

# The Specification

## EK13A /EK15A-3 Wheel Electric Forklift

Note: Before using must read this manual and the various warning label!



# Contents

I. Introduction .....	3
1.1 Summary .....	3
1.2 Parameter .....	3
II. Structure and working principle .....	5
2.1 Basic structure .....	5
2.2 Working principle.....	6
2.3 Electrical principle .....	8
2.4 Hydraulic principle.....	10
III、 Safety operation and matters needing attention .....	11
3.1 General rule.....	11
3.2 Storage and transportation.....	11
3.3 Check before using .....	12
3.4 Operation specification .....	12
3.5 Safe Operation Rules .....	15
IV、 Maintenance and Service Manual.....	17
4.1 Repair and maintenance of safety procedures.....	17
4.2 Routine Maintenance (Before every shift).....	18
4.3 Professional Maintenance Manual .....	19
4.4 Maintenance, Recharging and Replacement of the accumulator .....	21
V、 Service Manual.....	27
5.1 Troubleshooting.....	27
5.2 Preparation before repair.....	28
5.3Check hydraulic oil level .....	28

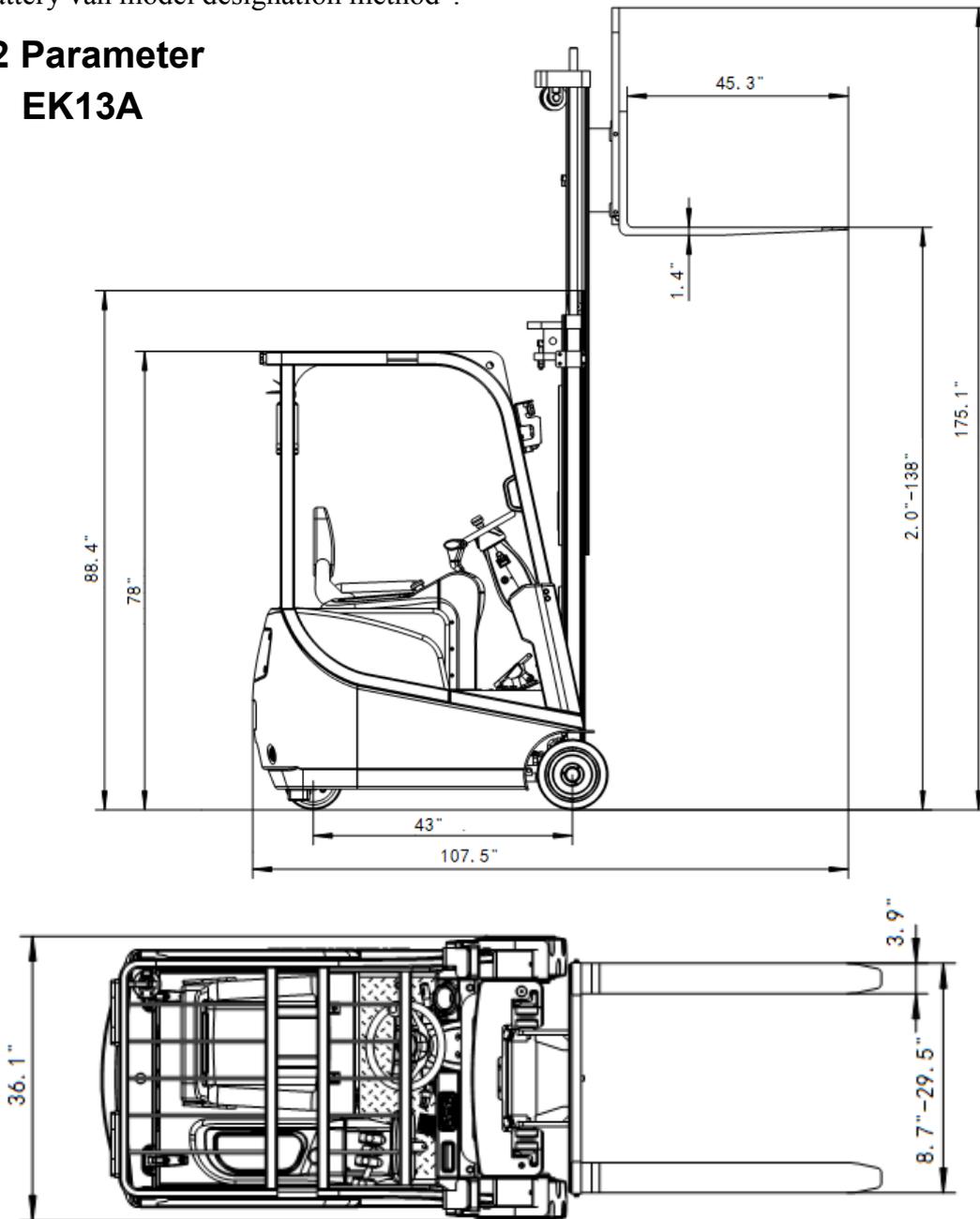
## I. Introduction

### 1.1 Summary

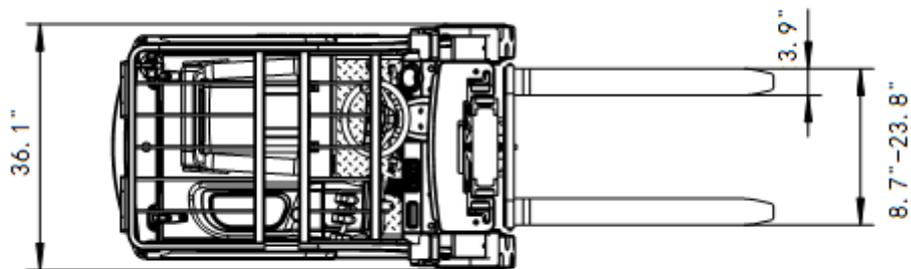
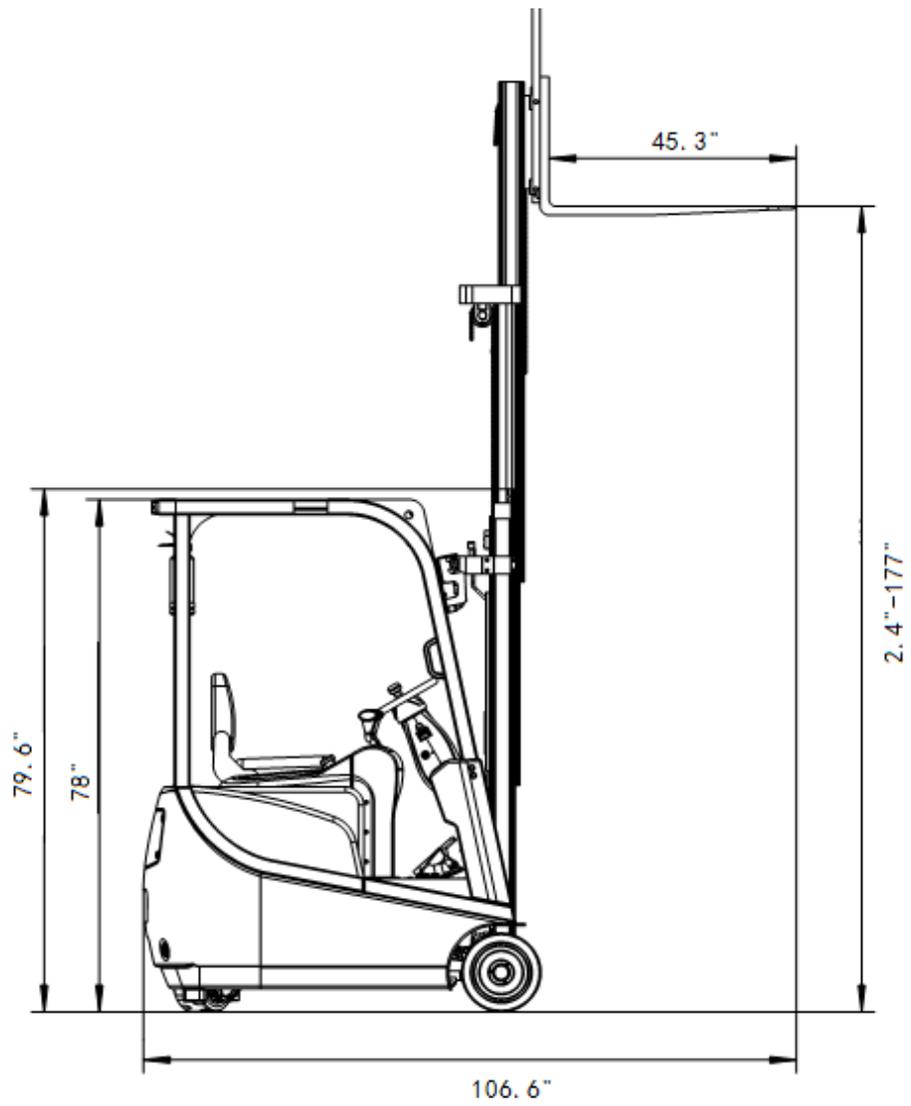
This manual combines the whole EK13A & EA15A Series 3300lb three-wheel counterbalanced electric forklift (hereinafter referred to as "forklift").

