



# Operations & Maintenance Manual

Lithium Counterbalance

EK14C-130/130LI

EK14CS-130LI/189LI



## **Instructions for use**

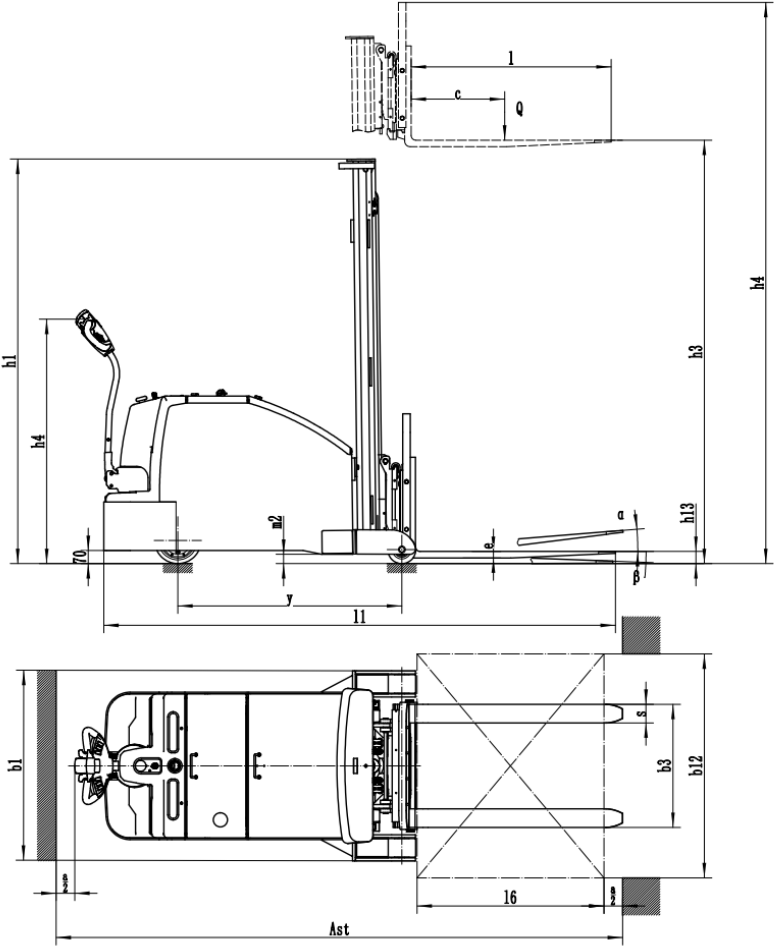
Please read this manual carefully and operate the vehicle safety.

- Do not operate this vehicle without training.
- Please comply with ISO3691 “Safety Specification for Motor Vehicles Industry”.
- Please do not modify or change the repair parameters, including adjusting the pressure. Any loss or damage to the vehicle resulting from such actions will be your responsibility, and doing so will void our warranty commitment.

### **SPECIAL WARNING:**

The company is committed to innovation and sustainable development. As part of this commitment, we continually improve the technology of our products. Therefore, we reserve the right to make changes and improvements to any product described in this specification without prior notice.

# 1. Contour Diagram



## 2. Main technical parameters

Specification	1.2	Model number		QPA13
	1.3	Driving mode		Electric
	1.4	Driving mode		Walking type
	1.5	Rated maximum load	Q (lbs.)	3000
	1.6	Load center distance	c (in)	24
	1.7	Wheel track	y (in)	44.6/47.2
Weight	2.1	Service Weight (with battery)	kg	
Chassis	3.1	Wheels		polyurethane
	3.2	Wheel dimension, front	in	Φ9.84×2.95
	3.3	Wheel dimension, rear	in	Φ5.9×4.02
	3.5	Wheel number, front/rear (x = driving wheel)		2×1
	3.6	Front wheel gauge	b11(in)	34.56
Dimension	4.1	Max. Lift Height	h3(in)	130/189
	4.2	Free lifting	in	12.9
	4.3	Lowered fork height	h13(in)	2.55
	4.4	Lowered Mast Height	h1(in)	85.6/84.2
	4.5	Total length	l1(in)	118.1/130.5
	4.6	Body width	b1(in)	40.16
	4.7	Fork size	S/e/l(in)	1.4×3.94×42.13
	4.8	Turning radius	Wa(in)	66.3/68.9
Performance Data	5.1	Travel speed, full/empty	mph	2.2/2.4
	5.2	Increase speed, full load	in/s	3.5
	5.3	Descent speed, full load	in/s	4
	5.4	Drive motor power	Kw	1.5
	5.5	Lifting motor power	Kw	2.2

## 3. Safety

Counterbalance Stacker adopts storage batteries as the dynamic source and an AC motor as the driver, traveling through gear transmission. The lifting of the fork relies on the AC motor and the hydraulic transmission system. The up-and-down movement of the oil cylinders lifts the fork and the goods. As the traveling and lifting of the stacker are electrically driven, it possesses the characteristics of energy saving, high efficiency, stable operation, easy operation, safe and reliable, low noise and no pollution, etc.

