 7.1.4 Tilt cylinder

The tilt cylinder is a double-acting type. Its piston rod is connected to the mast through an earring. The bottom of the tilt cylinder is connected to the frame with a pin. There is a tilt cylinder on both sides of the forklift.

The tilt cylinder is mainly composed of a piston, piston rod, cylinder body, cylinder bottom, guide sleeve, and seals. The piston and piston rod are of welded structure. The outer edge of the piston is equipped with a support ring and two Yx seals. In the inner hole of the guide sleeve, a shaft sleeve is pressed and equipped with Yx seals, retaining rings, and dust rings. This shaft sleeve supports the piston rod, sealing rings, retaining rings, and dust rings, which are screwed to the cylinder body together with the O-ring to prevent oil leakage and dust. See Fig. 7-8 for the structure of the tilt cylinder.

When the tilt slide valve is pushed forward, high-pressure oil enters from the bottom of the cylinder, pushing the piston forward to make the mast tilt forward, with a maximum inclination of  $6^{\circ}$ . When the slide valve is pulled back, high-pressure oil enters from the front of the cylinder block and pushes the piston backward to make the mast tilt backward, with a maximum inclination of  $12^{\circ}$ .

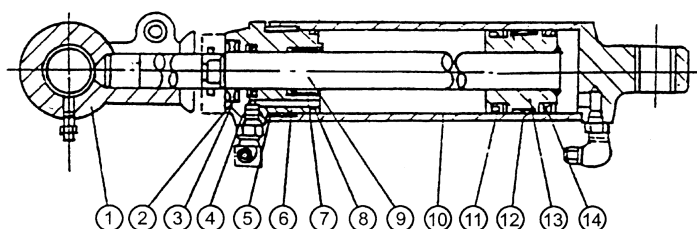


Figure 7-8 Tilt Cylinder

1. Earrings	2. Dust cover	3. Retaining ring	4. Yx seal ring	5. O-ring
6. Guide sleeve	7. Bearing	8. O-ring	9. Piston rod	10. Cylinder block
11. Yx seal ring	12. Support ring	13. Piston	14. Yx seal ring	

### 7.1.5 Hydraulic oil tank

The hydraulic oil tank is at the rear side of the frame. The oil tank is equipped with an oil suction filter, and the oil return pipeline is equipped with an oil return filter to ensure the supply of clean oil.

#### ▲ Replace the oil filter

- (1) Unscrew the oil drain plug to drain the oil.
- (2) Clean the oil tank cover plate and remove the cover plate screws.
- (3) Remove the oil suction pipe and oil return pipe.

- (4) Remove the fuel tank cover plate.
- (5) Remove the oil suction filter and replace it with a new one.
- (6) Remove the old gasket on the cover plate, replace it with a new one, and reapply the sealant. Sealant: Three Book 400 or equivalent.
- (7) Install the fuel tank cover plate and connect the oil suction pipe and oil return pipe.

## 7.2 Maintenance and adjustment of hydraulic system

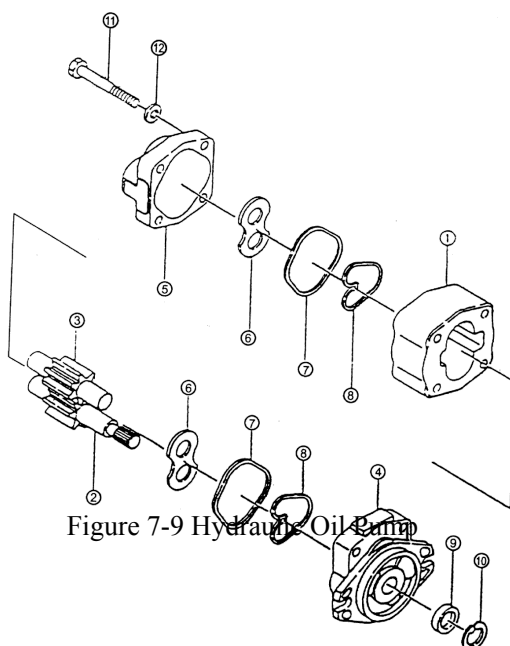
### 7.2.1 Maintenance of hydraulic oil pump

#### 1. decompose

Clean thoroughly before disassembly. Put the removed parts on clean paper or cloth, and be careful not to contaminate or damage the parts.