Forklift models " EK13A & EK15A rated load 3300lb, in line with JB / T8452 -1996 "Battery van model designation method".

### 1.2 Parameter EK13A



# EK15A

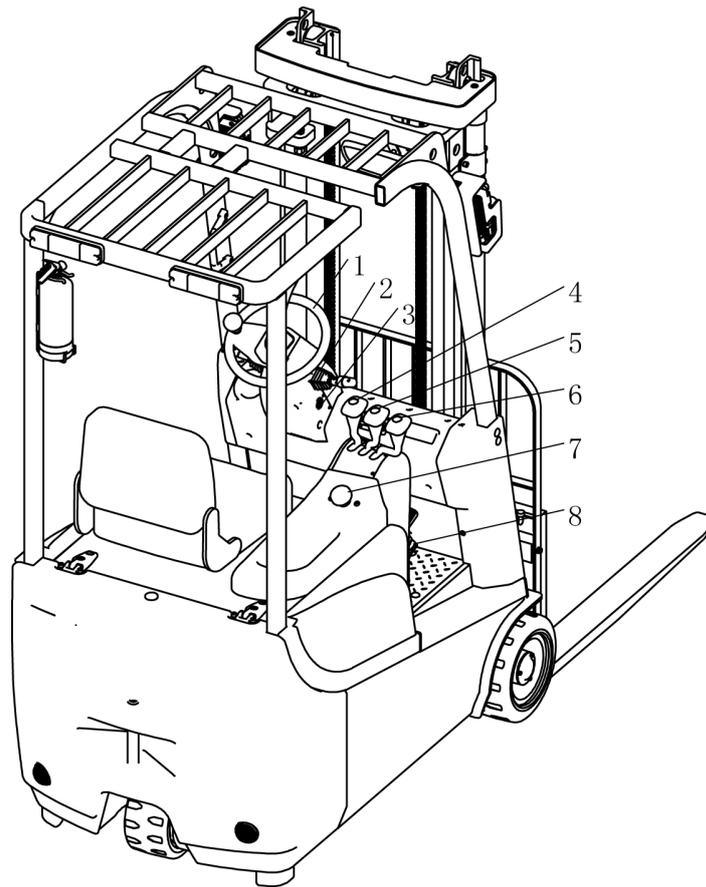


Model		EK13A	EK15A
Load capacity		Power	Power
Operator type		Seat	Seat
Load capacity	(lb)	3000	3300
Load center distance	(in)	24	24
Wheel base	(in)	43	43
Lifting height	(in)	138	177
Lowered mast height	(in)	88	79.6
Mast/Fork carriage tilt forward/backward	(°)	2/5	2/5
Overall length	(in)	105	106.6
Overall width	(in)	36	36
Fork size, Thickness/Width/Length	(in)	1.4/4/45.2	1.4/4/45.2
Fork adjust width	(in)	8.7-29	8.7-29
Turning radius	(in)	53	53
Max.gradient performance, laden/unladen	(%)	6/8	6/8
Lift speed,laden/unladen	(in/s)	4/5.5	4/5.5
Lowering speed,laden/unladen	(in/s)	5.3/4.7	5.3/4.7
Charger		24V/50	24V/50
Driving Motor		AC 24V/2.0kw	AC 24V/2.0kw
Lifting Motor		24V/2.5kw	24V/2.5kw
Battery voltage		24V/350AH(Side)	24V/400AH(Side)
Service Weight	(lb)	5200	5665

## II. Structure and working principle

### 2.1 Basic structure

The power source for forklift is battery. Forklift uses electric and hydraulic to control, realizing walking, forks lifting and lowering, mast tilt forward and backward, steering and other movements. The basic structure shown in FIG.