Environment for application:

- Elevation is no more than 4000 ft.
- Ambient temperature no higher than +104°F and no lower than -77°F.
- When the ambient temperature reaches +104°F, the relative humidity should not exceed 50%; at a lower temperature, higher relative humidity is allowed.
- Hard and level ground

- e. It is prohibited to use the stacker in a flammable, explosive or corrosive environment with acid and alkali.

Warning:

Please pay attention to the items below before operation

1. Electric truck should be used on the flat hard floor indoor only. It is forbidden to use in the environment of flammable explosive or environment of acid and alkali corrosion.
2. Only trained or acknowledged drivers are allowed to operate the truck.
3. Read the manual carefully before operation and know well the performances of the truck. Checking the truck carefully before using and repairing on one's own before training is forbidden
4. No overloading
5. The center of gravity of the goods should be placed between the two forks and do not carry loose goods
6. Drive the truck slowly when forks enter the pallet.
7. It is strictly forbidden to press the lift or lower buttons while the truck is walking and frequently switching the two buttons, which might damage the truck and the goods
8. It is not allowed to rapidly put heavy goods onto the forks.
9. Do not put the goods on the forks for a long period of time.
10. Turning rapidly on narrow road is strictly forbidden. In order to ensure the safety of the people and goods, the truck should turn slowly in this situation.
11. When the truck is not in use, the forks should be lowered to the lowest position.
12. Never put any part of the human body under heavy goods and forks.
13. The truck is applicable for use on plane ground and should never be parked on slope for a long period of time.
14. Over-load or over-slope operation is strictly forbidden. Otherwise, the wheel will slip, damaging the wheel and the motor. The safety of people and goods will be affected as well.
15. Operation of the truck under the stipulated voltage 20.4V is strictly forbidden.
16. It is strictly forbidden to directly connect the plug with AC power supply for charge.
17. When the lifting height is over 500mm, the truck should be stopped.

### 3.1 Safe operation specifications

(1) Driver's training:

**Note: The braking and acceleration features of the COUNTERBALANCE STACKERS with same technical parameter may be different, please drive the stacker after being familiar with every operation procedure.**

(2) Wear during driving

**Note: Please put on safety shoes and work clothes; To keep safe, please don't wear loose clothes, to avoid being hitched and bringing yourself in dangerous condition.**

(3) Must comply with the rules

**Note: Please do not drive the stacker when you feel tired, lack focus, use anesthetic or drink wine.**

(4) Safety in the workplace

**Note: Electric COUNTERBALANCE STACKER was limited to being used indoor with the flat hard ground. Prohibited to be used in the corrosive environment with flammable and combustible or vitriol.**

- A. Keep the roads in good condition and unimpeded.
- B. The workplace needs enough light.
- C. The workplace for stackers using and charging should be equipped with firefighting facilities, the fire extinguisher can eradicate solid combustibles and electrical fire.
- D. The noise level data showed in instruction were tested for the new stacker in flat, smooth and hard ground. If your ground is not in good condition or the wheels are broken, the noise will be louder.

(5) Keep the stacker's integrity



**Warning**

**Please do not reform the stacker**

- A. Please comply with safety rules and your workplace's rules during operation and maintenance.
- B. Can not modify the stacker without authorization, since it would change the stacker's performance. Prohibited modifications of the electric stacker without authorization from manufacturer or dealers, which may influence the stacker's capacity, stability and safety Even with authorization, the capacity, label, operation manual need be updated accordingly.

Consumer only can reform the stacker under the status if the stacker manufacturer stops producing and there is no principal or agent in the market to do.

However, consumers should comply with the below rules:

- a) We must arrange engineering experts in industrial vehicle or safety areas to make modifications to the stacker in design or testing.
- b) Take permanent records for the revised design, testing and proceeding aspects.
- c) Permitted to make suitable adjustments to the stacker's capacity pallet, label, tag and instruction.
- d) Stick the label on the stacker in permanent, showing the adjusting ways, adjusting date and the institution who made such adjustments, including name and address.

(6) Make safely operation procedure

Make safely operation procedure according to the actual situation before using the stacker, must fully consider the safety.

(7) Prohibited to drive the stacker under unsafe condition

A. It is prohibited to operate the stacker on uneven ground, and sluggish road and other workplace with some other unsafe factors. It is prohibited to lift the goods on a ramp.

B. It is prohibited to use the stacker with fault.

C. Make sure to check the stacker every day and maintain or replace the stacker if there is something wrong happening.

(8) Prohibited to overload the stacker.



### Warning

Prohibited to overload the stacker, since it could damage the stacker or cause injury.