- (a) Clamp the flange of the pump on the tong platform.
- (b) Remove the connecting bolts, rear end cover ⑤, and pump body ①. (See Figure 7-9)
- (c) Remove the lining plate ⑥, drive gear ②, and driven gear ③.
- (d) Remove the sealing ring ⑦ and retaining ring ⑧ from the front and rear end covers.

**Note: If the seal ring is not replaced, do not remove it from the front end cover.**



1. Pump body
2. Drive gear
3. Driven gear
4. Front end cover
5. Rear end cover
6. Liner plate
7. Seal ring
8. Retaining ring
9. Oil seal
10. Circlip
11. Bolt
12. Washer

#### 2. Inspect

Check the disassembled parts and clean them with gasoline (except rubber parts).

(a) Pump body inspection (Fig. 7-10)

If the contact length between the pump body cavity and the gear is greater than  $\frac{1}{2}$  of the circumference, replace the pump body.

(b) Lining plate inspection (Fig. 7-11)

Check the contact surface of the lining plate. If the surface is damaged or the thickness of the lining plate is less than the specified value, replace the lining plate.

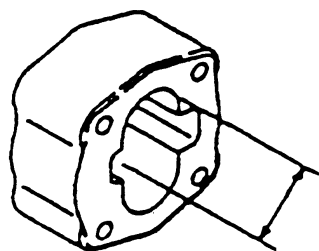


Fig.7-10

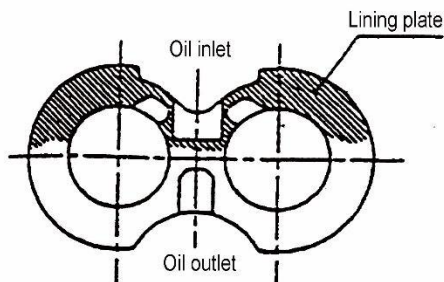


Fig.7-11

(c) Front and rear pump covers (Fig. 7-12)

If the discoloration (brown) of the inner surface bushing exceeds  $150^\circ$ , replace it.

(d) Check the drive and drive gears from the front and rear. If it is excessively worn, replace a pair. (Figure 7-13)

(e) Replace the seal ring, bushing seal, retainer ring, oil seal and spring retainer as required.

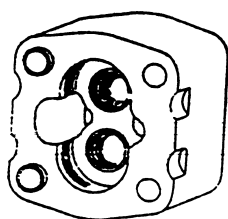


Fig.7-12

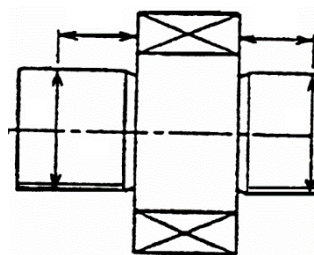


Fig.7-13

### 3. Assembly

(a) Install a new seal ring and a new retaining ring on the front cover of the pump.

(b) Install the lining plate on the groove of the front end cover, and be careful not to mix the



oil suction port with the oil discharge port.

- (c) Install the drive and driven gears on the front end cover.
- (d) Install the lining plate on the gear side to align the groove with the gear point. Be careful not to mix the oil suction port side with the oil discharge port side. (Figure 7-14)
- (e) Install a new sealing ring and a new retaining ring on the groove of the rear cover. (Fig. 7-15)
- (f) Install the rear cover on the pump body, and pay attention to the oil suction port and oil discharge port.
- (g) After all is installed, tighten the connecting bolts to the specified torque of 9-10kg. m.