- 1.Steering wheel, 2.Combination Switch , 3.Key Switch , 4.Lifting handle  
5.Tilting handle 6.Side shift handle 7.Emergency stop switch 8.Accelerator

## **2.2 Working principle**

### **2.2.1 Walking system**

The batteries provide energy to forklift for walking. With frequency conversion system, it converts DC into AC, by controlling the AC motor drive on driving wheels. AC motors through gear box convert the high-speed low torque into a low speed high torque, and ultimately by the drive wheel to perform the action. Walking speed is controlled by frequency control motor, there is an accelerator control.

Gear box is filled with enough gear box oil at the factory. Under normal circumstances, the gear box oil is replaced every 1000 hours.

If there is abnormal sound in gear box during using, the user should immediately stop the forklift to determine whether the bearing or gear is damaged. Continue to use only after replacement.

### 2.2.2 Steering system

The steering of forklift is controlled by the steering wheel through the steering reduce gear unit, led by a steering sensor sending a signal to steering motor. The steering column for steering shaft tilts back and forth a certain angle. So that the driver can adjust it to appropriate location, to meet different needs.

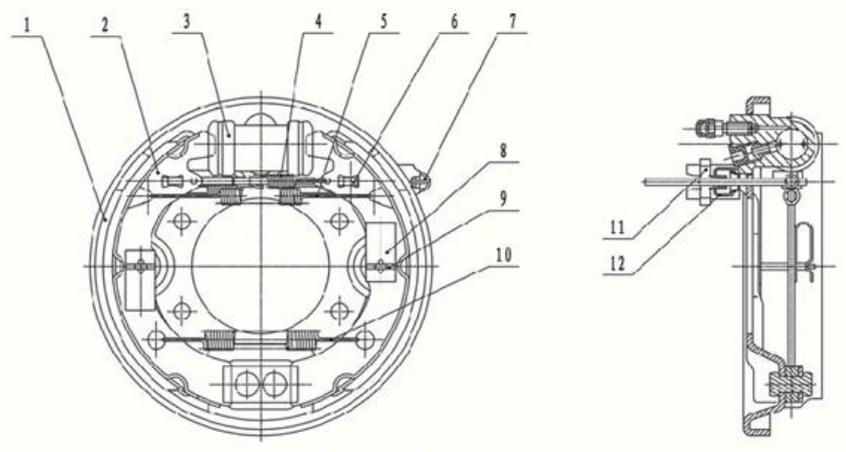
### 2.2.3 Braking system

The braking system for forklift is combined by brake system and parking brake.

Brake means braking the truck during operation, by using the foot brake.

When the brake cylinder sends the same force to the main brake shoe and vice brake shoe to suppress brake drums until the top of vice brake shoe against the fixing pins, the brake shoes move to the rotation direction of brake drum. After against fixing pins, friction between brake drum and friction plate is increased. Since the main brake shoe gives the vice brake shoe a much larger pressure than the one for brake cylinder, resulting in a lot of braking force.

Double shoes brake is mounted on both sides of the drive axle. Brake consists of two groups of brake shoes, brake cylinder and regulator. One end of the brake shoe is in contact with the fixed pin, and the other end is in contact with the adjusting means. The return spring and compression spring rod suppress the parking brake lever unit. In addition, the brake is also assembled the parking brake mechanism and automatic adjustment device.



## Brake

1. Left baseboard 2. Brake shoe 3. Brake cylinder 4.adjustable Spring  
5.return spring 6. Hand brake adjusting mechanism 7.hand brake return spring  
8.spring tab letting 9.pressure lever 10.tension spring 11.pull rod  
stop block 12.Jaw dust cover

The parking brake is mainly used for parking state, to prevent accidents caused by slip slope. Equipped with a limit switch on the parking brake, the control circuit is closed under a parking state. The parking brake must be released before starting to walk, only after that the control circuit can be switched on. The parking brake has adjustable elastic function.

### **2.2.4 Operating system**

The main working part of the forklift is forks. The forks realize the loading and unloading, stacking and short-distance transportation for pallets or cargo.

Forks mounted on the carriage, by chain drive or inner mast moves up and down, the carriage makes the goods off the ground or stacked on shelves. The chain transmission and inner mast overall movement are achieved by the stretching of the lift cylinder. Forklift operation process is achieved by stretching of the control cylinders (including tilt action).

Cylinder movement is controlled by a manual valve stem, and the pressure oil is provided by the pump station.

The safety valves in the circuit of lifting cylinders and tilt cylinder slow down the speed of mast lifting and falling or tilting forward, which ensures the safety drop.

## **2.3 Electrical principle**

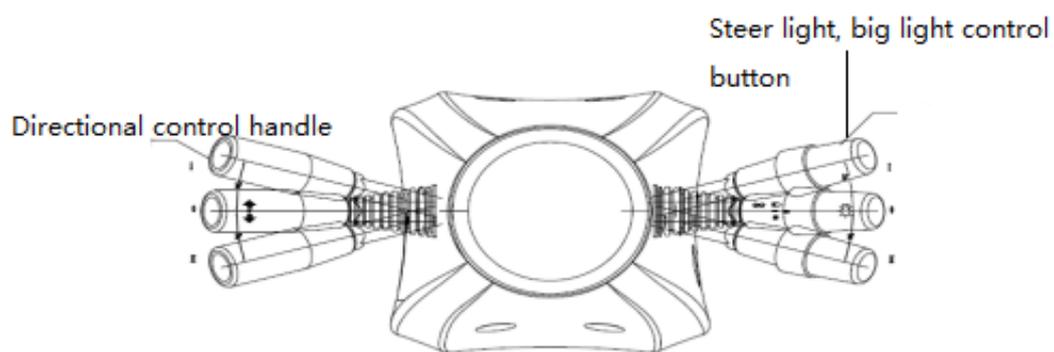
### **2.3.1 Electrical system**

Forklift electrical system includes walking and operation control, and lighting. Forklift adopts America CURTIS1232 AC control assembly.