#### (9) Use suitable pallet

The pallet should be in proper size, and not be too wide or too large.

#### (10) electrical system checking

**Note:** Must close the key switch and the emergency switch off during checking the electrical system.

### 3.2 Safe operation specifications

#### (1) Checking the safety situation around the stacker

**Note:** Make sure no person is around the stacker before starting the stacker.

**Note:** Please ask for another person's help while driving backward if handling the goods in huge size and your view is obstructed.

**Note:** Make sure no person is around the stacker when driving back.

**Note:** Ask someone to guide you when driving in catwalk.

**Note:** Driver should stop the stacker at intersections or places where your view is hidden. Driving the car after making sure there are no obstructions or people are in the way.

**Note:** Pay attention during the operation of the stackers.



### Take care

**Different with other stackers, this stacker's driving system is in the front of the stacker, its wing speed is high during swerving, so please keep the speed slow or swerving when the stacker is close to other objects, to avoid collision.**

#### (2) Prohibit savage driving

**Note:** Do not start, brake or swerve suddenly.

If it starts to brake suddenly, it will make the goods fall down.

If the unit is turning suddenly, it may make the stacker tip-over and lead to serious accident. So please slow down when turning and be more careful during.

**Note:** Comply with the workplace's safety rules, please slow down or sound the horn when driving close to other stackers. Please do not drive with low or no visibility.

**Note:** Make sure there is a certain gap between the stacker and entrance

#### (3) Do not drive by the side of the road

**Note:** Make sure there is enough distance between the car and roadside or platform.

Make sure there is a relevant distance between the stacker and the edge of the narrow road or platform, to avoid the stacker falling or tipping.



## WARNING

Do not swerve or load on the ramp, or the stacker might tip over.

### 3.3 operation specifications

**Note:** Stackers are only permitted to handle the goods in a rated capacity.

- 1) Prohibited overloaded.
- 2) Prohibited moving the goods in unbalance loading.
- 3) Prohibited handling people.
- 4) Prohibited operating the handles suddenly.
- 5) Prohibited using the stacker as tractor.
- 6) Drivers should be careful when handling the goods in extra wide size, make sure to slow down in turning and lifting up and down, meanwhile pay attention to safety in the workplace.
- 7) The stacker with fault should stay in place and not be used, put the fork in the lowest position, and put on the warning label, pull out the key.
- 8) Cannot operate the stacker if the mast shield was not installed.
- 9) Pay attention to avoid the wind hazard while loading the goods.

**Note:** Pay attention to avoid the wind hazard while loading the goods.

- 10) Drive should command the driving speed according to actual situation. Slow down when turning, working in narrow road, passing swing door and view is hidden. Driver must keep distance with former forklift and keep the stacker in control. It is prohibited to stop the stacker suddenly, turning quickly and overtaking, when in danger and the view is hidden.
- 11) The driver's view during driving: driver should keep his eyes toward the direction he is driving and pay attention to the road's condition. The driver must adjust the goods' position toward the backrest if it hides his view the driver must arrange for another person to go with the stacker on the side or in front of the goods' position can't be adjusted, so that he can tell the driver more information along the way.
- 12) Driving up and down the hill: The route of uphill or downhill must be specific driving route. Pavement must be kept clean, non-skid, and meet stacker technical performance, safety and reliability. Must keep fork moving forward while loading the goods by uphill and should drive in reverse if going downhill. During the process, drivers cannot swerve, diagonally drive or stop stacker midway. And must slow down and be ready to brake at any time while driving downhill.
- 13) Drive the stacker to elevator: Must make sure the elevator and loading desk with enough capacity, their structure is suitable to carrying stacker, meanwhile, must get permit from their designer, if you need to drive the stacker to elevator or loading desk. Must check all the procedure before operation. Must let the goods delivered to elevator at first when stacker driving into the elevator. Drive into the elevator after the goods are delivered in good condition. The staff should leave the elevator if it reaches the predetermined height.
- 14) The goods be handled should comply with these terms: Stacker driver should check the goods very carefully to avoid any dangerous caused. Must place and secure the goods before handling. Must install the appropriate protective devices (such as fencing), if the goods are in the tipping or falling hazard during handling process.

### 3.4 The notices after finishing work

1) Parking: The lift should be parked in the designated areas, prohibited to park the lift on a slope. Should comply with the below points before leaving the stacker:

- a) Fork down to the lowest position
  - b) Steering wheels should be in mid position
  - c) Turn off the key switch
- 2) Clean the stacker

**Note:** Should clean the electrical system by compressed air, cannot use water to clean it instead.

### 3) Charging



**WARNING**

**Should not with fire around the charging place, otherwise it will lead to explosion or fire.**

Take records of the charging situation. Please refer to the battery operation section in the instruction for the charging method details.

