

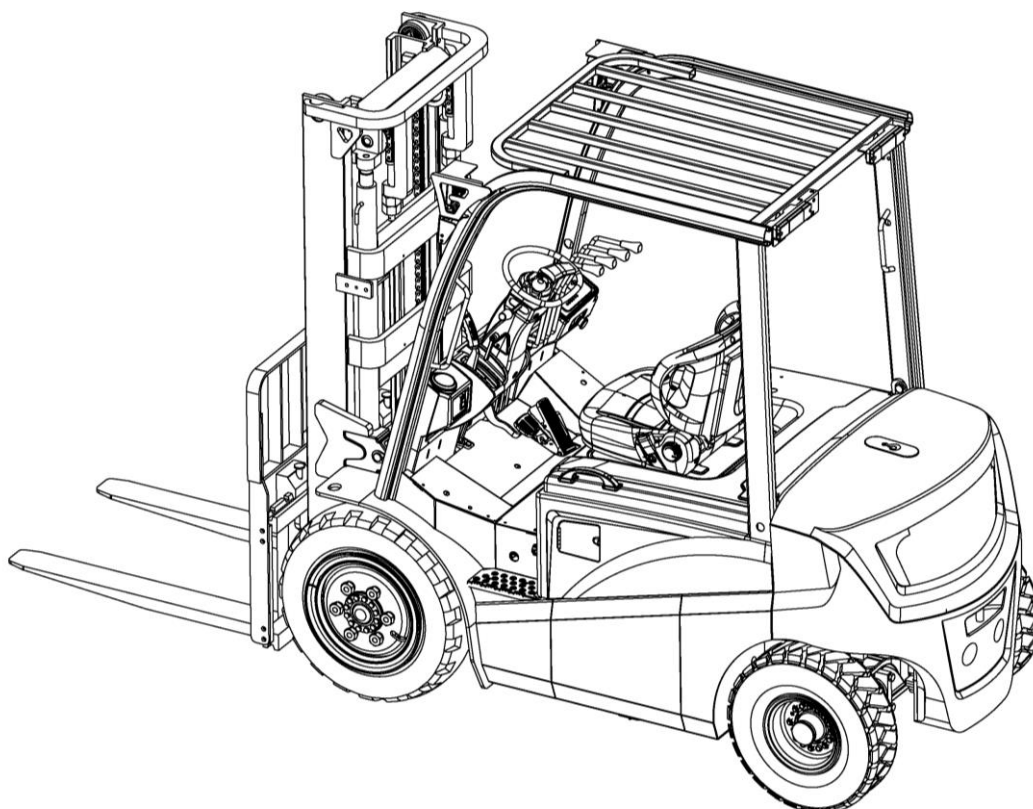
# NOBLELIFT



FE4P30-35Q-SMS-001

## **WARNING**

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



## **Operation manual**

**FE4P30-35 Q series**

**battery counterbalanced forklift truck**

**NOBLELIFT INTELLIGENT EQUIPMENT CO.,LTD.**

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# Introduction

This manual briefly describes the technical parameters of the counterbalanced accumulator forklift made by our company, and the structure of its main components, working principle and requirements on operation and maintenance. Please read this manual carefully before operation, so as to achieve proper driving and maintenance, and to ensure safe and effective material handling. Meanwhile, this manual aims to guide operators to use the forklift in an appropriate way and to maximize its performance! We hope that operators and equipment managers could read it carefully before use! Please strictly observe the provisions and cautions stipulated in this manual and operate the forklift with caution and care, so that the forklift can be maintained in its best status and optimal performance can be ensured. When you lease or transfer your forklift, always keep this manual with it.

For highlighting purpose, the following icons are used in this manual:


1.  ----Refers to a potential danger; if not avoided, it may cause serious human injury, vehicle damage or fire.
2.  ----Refers to a potential danger; if not avoided, it may cause minor human injury, or local damage to the vehicle.
3.  ----Refers to general cautions and instructions during use.