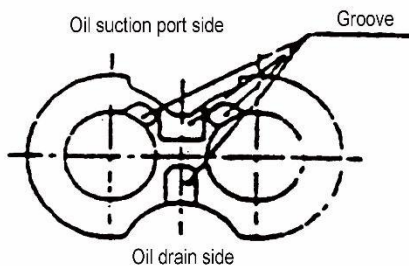


Fig. 7-14 Lining plate

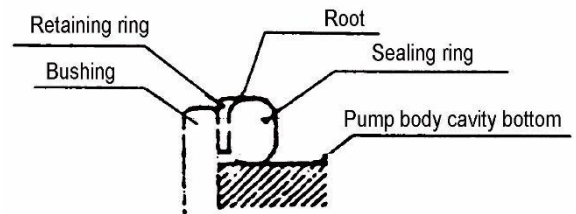


Fig. 7-15 Bushing Seal

**Note: Due to different oil pump suppliers, the maintenance data of the above oil pump parts may be different.**

#### 4. Test run

Run in the oil pump to check whether it operates normally. It is better to test the oil pump on the test bench, but it can also be tested on the forklift according to the following steps:

Note: If the oil pump is disassembled for maintenance due to severe wear or seizure of the pump due to the hydraulic oil, the hydraulic oil, and filter should be replaced before the test run on the forklift.

- (a) Install the pump on the forklift, and install a pressure gauge on the pressure detection port of the multi-way valve.
- (b) Loosen the adjusting screw of the overflow valve, make the pump run at 500-1000 rpm for about 10 minutes, and ensure that the oil pressure is lower than 10 Kg/cm<sup>2</sup>.
- (c) Increase the pump speed to 1500-2000rpm and operate for about 10min.
- (d) Keep the running speed of the pump at 1500-2000rpm, increase the pressure by 20-30 Kg/cm<sup>2</sup> each time, and operate for 5 min until it reaches 175 Kg/cm<sup>2</sup>. Then operate each oil

circuit for 5 minutes and replace the return oil filter.

When increasing the oil pressure, pay attention to the temperature of the oil, the temperature of the pump surface, and the sound of the operation. If the oil temperature or pump surface temperature rises excessively, reduce the load to reduce the oil temperature, and then continue the test.

(e) After the test, make the overflow pressure at 175 Kg/cm<sup>2</sup> and measure the flow. The oil volume is measured by the lifting speed.

## 7.2.2 fault diagnosis

If the hydraulic system fails, find out the cause according to the table below and carry out necessary repairs.

### 1. Multiway valve

Fault	Reason	Repair method
The pressure of lifting oil circuit is not high	Spool valve stuck	Cleaning after disassembly
	Plugged oil hole	Cleaning after disassembly
shock Slow pressure rise	Spool valve stuck	Cleaning after disassembly
	Insufficient exhaust	Fully exhaust
Steering oil circuit pressure is greater than the specified value	Spool valve stuck	Cleaning after disassembly
	Plugged oil hole	Cleaning after disassembly
The specified oil quantity is not reached	Improper adjustment of overflow valve	adjustment
Noisy	Improper adjustment of overflow valve	adjustment
	Wear of sliding surface	Replace the relief valve
Oil leakage (external)	O-ring is aged or damaged	Replace O-ring
Low set pressure	Broken spring	Replace the spring
	Valve seat surface is damaged	Adjust or replace the relief val
Oil leakage (internal)	Damaged valve seat surface	Correct valve seat surface
High set pressure	Valve stuck	Cleaning after disassembly

### 2. Oil pump

Fault	Reason	Repair method
Less oil discharge	Low oil level of oil tank	Add oil to the specified amount
	Oil pipe or oil filter blocked	Clean or replace as required
Low pump pressure	Damaged lining plate and support Poor seal ring, bushing seal or retainer ring	replace
	Improper adjustment of relief valve	Use a pressure gauge to adjust the pressure of the relief valve to the specified value
	Air in the system	Retighten the oil suction measuring pipe and add oil Replace oil pump oil seal
Noise during operation	The oil suction pipe is damaged or the oil filter is blocked	Check the pipe or repair the oil filter
	Loose air leakage at oil suction side	Fastening looseness
	Oil viscosity is too high	Replace the viscosity oil corresponding to the operating temperature of the pump
	Bubbles in oil	Find out the causes of bubbles and take measures
Pump leaks oil	Pump oil seal or seal ring damaged	replace
	Pump damage	replace