## 4. Use and Operation Instructions

The stacker adopts storage batteries as the power to supply for walking and goods lifting. It is used for handling and stacking goods for short distances. Correct use and operation will bring you great convenience in your work, but incorrect use and operation will damage the stacker and bring you and your goods danger.

### 4.1 Before operation:

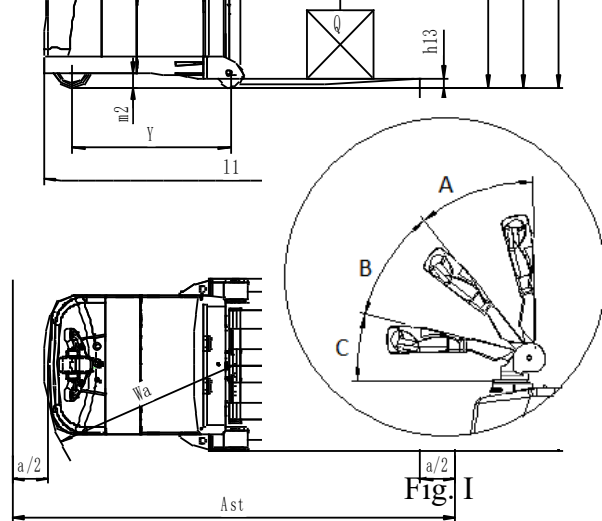
4.1.1 Before operation, please check if the stacker is in normal condition: Is there any oil leakage in the hydraulic pipes? Are the supporting wheels able to operate normally? Is there any block? Stackers with problems are prohibited for operation.

4.1.2 Check if there is any electric power in the batteries. Pull the red emergency switch on, switch the electric lock on, check the hour meter on the dash panel of the stacker. If only one grip is on light, it indicates there is no electric power in the batteries and charging should be conducted at once. It is prohibited to operate the stacker without electric power as that will greatly reduce the service life of the batteries and even damage the batteries.

4.1.3 Check if the stacker brake is normal. Check the lifting, dropping, forward and backward traveling of the stacker to see if the actions are normal. Check if the emergency reverse action of the stacker is normal with the method indicated in Fig.I:

Move the control handle to division A or division C as indicated in Fig.I and press the rise/lowering button on the control handle to see if the lifting and lowering of the fork is normal

Move the control handle to division B as indicated in Fig.I, slowly start the stacker and press the handle to the horizontal position to see if the stacker can travel or brake normally.



Move the handle to division B as indicated in Fig.I., and press the emergency reverse switch button on top of the control handle to see if the stacker can travel forward.

After the above check, if there is no failure in the stacker, it can be put into operation; if there is some failure, please repair it at once. It is prohibited to use stackers with problems.

## 4.2 In operation :

4.2.1 Note: A side-magnetic brake is installed on the shaft end of the drive wheel motor and there is a cam and a fine motion switch installed on the rotary shaft of the rotary arm. Only the rotary arm is at  $30^{\circ} \pm 20^{\circ}$  (as indicated in Fig.II), the stacker can get power and operate. Larger or less than the angle, the stacker has no power and is braked. In that case, the stacker can lift goods. When lifting goods, the stacker cannot travel. As indicated in Fig. I, when the control handle is in division A or division C, the stacker can only lift or lower but not travel; when the control handle is in division B, the stacker can travel, lift as well as lower. The operation position of the handle will not be specially described in the following descriptions, i.e. the handle must be in division A or C when the stacker lifts or lowers and it must be in division B when the stacker is traveling.

### 4.2.2 Operating of handling and stacking

As indicated in Fig. II, pull out the general power supply switch, unlock the electric door lock. Move the stacker near the goods pile (the head of the fork is 30cm from the goods piles). Press the lowering button; adjust the height of the fork to a proper position. Press the lowering button till the fork is 200-300mm away from the ground. Then move the stacker and stop when the head of the fork is 300mm in front of the goods. Press the lifting button to lift the fork to a proper height (the bottom of the pallet is about 100mm away from the shelf). Move the goods to the proper position of the shelf and press the lowering lift and put the goods on the shelf carefully. Meanwhile, drive the stacker slowly to move the fork away from the pallet (the head of the fork is 300 away from the shelf). Then lower the fork down to 300mm away from the ground and drive away from the shelf. Please pay attention to the obstacles around while driving and slow down while turning.

### 4.2.3 Operating of taking goods from the shelf

As indicated in Fig. II, pull out the general power supply switch, unlock the electric door lock. Move the stacker near the goods pile (the head of the fork is 30cm from the goods piles). Press the lowering button; adjust the height of the fork to a proper position. Press the lowering

button till the bottom of the pallet is about 100mm away from the shelf. Drive the stacker slowly to move the goods out of the shelf (the head of the fork is 300mm away from the shelf). Press the lowering button till the fork is 200-300mm far from the ground. Then move the stacker away from the shelf and stop slowly in the destination. Press the lowering lift and download the goods. When the fork is separated away from the goods totally, move the fork away from the pallet.