Instrument has the indicator for power display, slowing down of mast lifting, parking and working time display function. When the battery power is too low, the power meter will cut off the control circuit of pump motor. The forklift cannot raise but only walk, which means the forklift should be charged immediately.

Oil pump motor is a DC motor with five-minute working system, so pump motor is not suitable for long continuous operation. The vertical movements should have time interval, should not be continuous, otherwise it causes the motor to heat, or even burned.

Special Note: When the forklift is used for a long time, pump motor starter may have fault. The performance is that the starter cannot pull back or cannot be disconnected. The latter one is acted as no pulling the multi-way valve control lever, pump motor will keep turning. The forklift should be stopped immediately, turn off the power (unplug the battery plug-in), so that the pump motor stops, and timely replacement starter.



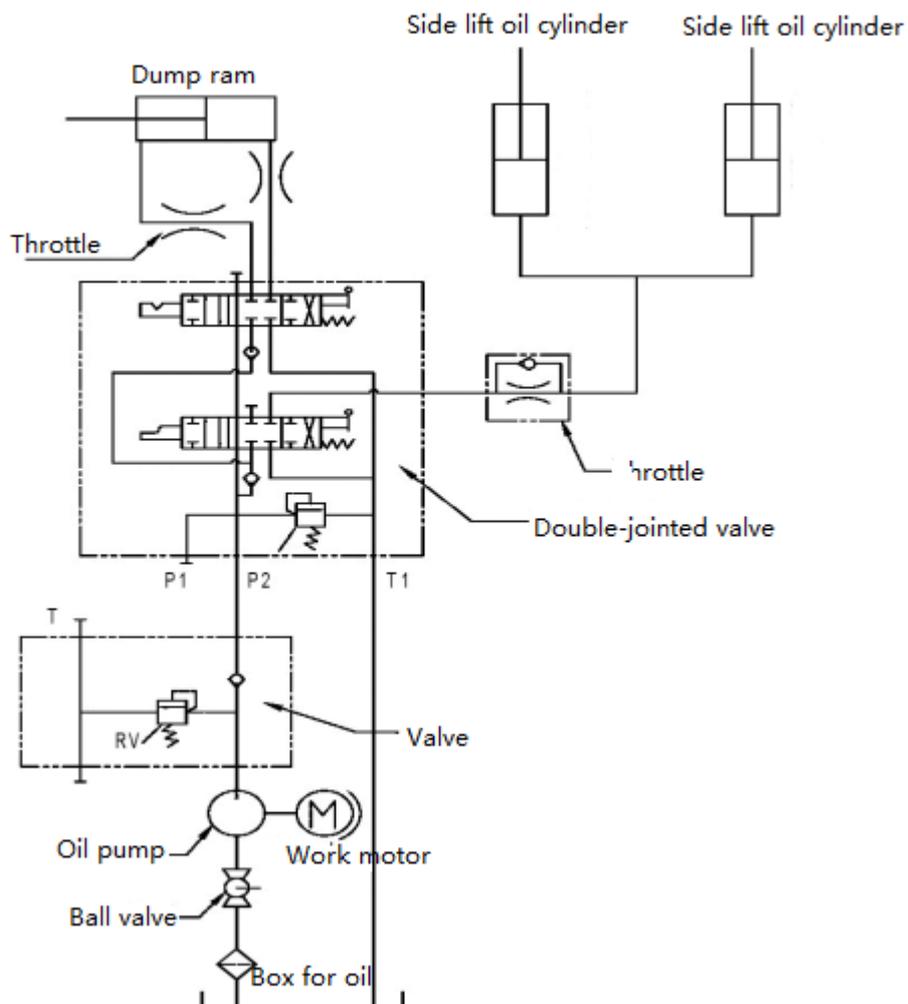
The forklift is equipped with front headlights, rear lights, reversing horn and other safety and lighting devices

The switch groups

## 2.4 Hydraulic principle

Pump motor driven gear pump provides hydraulic power; Two lifting cylinders are responsible for the fork lift; a tilt cylinder is for the mast tilt movements. The oil-way for Lift-lower and tilt is controlled by two handles on the double valve, the lifting and lowering action is controlled by a single-acting oil-way on the passage double valve, while tilt motion is controlled by a double-acting oil-way on the double valve passage. The hydraulic system pressure for this forklift is adjusted only on double valve, which has been debugged in the factory. If you're not our after-sales employee or professional repair staff, it is not allowed to adjust, in order to avoid accidents.

Hydraulic principle FIG.



## **III、 Safety operation and matters needing attention**

### **3.1 General rule**

**3.1.1** The operator must have a forklift operation qualification which proved by the relevant departments of the training before driving forklift truck.

**3.1.2** The operator must read the instructions before use all of the content, after fully understand operation method can drive forklift.

**3.1.3** Forklift trucks must not carry passengers.

**3.1.4** Operators should pay special attention to when homework operating environment, including other people nearby and fixed object.

**3.1.5** Without the manufacturer's approval, shall not modify, add or remove the forklift parts, lest affect performance of forklift.

### **3.2 Storage and transportation**

**3.2.1** Use container or car should pay attention to at the time of shipment:

① Front and rear wheels with wedge, begin to pull up the parking system, prevent sliding in the process of transportation;

② Using the lasso, not placed in the weak structure of the forklift truck;

③ When the forklift is used, keep the forklift truck's center of gravity in the intermediate position of the two goods forks.

**3.2.2** When forklift doesn't work, should be parked in a dry ventilated cleaning warehouse, prevent weathered. And:

① Close electric lock, and make the safety switch power, unplug the power plug;

② Begin to pull up the parking system, front and rear wheels with block mat;

③ Such as discontinued for a long time, battery should be added once every 15 day electricity.

### **3.3 Check before using**

**3.3.1** New car if there is any damage in transit, please don't be put into use, and promptly get in touch with the supplier, do proper processing.

**3.3.2** New cars in the factory run parts has been filling lubricating oil, hydraulic oil tank has been listed.

**3.3.3** Forklift truck equipped with battery. The battery is charged before leaving factory. If leaving the factory for a long time, may the battery is low. Before use should pay attention to electricity meter shows that when the electricity meter display to the last two warning, must charge at once. Every day before using, or before charging, should open the battery blocks, check the liquid level height, such as liquid level is too low to add distilled water in charge.