## 8. Mast system

## 8.1 Summary

The gantry system is a two-stage roller-type vertical lifting and retraction system, which is composed of inner and outer gantries and fork racks. The fork is fixed in the groove of the upper crossbeam of the fork frame with a locking pin. The fork spacing can be adjusted left and right by hand. The fork and the fork frame adopt international standards for general use and interchangeability.

### 8.1.1 Internal and external mast

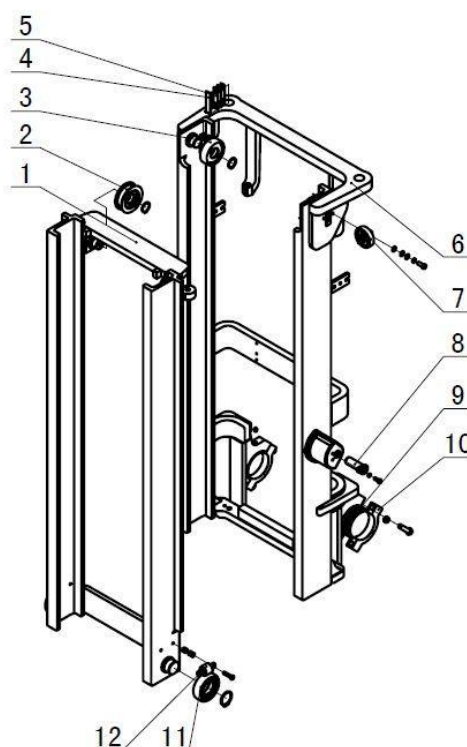


Figure 8 - Internal and External Gantry

1. Inner mast	2. Chain wheel	3. Main roller	4. Limit slider
5. Adjusting shim	6. Outer mast	7. Side roller	8. Pin
9. Bearing bush	10. Bearing seat	11. Main roller	12. Side roller

The inner and outer gantries are weldments (Fig. 8-1). The bottom of the outer mast is mounted on the drive axle with support.

The middle part of the outer mast is connected with the frame through the tilt cylinder, and can tilt back and forth under the action of the tilt cylinder.

The channel steel of the outer mast is C-type, and the upper part is installed with the main roller and the side roller.

The channel steel of the inner mast is J type, and the main roller and side roller are installed at the bottom.

**The maintenance of the main roller and side roller on the inner and outer gantries belongs to high-level maintenance, and attention should be paid to safety.**

### 8.1.2 Fork carriage

The fork carrier rolls in the inner mast through the main roller. The main roller is installed on the main roller shaft and clamped with an elastic retainer ring. The main roller shaft is welded to the fork carrier; The side rollers are fixed on the fork carrier by bolts and roll along the inner mast wing plate, which can be adjusted by adjusting pads. To prevent rolling clearance, use 2 fixed side rollers to roll along the outside of the inner mast wing. The longitudinal load is borne by the main roller. When the fork is lifted to the top, the upper roller is exposed from the top of the mast, and the lateral load is supported by the side roller.