#### **4.3 Handling of exceptional cases during use**

- 4.3.1 The fork can be lifted if the lifting button is pressed, but if it keeps lifting when the button is not pressed, it means the stacker has lost control. At this time, please cut off the power and move the stacker to a safe place. Then discharge the goods manually and repair the stacker.
- 4.3.2 If the brake of the stacker is out of control during use, please stop immediately and repair it.
- 4.3.3 During the process of reversing, if the operator was pushed to the wall or other objects press the emergency reversing switch and the stacker will move to the opposite direction automatically in case of making the operator injured.

#### **4.4 After Using:**

Stop the stacker to the fixed place after using and maintaining it as the sixth point following. Meanwhile, do not forget to charge the stacker.

### **5. Maintenance**

**Note: It is prohibited for untrained personnel to maintain the stacker**

#### **5.1 Whether the stacker can operate satisfyingly depends on the efficient maintenance.**

When maintenance is ignored, the stacker may pose a threat to human lives and cause property damage. Routine inspection should be conducted when the stacker is in operation, to eliminate abnormal conditions. Never use a stacker with trouble to ensure safety and to prolong the service life of the stacker.

#### **5.2 Maintenance:**

The maintenance of the stacker is divided into three levels, i.e. routine maintenance, level I maintenance and level II maintenance.

Routine maintenance: Daily maintenance is to clean the surface of the stacker body and the surface of the storage battery and to examine the firmness of the power supply cable.

Level I maintenance: Level I maintenance should be performed once every week. Besides what should be done in daily maintenance, the operation situation of all the parts should be carefully inspected to see whether the operation is normal; whether there is any looseness of the fasteners; is there any oil leakage at the hydraulic connection; is there any abnormal wearing and tearing in the mechanical parts; is there any abnormal temperature rise or sparks in the electric part, etc. If there is any abnormal situation, adjustment or trouble-shooting should be performed promptly.

Level II maintenance should be carried out as planned. Overall inspection should be performed for the stacker according to the following requirements.

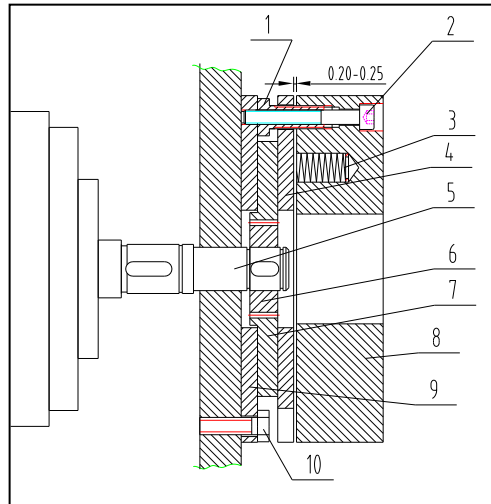
- a. Maintenance for mechanical systems: Once half a year. The major content is to add lubricant to the transmission gears and bearings of the drive wheel and the rotary joints, and examine the firmness of the fixing fittings, the flexibility of the wheels, as well as whether the forks can be

lifted and lowered normally. Clean the dirt and dust on the friction plate of electromagnetic arrester and adjust the clearance to the proper distance. The operation noise of the stacker should be no more than 70dB after maintenance.

- b. Maintenance for hydraulic system: Once half a year. Examine if the oil cylinder is normal, if there is any leakage externally or internally, if the hydraulic connection and the hose are reliable with no leakage. The hydraulic oil should be kept clean and generally it should be replaced every 12 months. ISO oil product standard is adopted for hydraulic oil. When the ambient temperature is  $-41\sim 104^{\circ}\text{F}$ , HL-N46 or HL-N68 should be used; when the ambient temperature is  $-95\sim -41^{\circ}\text{F}$ , HV-N46 or HV-N68 should be used. The replaced waste oil should be treated according to the local rules and regulations.
- c. Maintenance for electric equipment: Once every three months. First examine whether the specific gravity of the electrolytic solution of the storage battery [specific gravity at 1.24 (at  $77^{\circ}\text{F}$ ) in tropical areas and 1.26 (at  $77^{\circ}\text{F}$ ) in other areas] fits and the terminals are clean. Otherwise, the specific gravity of the electrolytic solution should be adjusted as required and the terminals should be cleaned and painted with Vaseline and tightened. Examine if the connections of the electrical devices are reliable, the switches are normal, and the insulation is ok (The insulation resistance between the electrical devices and the stacker body should be above  $0.5\text{M}\Omega$ ). Clean the dirt, dust, and carbon fouling of motor. Meanwhile check the wearing condition of the electric brush and replace it if necessary.