### **3.4 Operation specification**

Before operating the forklift, please be familiar with the dashboard function of each switch/button.

**3.4.1** Start, run and parking:

① Insert the key into the key switch, turn to the right, the emergency power safety switch clockwise reset, gently open the control circuit.

② The fork rises from the ground about 10 cm.

③ Begin to loosen parking system.

④ According to the requirements in the direction of the forward or backward direction of switches.

⑤ On the accelerating pedal slowly, until the required speed.

⑥ In the process of operation, forklift exception occurs fault, need to quickly cut off power supply, please press the red emergency power switch.

⑦ When forklift driving turn, should reduce speed, where possible, try not to turn.

⑧ Forklift truck carrying gradeability is 10%, so the uphill slope need to understand the situation, when climbing the forklift must accelerator pedal pressed down as far as possible, the maximum climbing force can be achieved.

⑨ Forklift in the process of downhill, loosen the accelerator pedal, in order to obtain the reverse braking current, if the reverse current can't control the downhill braking speed. Please on the brake pedal at the same time, to ensure safety.

⑩ When stopping driving f, leave the accelerator pedal, right foot on the pedal until the forklift stop completely. Put the pallet fork in the lowest position, taut hands in the car, press the safety switch, pull out the key.(Note that can't leave without a taut hand brake lever forklift).

### **3.4.2 The steering wheel Angle adjustment**

According to the individual operating habits, steering wheel angle can be adjusted . Adjustment method is as follows: Loosen the left hand of direction column, adjust the steering wheel to the right position, then lock regulating handle.

### **3.4.3 Accelerator pedal operation**

Determine the vehicle forward or backward. Toggle joystick in place, right foot will tread the foot pedal accelerator to make the vehicle slowly forward or backward. Continue down the pedal, the vehicle's speed to speed up. Started never put foot accelerator jammed on to the end, in order to avoid the vehicle out of control.

### **3.4.4 Brake pedal operation**

When the vehicles need parking in moving , loosening the foot accelerator, Will move to the right foot on the brake pedal in the middle to depress and the vehicle will stop after .

### **3.4.5The using of emergency power safety switch**

When vehicles out of control on the moving or having smoking and anxious burnt flavor in the using, please pressed emergency switch on the dashboard shut off. Find out the reason and clear fault than to open. The method of the opening: turn the red button as clockwise, pop-up button up, open end.

Emergency power switch button for plastic parts, press down or clockwise not too hard, so as not to damage the switch.

#### **3.4.6 The use of speakers and reversing speakers**

For the safety of driving, vehicle equipped with speakers and reversing speakers. To remind others when driving, the steering wheel in the middle of the horn button, when walking vehicle reversing, reversing the horn alarm sound will start automatically alert pedestrians.

#### **3.4.7 The operation of the hydraulic control rod**

Hydraulic control rod is for hydraulic transmission parts distributor of different needs, there are two files, joystick is divided into the following functions:

(1) Pallet fork lift lever: a. fork to ascend (after); b. fork remains; c. fork lower (push)

(2) Tilt lever: a. hypokinesia (after); B. stay in situ; C. forward (push)

Every joystick can only manipulate a hydraulic circuit. Joystick when dial, with micro switch will start the oil pump motor rotating at the same time, the output pressure of hydraulic oil, make the related hydraulic components. In order to ensure the safety of hydraulic system pressure, the hydraulic valve block is equipped with pressure relief devices, once set pressure exceeds standard, control valve block automatically unloading overflow.

Note: the pressure of the hydraulic valve block device, cannot adjust at will!

#### **3.4.8 Battery capacity indicator**

The dashboard for forklift battery capacity has capacity display function, can also use electricity time statistics (cumulative hour).

#### **3.4.9 Handling stacking operation**

(一) How to transport the goods pile on weight

Will forklift drive to the front of the items which need to carry slowly , make fork parallel to the ground, lifting the fork to height, it can be inserted into the freight

insert goods fork and move forward slowly, when the goods completely inserted into the goods after parking and stepping on the brakes, manipulating ascend handle, the heavy lifting to a certain height, make the door frame lean back, slowly astern, don't touch the adjacent goods, when weight completely left the heap of goods, reduce the goods to the right position, then walking for handling.

(二) The weight on the heap of goods

Will weight low, lean back door frame, to storage goods moving close to the pile of deceleration, when determining forklift with pile goods into a linear state, stepping on the brakes slowly adjust the door frame Angle to the vertical state, increase the weight will be slightly more than goods pile height, and then slowly driving forklift driving forward to pile top stop. Heap controls control lever slowly, once handling stacked drags the weight, the goods fork to the hollow position, from the weight of the goods fork, make sure barrier-free backward position, can retreat. After goods fork out weight reduce goods fork, door frame round of the reentry after handling operation.

## 3.5 Safe Operation Rules

**3.5.1 Requirements for drivers:** The forklift must be operated by a trained staff. He can demonstrate the operation of the goods to the users, and can clearly guide the user how to operate the forklift.

**3.5.2 Drivers' rights, obligations and responsibilities:** Has been trained by the operation of the vehicle, the driver must be clear of his rights and obligations; and he is familiar with the contents of the relevant operating instructions. If the vehicle is pedestrian, the driver must also wear safety boots.

**3.5.3 Prohibit unauthorized personnel to operate:** the driver is responsible for the vehicle at work. He must prevent unauthorized persons from driving or operating this vehicle. It is forbidden to use the vehicle to transport or lift personnel.

**3.5.4 Malfunctions and defects:** There is any malfunction or defect for the vehicle, must immediately inform management. If the vehicle cannot be safely operated (e.g.: wheel wear or brake failure), then it must stop using until it is fully repaired.

**3.5.5 Safe operation and environmental protection:** inspection and maintenance must be performed in accordance with the time intervals on the maintenance list.

Parts of the vehicle cannot be changed without any permission, especially safety devices. The operating speed of the vehicle is not allowed to change.

All original spare parts have been verified by quality assurance department. To ensure the safety and reliability of the operation of the vehicle must use only the manufacturer's spare parts. The old parts, such as oils and fuels must be handled in accordance with the relevant environmental protection rules.

**3.5.6 Hazardous area:** Hazardous area usually refers to the following range: vehicle or its load lifting devices (e.g. fork or accessories) is dangerous for personnel when running or lifting movements, or the ongoing regional transport loads. Typically, this range extends to the load or vehicle accessories landing area.