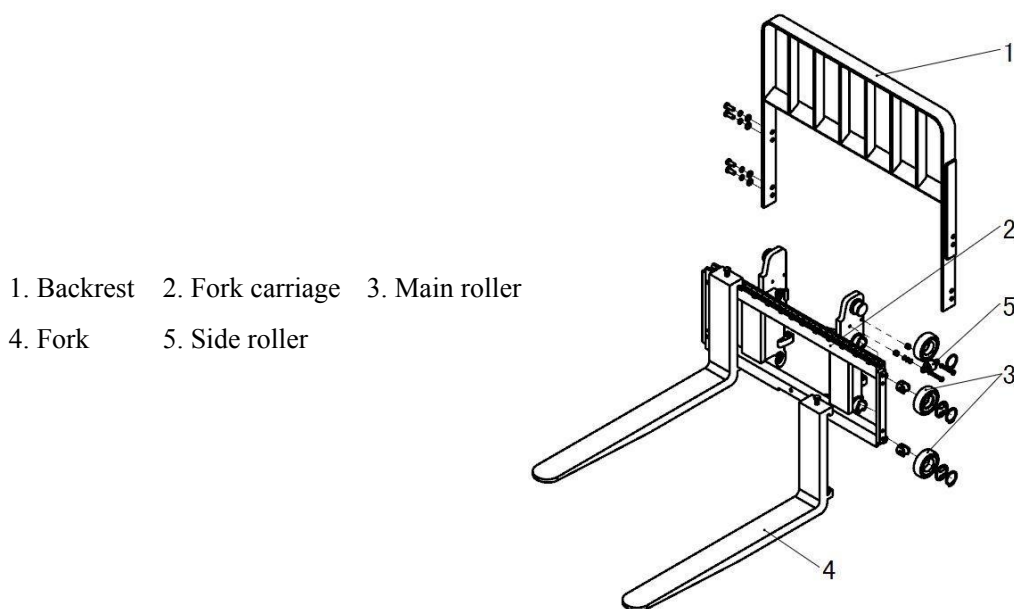


Figure 8-3 Fork carrier (2.5t)

### 8.1.3 Fork locating pin

The fork locating pin locks the fork in a certain position. To adjust the fork spacing, pull

up the fork positioning pin and turn it for 1/4 turn. The fork spacing adjustment depends on the goods to be loaded and unloaded.

## 8.2 Maintenance and adjustment of mast system

### 8.2.1 Lifting cylinder adjustment

When the lifting cylinder, inner mast, or outer mast are disassembled and replaced, the travel of the lifting cylinder should be readjusted. The adjustment method is as follows:

(1) Install the piston rod head into the upper crossbeam of the inner mast without adjusting the pad.

(2) Slowly raise the mast to the maximum lift of the oil cylinder, and check whether the two oil cylinders are synchronized.

(3) Add an adjusting pad between the head of the piston rod of the oil cylinder that stops moving first and the upper crossbeam of the inner mast. The thickness of the adjusting pad is 0.2mm~0.5mm.

(4) Adjust the chain tension.

**The adjustment of the lifting cylinder belongs to the high-level maintenance, and attention should be paid to safety.**

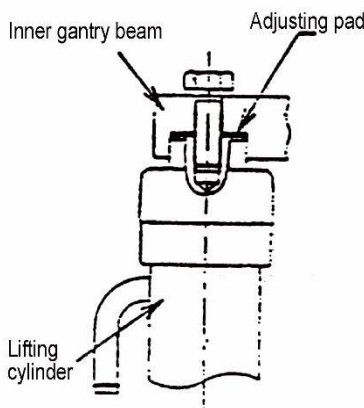


Fig. 8-4 Lifting cylinder adjustment

### 8.2.2 Height adjustment of fork carriage

(1) Park the forklift on the horizontal ground and make the mast vertical, as shown in

Figure 8-5.

(2) Make the bottom of the fork contact the ground, and adjust the adjusting nut of the upper-end joint of the chain so that there is a distance A between the main roller and the fork carrier. 1.5-1.8t forklift, A: 36~41mm; 2-3t forklift, A: 24~29mm.