### 5.3 Adjustment of the brake clearance

- ① Hollow screw
- ② Fitting screw
- ③ Spring
- ④ Armature
- ⑤ Motor shaft
- ⑥ Spline housing
- ⑦ Friction plate
- ⑧ Electromagnetic coil
- ⑨ Mounting cover plate
- ⑩ Mounting screw



The brake structure is indicated as the Fig on the right. After being used for a while, the performance of the brake may decline with the wearing of the brake block, or the brake plate can't be released. At this time, it is necessary to adjust brake clearance. As indicated in the figure on the right, in braking status, use a feeler to check the gap between the brake block and electromagnetic magnet, if the gap is more than 0.5mm, then it needs adjustment. Before adjustment, clean the dirt and dust on the friction plate. When adjusting, loosen the fixed screw 2, adjust the length of set screw 1, then fasten the retention screws, after adjustment, the clearance between the brake block and electromagnetic magnet should be fixed from 0.2~0.3mm. It must be noted that even adjustment for three retention screws can make even clearance gap between the brake block and electromagnetic magnet after adjustment. After the adjustment, turn on the brake with 24v DC power. Then the brake will make a clear sound.

## 6. Common faults and trouble shooting

No.	Faults	Cause	Shooting
1	The stacker can't be started. (The contacts do not work.)	① The fuse of the control circuit is burn out.	Replace
		② The power switch contact is bad or damaged.	Repair or replace
		③ The fuse of the major circuit is broken.	Replace
		④ The contact of the electric lock switch is bad or broken.	Repair or replace
		⑤ The connection of the storage batteries is loose or has fallen off.	Tighten
	The stacker cannot be started (The contact's work.)	① The side-magnetic brake of the drive wheel does not suck and the stacker is in a braked condition.	Repair or replace
		① The walking motor carbon brush is worn or bad contact between the steering device and the carbon-brush.	Repair or replace
		① The magnet-exciting coil of the stepper motor is broken or bad contact at the wire end.	Repair or replace
		④ Bad contact.	Repair or replace
		⑤ There is a trouble at the MOSFET tube type circuit board.	Repair or replace
2	The stacker can only move forward (or backward)	① Bad or broken contact.	Repair or replace
		② There is a trouble in the circuit board.	Repair or replace
3	The stacker cannot stop while traveling	Broken contact. The moving contact cannot be reset.	Cut off the power at once and replace the contact
4	The brake does not work	① The erection bolt of the fine motion switch looses or is damaged.	Adjust or tighten the bolt or replace the fine motion switch.
		② The connecting wire of the side-magnet brake is loose or the side-magnetic brake is damaged	Tighten the bolt or repair the side-magnet brake.
		③ The moving plates of the side-magnetic brake is loose or damaged.	Replace the braking plates.
5	The steering has got stuck	① The bearing of the steering device is damaged.	Replace the bearing

		② The bearing of the steering device lacks lubricant or there is too much dust	Clean the bearing
6	Difficult steering of the drive wheel, noise and the motor is overloaded.	① The gear or bearing has got stuck because of foreign matters.	Clean or replace the bearing
		② There is clearance in the bearing installed or the fixing ring has come off.	Reinstall the ring. Adjust the clearance.
		③ The front wheel bearing is damaged.	Replace the bearing
7	The forks cannot be lifted.	① Overload	Reduce the load
		② The pressure of the overflow valve is too low.	Adjust the pressure higher
		③ Internal abnormal leakage in the lifting oil cylinder.	Replace the seals
		④ Insufficient hydraulic oil	Add appropriate quantity of filtered hydraulic oil
		⑤ Insufficient voltage of the storage battery	Charge the battery
		⑥ The operation handle is not horizontal or vertical, the motor of oil pump has not been turned on.	Improper operation
		⑦ Damaged oil pump motor	Repair or replace
		⑧ Damaged oil pump	Repair or replace
		⑨ Damaged lifting button	Repair or replace
		⑩ Electric lock is not unlocked or is damaged.	Repair or replace
		(11) Seriously insufficient voltage in the cell.	Recharge
8	The forks cannot be lowered after rising	The electromagnetic valve is out of control	Shoot the trouble
9	Reduced voltage of the storage battery(after charged)	① Individual battery is damaged.	Repair or replace
		② Low level of the electrolytic solution	Add electrolytic solution
		③ Foreign matters in the electrolytic solution	Replace electrolytic solution

## 7. Use, maintenance and charge of the storage batteries

### 7.1 Initial charge

**Note: The charging environment requires good ventilation and there should be no open flame, otherwise an explosion may occur.**