Unauthorized personnel must be asked to leave the dangerous zone. As long as the situation might cause some kind of damage, the driver must give a warning, if the driver asked the person to leave but did not leave the danger zone, the driver must immediately stop the vehicle

**3.5.7 Risk environment:** When working in high-risk environment, you must have a special design to be protected

The vehicle was not specially designed for the high-risk environment.

**3.5.8 Safety devices and warning signs:** Safety devices, warning signs and warning notes described in the previous operating instructions must be taken seriously enough.

**3.5.9 Driving in public places:** the vehicle is forbidden to drive in public places other than special areas.

**3.5.10 distance between vehicles:** Keep in mind that the vehicle in front could suddenly stop at any time, so please keep an appropriate distance.

**3.5.11 headroom:** When the headroom is below the cargo or mast, it is prohibit using the vehicle.

**3.5.12 the use in the elevator and loading platform maneuvering:** if there is sufficient loading capacity, does not affect the operation of the vehicle, and agreed by the user of the vehicle, lift and loading platform that can be used for vehicle transport. Before entering the elevator or loading station, driver must personally identify. The goods must be placed in front and occupy an appropriate place, when the vehicle enters the elevator, so as not to contact with the walls of the elevator. When personnel and vehicles take the elevator together, personnel must enter after the vehicle safety entered, and personnel must leave before the vehicle.

**3.5.13 with access and working area:** The vehicle must be operated on the specified channel, all the non-related personnel must leave the work area, and cargo should be stacked in designated places.

**3.5.14 Operations Management:** traveling speed must be adapted to local conditions. When through the corners, narrow passage, swing doors and closed place, the vehicle must slow down. Drivers must be able to visually an adequate braking distance between the vehicle and the vehicle in front, and he must remain in control of his vehicle. Sudden stop (unless urgent needs), rapid U-turn, chased each other in the channel is not allowed in not smooth places. It is forbidden to operate while the body is lean outside.

**3.5.15 Visibility:** The driver must look in the direction of travel, to ensure that the front situation is clearly visible. When the vehicle is backing up with the carriage of goods blocked the line of sight, there is must be a second person walk in front of the vehicle to give appropriate guidance and warnings.

**3.5.16 via the ramp:** Only known ramp was allowed to go through. While the ramp should be clean, non-slip, and the vehicle technical specification includes the ramp. The goods on the forks must face uphill. It is forbidden to turn back, move diagonally or park on the ramp. The driver must slow down when going through the ramp, and prepare to brake at any time.

**3.5.17 ground load:** Remember to check the load pressure of the body weight or wheels on the ground does not exceed the capacity of the ground, when the vehicle is in operation.

**3.5.18 Vehicle Change:** any possible changes or modifications for rated load, stability or safe operation of the vehicle, must obtain prior written approval from origin manufacturers or its successor. After vehicle manufacturer check and approve the changes, nameplates, labels and markings of Operation and Maintenance Manual must be modified as well.

## **IV. Maintenance and Service Manual**

### **4.1 Repair and maintenance of safety procedures**

**Maintenance technician:** The maintenance and service should only be performed by special personnel trained by the manufacturer. After the technician sent by after-sales

department of the manufacturer completed maintenance and servicing work, they should sign on the service log.

**Cleaning Operation:** Flammable liquid cannot be used for cleaning the forklift. Before cleaning, take safety precautions to prevent electric sparks (e.g. sparks caused by short circuit). When operating the accumulator, connectors on it must be disconnected. Use soft air suction or compressed air, non-conductive and anti-static brushes to clean electric and electronic components.

**Operation of Electric System:** Operation on the electric system should only be performed by specially trained personnel. Before performing any operation on the electric system, precautions must be made to prevent electric shock. When operating the accumulator, connectors on it must be disconnected.

**Installation:** When repairing or replacing hydraulic components, electric and electronic components, make sure to install them back to their original positions.

**Wheels:** Quality of the wheels has significant effect on stability and driving performance of the stacker. Modification on wheels can be performed only with the approval from the manufacturer. When replacing wheels, ensure that the stacker is levelled as delivery state(wheels must be replaced in pairs, i.e. replace right wheel together with left one).

**Lifting chain and rollers:** Chain and rollers will be worn quickly without good lubrication. Perform periodic lubrication according to following maintenance table. Shorten the lubrication period under adverse operation conditions (such as in dusty and hot environment).

**Hydraulic oil pipe:** The oil pipe must be changed every 6 years. When change the hydraulic assembled parts, the oil pipe should be also changed.

## **4.2 Routine Maintenance (Before every shift)**

4.2.1 Check the liquid level of electrolyte in the accumulator.

The liquid level will be higher when being recharged.

4.2.2 Check every pole, every cable and their covers.

4.2.3 Check if the accumulator box is secured.

4.2.4 Check the forklift for oil leakage.

4.2.5 Check the chain, rollers, fork, oil pipes and horn.

4.2.6 Check the brake.

4.2.7 Check the wear and tear of drive wheels and loading wheels.

## 4.3 Professional Maintenance Manual

It is very important for safe operation of the forklift to perform overall professional maintenance. Failure in performing maintenance according to specified interval may cause malfunction of the forklift, and potential risk to human and equipment.

Maintenance periods listed in this manual apply to single shift a day under normal operation conditions. If using in dusty environment, the ambient temperature varies remarkably or in multi-shift situation, the maintenance period has to be shortened.

Maintain the stacker according to following maintenance list. Maintenance periods are as follows:

W1 = Every 50 work hours, but at least once a week.

M3 = Every 500 work hours, but at least once every three months

M6 = Every 1000 work hours, but at least once every six months

M12 = Every 2000 work hours, but at least once every 12 months

Additional operations should be performed in trial run period:

(In initial 50 – 100 working hours or after two months)

— Check the nuts on the wheels, and tighten them if necessary.

— Check the hydraulic components for leakage, and tighten them if necessary.

— Replace the hydraulic filter.