(3) Lower the fork to the ground and tilt it back into position. Adjust the q-end joint of the chain, and adjust the nut to make the two chains have the same tension. (Figure 8-6)

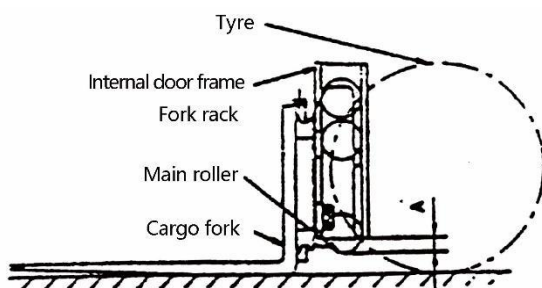


Fig. 8-5

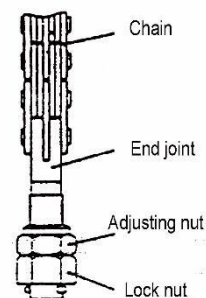


Fig. 8-6

### 8.2.3 Replace the fork carrier roller

- (1) Put a pallet on the fork and park the car on the level ground.
- (2) Drop forks and pallets to the ground.
- (3) Remove the upper-end joint of the chain and remove the chain from the sprocket. (Figure 8-6).
- (4) Lift the inner mast (① in Fig. 8-7)
- (5) Back up the forklift after confirming that the fork frame has been separated from the outer mast. (② in Fig. 8-7)
- (6) Replace the main roller

- Remove all spring retainer rings, take down the main roller with a drawing tool, and pay attention to keeping the adjusting pad.

- Confirm that the new roller is the same as the replaced roller; install the new roller into the fork carrier and clamp it with the circlip.

### 8.2.4 Replace the mast roller (Fig. 8-8)

- (1) Remove the fork carriage from the inner mast in the same way as described in 8.2.3

Replacing the roller of the fork carriage.

- (2) Drive the forklift to the level ground and pad the front wheels 250~300mm.
- (3) Pull on the hand brake and chock the rear wheels.
- (4) Remove the fixing bolts of the inner frame of the lifting cylinder. Lift the inner mast and be careful not to lose the adjusting pad of the piston rod head.
- (5) Remove the connecting bolts between the lifting and the bottom of the outer mast, remove the oil pipe between the two cylinders, and do not loosen the oil pipe connector.
- (6) Lower the inner mast and remove the main roller at the bottom of the inner mast. The main roller on the upper part of the outer mast will also be exposed from the top of the inner mast.
- (7) Replace the main roller
  - Use a drawing tool to remove the upper main roller without losing the adjusting pad.
  - Install the new roller together with the adjustment pad just removed.
- (8) Lift the inner mast until all rollers enter the mast.
- (9) Install the lifting cylinder and fork frame in reverse order of removal.

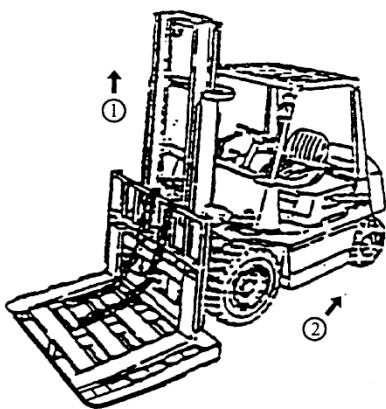


Fig.8-7

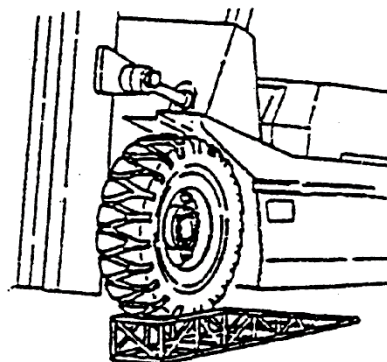


Fig.8-8

**Attached table:**

**Lithium battery forklift charging record card**

Forklift model:

Serial number:

Date of purchase:





Lithium battery model:

Lithium battery No.:

Date of first use:

[illegible]

## Lithium battery precautions

1. Please charge the lithium battery if its SOC is lower than 20%;
2. During the use of the electric forklift, the voltage of the forklift should not be lower than 72V, or the lowest monomer voltage should not be lower than 3V;
3. If it is not used for a long time, check the battery monthly.

Exceptions:

**Note: Please copy and fill in the form carefully, which will serve as the basis for lithium battery maintenance.**

## Record