- 7.1.1 Initial charge should be conducted for batteries that have never been used. Before the initial charge, the surface of the batteries should be cleaned, and the batteries should be examined for damage. The bolts should be tightened to ensure reliable connection.
- 7.1.2 Pull out the sealing cover and replace it with the open cover type liquid hole plug and open the cover.
- 7.1.3 When the charging equipment is able to operate normally, pour the sulfuric acid electrolytic solution with a density of  $1.260 \pm 0.005$  (77°F) and a temperature of lower than 86°F into the batteries. The liquid surface should be .6-1in higher than the protective board. In order to reduce the temperature rise caused by chemical reaction of the electrolytic solution and let the electrolytic solution fully penetrates into the pores of the polar plates and the baffles, the batteries should be placed still for 3-4 hours, not exceeding 8 hours. The initial charging can only be conducted when the temperature of the solution reduces to below 95°F. (When necessary, the batteries can be put into cold water for temperature reduction). After the still placement, if the surface of the solution is reduced, electrolytic solution should be added.
- 7.1.4 The sulfuric acid electrolytic solution is prepared with battery sulfuric acid complying with the state standard GB4554-84 and distilled water. Never use industrial sulfuric acid and running tap water. The standard temperature (77°F) and density of the electrolytic solution can be converted as follows:

$$D_{25} = D_t + 0.0007 (t - 25)$$

Where:  $D_{25}$ : the density of the electrolytic solution at 25°C  
 $D_t$ : the actual density of the electrolytic solution at a temperature of t °C.  
t: temperature of the electrolytic solution when testing the density.

- 7.1.5 Sweep the electrolytic solution on the surface of the batteries and connect the positive and the negative poles of the battery group respectively with the positive and the negative ends of the DC power supply (charger). Turn on the power supply. First charge with 18A (the first stage current,); when the voltage reaches 28.8V ( $12 \times 2.4V = 28.8V$ ), change to the second stage current 9A and continue to charge. The temperature of electrolytic solution during the process of charging must not exceed 113°F and when it is close to 113°F, the charging current should be reduced by 50% or the charging should stop temporarily. Wait till the temperature reduces to 95°F to continue the charging. The charging time, however, should be properly prolonged.
- 7.1.6 Fully charged basis: When the voltage during the second stage charging reaches 31.2V ( $12 \times 2.6V = 31.2V$ ), the variation of the voltage is no greater than 0.005 (V); the density of the electrolytic solution reaches  $1.080 \pm 0.005$  (77°F), no obvious variation in 2 hours and there are fine air bubbles appear violently, it can be deemed that the batteries are fully charged. The charged power capacity is 4-5 times of the rated capacity, and the charging time is about 70 hours.
- 7.1.7 In order to accurately control the sulfuric acid content of the electrolytic solution density of the batteries should be examined during the last period of charging. If there is inconsistency, adjust with distilled water or sulfuric acid with a density of 1.40. The electrolytic solution density and the liquid surface should be adjusted to the stipulated value within two hours in the charging state.

- 7.1.8 After the initial charging is completed, the surface of the batteries should be cleaned. Close the cover of the open cover type liquid hole plug and then the batteries can be used.

## 7.2 Use and maintenance

- 7.2.1 In order to guarantee the service life of the batteries, the batteries in use should be fully charged. Insufficiently charged batteries must not be used. During the process of use, close attention should be paid to the discharge extent. Over discharge is prohibited---the voltage reduces to 1.7V per battery (when the total voltage reduces to  $1.7V \times 12 = 20.4V$ ). When the density of the electrolytic solution reduces to 1.17, discharging should be stopped, and charging should be conducted at once. The batteries should not be placed idle for a long period of time. The supplementary charging frequently conducted during the process of use is called common charge.
- 7.2.2 Common charge: The first stage current of common charge is 26A and that of the second stage is 13A. The charging method is the same as that of initial charge. The charged volume is 130-140 % of the discharged volume and the charging time is about 15 hours.
- 7.2.3 The batteries in normal use should avoid over-charge, but over-charge must be properly conducted for the batteries in following situations, i.e. equalizing charge.
- The “lag-behind” batteries--- batteries with a voltage lower than that of the other batteries in the discharging process and the batteries having been repaired for failure. (When equalizing charge is conducted, the positive and negative poles of the “lag-behind” battery should be respectively connected with the positive and negative ends of the charger, the DC power supply, and the charge should be conducted independently.).
  - Equalizing charges should be conducted for the batteries in normal use every 2-3 months.
  - Equalizing charges should be conducted for the batteries that have not been used for a long period of time before use.
- 7.2.4 Equalizing charge
- Charge with a 4A current
  - When the charge voltage reaches 31.2V ( $12 \times 2.6V = 31.2V$ ) and air bubbles occur in the electrolytic solution, the current should be reduced by 50% (2A) and continue to charge.
  - When the batteries are in the state of fully charged, stop for 0.5 hour and charge again with a 1A current for one more hour.
  - Stop for another 0.5 hour and charge with a 1A current for another one hour.
  - Repeat according to item d till air bubbles occur violently in the batteries once the charger is switched on.