# maintenance

		Time interval of maintenance				
		Standard: ●	W	M	M	M
		Cool storage: #	1	3	6	9
Chassis&Main frame	1.1	Check all bearing parts for damages		●		
	1.2	Check all bolt connections		●		
Driver	2.1	Check the drive system for noise and leakage		●		
	2.2	Check oil level in drive system		●		
	2.3	Replace lubricant oil			#	●
Wheels	3.1	Check for wear and tear		●		
	3.2	Check the bearings and make sure they fit well with the wheels		●		
Steering system	4.1	Check the steering control		●		
Braking system	5.1	Check the performance and adjust accordingly	#			
	5.2	Check reset function of the air spring, and check for leakage and damages		●		
	5.3	Check the brake disk for wear		●		
	5.4	Check the connection of brake and adjust if necessary		●		
Lifting Mechanism	6.1	Check performance and wear, and adjust accordingly		●		
	6.2	Visually inspect the loading wheels for blockage		●		
	6.3	Check fork tips and pallet support for wear and damages	#			
Hydraulic system	7.1	Check performance	#			
	7.2	Check all connections for leakage and damages	#			
	7.3	Check the cylinder for leakage and damages and if the accessories are safe and	#			
	7.4	Check the oil level.	#			
	7.5	Replace hydraulic oil and the filter element			#	●
	7.6	Check the pressure regulator valve			#	●
Electric system	8.1	Check performance		●		
	8.2	Check all cable connections for safety, reliability and damages		●		
	8.3	Check if the amperage of fuses is proper				
	8.4	Check if the switches and release cam mechanism is secure and functions properly		●		
	8.5	Check the connectors and replace worn parts if necessary				
Motor	9.1	Check the carbon brush for wear		●		
	9.2	Check safety of additional devices of motor		●		
	9.3	Use a vacuum to clean motor frame. Check the commutator for wear		#		
Accumulator	10.1	Check the density of acid liquid, capacity and voltage of the accumulator	#			
	10.2	Check the safety devices on terminals and the grease	#			
	10.3	Clean the connector of accumulator and check the connection.	#			
	10.4	Check the cable for damages, replace if necessary		●		
Lubricant oil	11.1	Grease the stacker according to time table for filling up lubricant	#			
	12.1	Check the grounding connection of electric system				●
	12.2	Check the travelling speed and braking distance				●

General Test	12.3	Check the lifting and lowering speed				●
	12.4	Check the safety device and switch off devices		●		
Trial	13.1	Perform trial run under rated load		●		
	13.2	The stacker is proved to be safe and reliable to personnel after completion of above	#			

## 4.4 Maintenance, Recharging and Replacement of the accumulator

The forklift must be parked in a safe location before any operation on the accumulator.

### 4.4.1 Maintenance Technician

Only qualified technician can perform operations on the accumulator such as recharging, maintenance and replacing. Before operation carefully read instruction manuals including operation manual, replenishment preparation and recharging requirements.

### 4.4.2 Fire Prevention Measures

Never smoke or use open fire when perform operations on the accumulator. The accumulator should be away from flammable material at least two meters when storage or recharging. The location for accumulator storage should be well ventilated and equipped with firefighting devices.

### 4.4.3 Maintenance of the Accumulator

- 1) Keep the nuts on every battery cell dry and clean. Tighten every terminal and cable end and brush them with grease to prevent corrosion. Naked cable ends and terminal posts should be covered with a skid-proof insulating cover.
- 2) Every two cells should be well-connected. Check the nuts on each pole, if loose, tighten the nuts.
- 3) Keep the surfaces of accumulator clean and dry. After the completion of recharging, clean spilled acid with cotton yarns or brush. And clean with wet towel if necessary.
- 4) Over recharging and over discharging should be avoided, and fast charging and insufficient recharging are also not allowed. Otherwise life span of the accumulator may be affected.

- 5) Do not put conductive objects including metal tools on the accumulator, or short circuit or even explosion may be caused.
- 6) Never spill any hazardous liquid or solid material on surfaces of the accumulator. When using a densimeter or a thermometer, make sure the surface is clean and clear.
- 7) Recharge the discharged accumulator in time. Delayed recharging may damage the accumulator. Do not delay recharging more than 24 hours. Recharging of the accumulator may not work outdoors in cold weather. In this case, move it indoors to perform recharging.
- 8) If the accumulator will not be in use for a long time, it should be recharged and discharged once every month and it should be fully recharged every time.
  - 9) During recharging or using, the liquid level of electrolyte lowers because of water evaporation, so pure water should be added. It is not allowed to add electrolyte with a specific weight of 1.280.
- 10) If individual cell fails, identify the cause and repair the cell immediately. Replace the cell when it cannot be repaired.
- 11) The site for recharging should be well ventilated. It is prohibited to smoke or use open fire, avoiding the risk of hydrogen explosion.
- 12) The electrolyte in accumulator is toxic and corrosive. For this reason, always wear working suit and protection glasses to protect your body from contacting the electrolyte in accumulator.
- 13) If your clothes, skin or eyes are spilled with acid liquid in accumulator, flush with large amount of clean water. For skin and eyes, flush with large amount of clean water and also seek doctor's treatment immediately. Acid spillage must be neutralized and treated immediately.
- 14) The weight and dimensions of the accumulator have remarkable effect on stability of the stacker. Therefore do not modify the type of accumulator without approval from the manufacturer.
- 15) Never discharge in large current, for example, performs travelling and lifting simultaneously.

#### **4.4.4 Disposition of worn-out accumulators**

Worn-out accumulators should be recycled according to local regulations, and stored in specified zone or cast-off treatment zone. These works should be done by qualified specialized companies.

#### 4.4.5 Specification of the accumulator

Battery		Charger	
Rated power: 24V	Rated capacity: 350Ah	Input: AC115/230 50Hz	Output : DC24V50A

Uninsulated terminal poles on the accumulator should be protected with an insulated cover. When connecting the accumulator and socket, make sure to stop the forklift and put the switch at position “0”. When replace or install the accumulator, make sure the accumulator is fixed securely in battery box.

#### 4.4.6 Storage, transportation and installation of the accumulator

The forklift must be parked on the level ground steadily. To prevent short circuit, naked cable ends and the terminal posts should be covered with insulated covers. When pulling out the accumulator, properly arrange removed accumulator's connectors and cables without blocking access of the accumulator.

When install or remove the accumulator with a crane, make sure the load capacity is sufficient (weight of the accumulator is marked on both the nameplates of the accumulator and the stacker.) The crane must pull vertically to prevent the battery box from being damaged. The hooks of the crane should be safe and secure. Never let the hooks fall on an individual battery .

- Press emergency stop switch and turn the power supply switch to OFF position
- Remove the connectors of accumulator cables.
- Connect the lifting device to lifting holes.
- Lift out the accumulator from the top and move away with handling equipment.

Perform installation in reverse order of above steps. It is noticeable to put the accumulator in right position and connect the cables securely. After reinstalling the accumulator, always check all cable connections and connectors for obvious damage.

#### 4.4.7 Capacity indicator of the accumulator

Capacity indicator of the accumulator the status of accumulator discharging is indicated on the indicator with 10 bar graphs, each bar represents 10 percent of increment. As the consumption of accumulator capacity, the lighting bars will fall down from the top.

Preset “Warning” marks will appear when remaining capacity of accumulator meets following conditions: When the remaining capacity of the standard accumulator is 30 percent, “Warning” mark will appear and you can recharge the accumulator.

Preset “Warning” mark and a flashing “Stop” mark will appear when remaining capacity of accumulator meets following conditions: When the remaining capacity of standard accumulator is 20%, “Stop” mark will appear and keep lighting. When the “Stop “mark keeps lighting, lifting



Capacity  
sufficient



Recharging  
needed



Low battery

If the indicator shows low battery when lifting loads for a not very long period, lifting function can only be performed after recharging the accumulator to at least 70% of capacity.

#### 4.4.8 Recharging

The EK13A series of forklift is supplied with a special charger for recharging.

A: Read the instruction manual carefully before recharging.

B: The batteries should be recharged in well-ventilated areas. Make sure no metal objects are placed on the accumulator. Check all cable connections and connectors for obvious defects. Observe strictly all safety instructions, e.g. replenishment of the accumulator and preparation for recharging.

C: Hydrogen will be precipitated in the charging process. So the accumulator room should be well-ventilated, and the hydrogen content shall be strictly controlled to ensure safety.

D: For the safety of the cooperation, the forklift should be added protective cover before using.

### **Balanced Recharging**

After using for a period, voltage and concentration may vary from battery to battery. Balanced recharging will eliminate the differences so that the performance of each cell becomes uniformed. In following cases, balanced recharging is necessary: Voltage of an individual cell is frequently below 1.7V; large current occurs during discharging, for example, when using the driving motor and lifting motor simultaneously; for accumulators that are not recharged in time after discharging:

Over discharged accumulators and those are not in use for a long time.

- a、 Recharge with a current of  $0.1I_5A$ .
- b、 When the voltage up to 2.5V, and there occur bubbles in the electrolyte, continue recharging at a reduced current of  $0.05I_5A$ .
- c、 Recharge the accumulator to full capacity and stop recharging for half an hour, and then continue recharging with further-reduced current of  $0.025I_5A$  for an hour.
- d、 Stop recharging again for half an hour and continue recharging with a current of  $0.025I_5A$  for an hour.
- e、 Repeat step D until bubbles occurs intensely and instantly when switching on the charger.



**Perform balanced recharging to accumulator once a month in normal use.**

## V、 Service Manual

### 5.1 Troubleshooting

Fault	Cause	Repair measures
The stacker can not move	<ul style="list-style-type: none"> <li>- Connectors on accumulator are not connected</li> <li>- Electric lock is in position "0"</li> <li>- Emergency stop switch is not turned on.</li> <li>- The accumulator capacity is in used up</li>   <li>- The control lever is not in drive rage F</li> <li>- fuse blown</li> </ul>	<ul style="list-style-type: none"> <li>- Check the connectors on accumulator, connect them if necessary</li> <li>- Turn the Electric lock in position 1</li> <li>- Turn on the emergency stop switch.</li> <li>- Check the capacity of accumulator, recharge if necessary</li> <li>- Turn the control lever to drive rage F</li> <li>- Check fuse FU01 and FU1</li> </ul>
Loads can not be lifted up	<ul style="list-style-type: none"> <li>- The stacker is not operating</li> <li>- Low hydraulic oil level</li> <li>- fuse blown</li> <li>- The accumulator has only 20/30% of capacity</li> <li>- The UP switch is in bad contact or damaged.</li> </ul>	<ul style="list-style-type: none"> <li>Do as methods in "The stacker can not move" table.</li> <li>- Check hydraulic oil</li> <li>- Check fuse FU02 and FU2</li> <li>- Recharge the accumulator.</li> <li>- Check UP switch and replace if necessary.</li> </ul>
Loads can not be lowered down	<ul style="list-style-type: none"> <li>- Dirty oil blocks control valve.</li> <li>- The solenoid valve for lowering is not opened or is damaged</li> </ul>	<ul style="list-style-type: none"> <li>- Check hydraulic oil and clean control valve. Replace the oil if necessary.</li> <li>- Check or replace the valve for lowering</li> </ul>
It can not stop when lifting up	<ul style="list-style-type: none"> <li>- The UP switch is damaged.</li> </ul>	<ul style="list-style-type: none"> <li>- Disconnect power supply and replace the UP switch</li> </ul>
Moving in one direction	<ul style="list-style-type: none"> <li>- The sensitive switch and the connecting cable are not well-contacted.</li> </ul>	<ul style="list-style-type: none"> <li>- Check the sensitive switch in control lever and the connecting cable.</li> </ul>
The stacker travels very slowly.	<ul style="list-style-type: none"> <li>- The accumulator capacity is insufficient. Or the electromagnetic brake is tight. Or the related cables are not well-contacted.</li> </ul>	<ul style="list-style-type: none"> <li>- Check the capacity indicator, the brake and related cables.</li> </ul>

If above steps still cannot solve problems, please contact after-sales service department of the manufacturer and have the problems solved by specially trained technicians.

## **5.2 Preparation before repair**

To prevent possible accidents during maintenance and repair work, following preparations must be done:

- Park the stacker safely.
- Press the emergency stop switch and disconnect the connectors on accumulator.

## **5.3 Check hydraulic oil level**

- Get the stacker ready for maintenance or repairing.
- Open the cover of electric unit.
- Check hydraulic oil level in oil tank.

Check the hydraulic oil level only after the fork and main frame are lowered to their lowest position.

## **5.4 Use Preparation after maintenance or repairing**

Use the forklift only after following operations have been completed.

- Clean the forklift
- Check the brake.
- Check the emergency stop switch.
- Check the horn.