## 7.3 Storage

- 7.3.1 Batteries should be stored in a clean, dry and well-ventilated warehouse with a temperature of 5-40°C. The valid shelf life is 2 years. The batteries should be kept according to the following requirements during storage:
- No direct sunshine on the batteries and at least 2m away from heat source.
  - Avoid contacting any harmful substances. No metallic matters are allowed to drop into the batteries.
  - The batteries should not be placed upright down and should not be impacted mechanically or heavily compressed.
  - The batteries must not be stored with electrolytic solutions. When it is required in a special situation that the batteries must be stored with electrolytic solution, the batteries should be fully charged and the density and the liquid surface of the electrolytic solution should be adjusted to the stipulated values. When the storage period comes to one month, the batteries should be complementarily charged with the common charge method.

## 8. List of accessories, spare parts

SN	Name	Use position	Type & specification	Quantity
1	Key to the electric lock	Unlock the electric lock		2
2	Charging plug and socket	Matched with the charger		1 set
3	Fuse	Electric equipment	200A	1
4	DH sealing ring	Oil cylinder	160A	1

## 9. Packaging & transportation

The stacker is packed with a pallet. During transportation, turnover and upside-down are not allowed. Collision is not allowed when lifting and loading onto the stacker. Do not damage the outward surface of the stacker when opening the package.

## 10. Warning (points for attention)

10.1 Read the manual carefully before the operation and know well the performances of the stacker.

10.2 It is strictly forbidden to press the lift or lower buttons while the stacker is walking and frequently switching the two buttons, which might damage the stacker and the goods.

10.3 Do not shake the lever rapidly or with high frequency.

10.4 It is not allowed to rapidly put heavy goods onto the forks.

10.5 The stacker should not be overloaded. When overloaded, the stacker will not be able to operate normally.

10.6 The center of gravity of the goods should be placed between the two forks, otherwise, the forks will be damaged, and the goods will fall down in the process of operation.

10.7 Loose and unstable goods are not allowed to load onto the stacker.

10.8 Do not put the goods on the forks for a long period of time.

10.9 Turning rapidly on narrow roads is strictly forbidden. In order to ensure the safety of the people and goods, the stacker should turn slowly into this situation.

10.10 When the stacker is not in use, the forks should be lowered to the lowest position.

10.11 Never put any part of the human body under heavy goods and forks.

10.12 The stacker is applicable for use on plane ground and should never be parked on slope for a long period of time.

10.13 Over-load or over-slope operation is strictly forbidden. Otherwise, the wheel will slip, damaging the wheel and the motor. The safety of people and goods will be affected as well.

10.14 Repairing on one's own before training is forbidden.

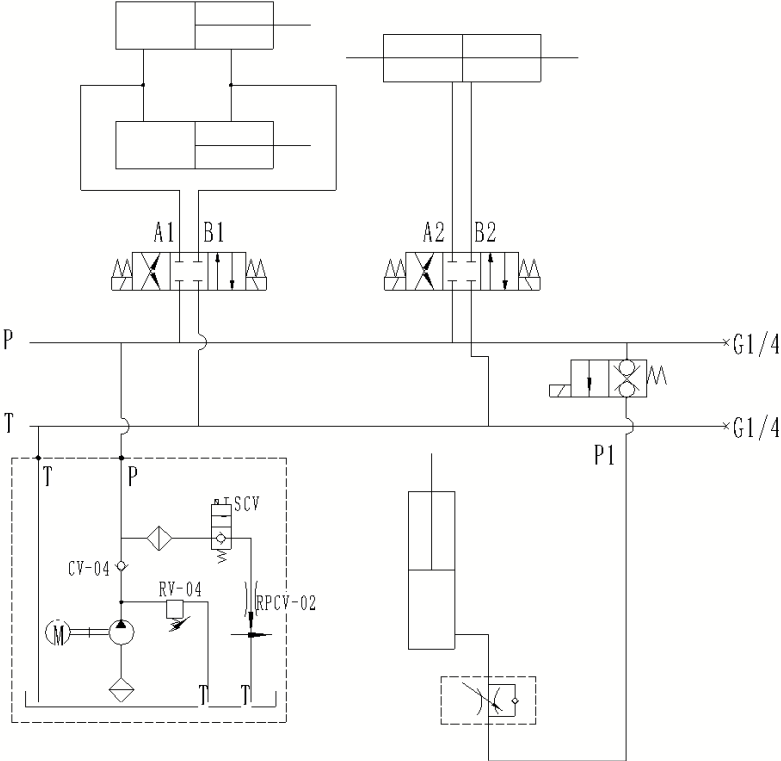
10.15 Operation of the stacker under the stipulated voltage 20.4V is strictly forbidden.

10.16 It is strictly forbidden to directly connect the plug with AC power supply for charge.

10.17 When the lifting height is over 19.in, the truck should be moved at the lowest speed and the walking distance cannot be over 6.6ft.

# 11. The “principal diagram of hydraulic system” and “principal diagram of electrical system”

## 11.1 “The principal diagram of hydraulic system”



11.2 "principal diagram of electrical system"