 Most parts of the product are made from recyclable steel. The recycling and disposal of cast-offs resulted during use, maintenance, cleaning and disassembling of the product has to comply with local regulations without pollution to the environment. The recycling and disposal of the cast-offs should only be operated by specialised personnel in the designated area. The cast-offs, such as hydraulic oil, batteries and electronic units, if improperly disposed, may be hazardous to the environment and human health.

**4) The normal use of the product's environmental requirements as follows: no more than 2000 meters above sea level and the temperature range of +5 ° C - +40 ° c, humidity should no more than 90%.The wind speed is not more than 5m/s.**

**If you need to use in the freezer for a long time, Or in special environment, it is needed to install special attachments. Please contact our technical staff.**

**5) Product recall service is available when serial faults occur.**

 Due to continuous product improvement, Noblift reserves the right to make changes in product designs and specifications without prior notice. For the latest product parameters, please feel free to contact us. All parameters provided herein are as of the publication date of the Instruction Manual.

## Chapter one Attentions when using the forklift truck

The operator must always keep in mind the principle of safety first. Conscientiously and cautiously read the maintenance manual. Undergo safe operate and canonical operate strictly following the demand in this manual

### 1 .Transportation for forklift

Pay attention to the following particulars when using container or automobile to convey forklift truck

- (1) Enable parking brake
- (2) Fasten mast and counterweight with steel wire in both two sides; Chock with wedge the front and rear wheels at proper site
- (3) Hoist Lift the forklift according to indication on lifting plate

### 2. Deposit

- (1) Lower the mast to the lowest position
- (2) Switch off power, Push all the operating rod to vacancy; Pull out power plug
- (3) Stretch hand brake rod
- (4) Chock with wedge front and rear wheels
- (5) When truck is in long-term non-use. Wheels should be overhead. And battery should be boost charged once a month

### 3. Preparation before use

- (1) Check up all the meters
- (2) Check up tire pressure
- (3) Check up the state of each handle and pedal
- (4) Check up if the voltage of battery is in operating range; and weather the specific density of electrolyte and the altitude of liquid surface are in order
- (5) Check up if the contact of each connector and plug of electrical system is ok
- (6) Check up if the hydraulic liquid, electrolyte or brake fluid is leaking
- (7) Check up the condition of each main fastener
- (8) Check up if the illuminators, signal lamps are in order
- (9) Loosen parking brake
- (10) Try to lift and lower the mast, tilt forward and backward the mast, turn and brake the truck
- (11) Be sure that the polluting level of hydraulic oil is less than 12grade

### 4. Operation of truck

- (1) Only can the person operate the truck who has been trained and got driver's license
- (2) Operator should wear safe protective shoes, cap, costume in his operation
- (3) Pay attention to the performance and working conditions of mechanics, hydraulic, electrical and MOSFET governor when operating
- (4) Switch on the power, turn on the key, select the position of direction switch, roll the steering wheel to see if the truck is in order, step down the governor pedal slowly, keeping a proper starting acceleration
- (5) Check the voltage meter when the truck is in working, if the value stated in the meter is less than 41V (72V) , stop working immediately, charge the battery or change another fully charged battery
- (6) When conveying, the load should not exceed the rated capacity. The separation and position of forks should be appropriate, insert the forks absolutely downside the load, make the load

uniformly distributed on the forks;to prevent load from deviation

(7) When the distance between the load' gravity center and yoke is equal or less than 500mm.The maximum load capacity should be the rated capacity,and when the distance between the load' gravity center and yoke is more than 500mm;the maximum load capacity should be less than the rated capacity

(8) When forks is bearing load,tilt backwards mast mostly,the yoke should always contact with load;lift forks upto 200mm high from ground before driving

(9) No standing under forks,no standing on forks when lifting

(10) The starting speed should not be too fast when starting to lift and lower the load

(11) No operation of truck and it's additions without sitting on the driver's seat

(12) Push handle immediately to middle position when the mast has tilted forward or backward to the extreme position

(13) No driving or turning when the mast is lifting

(14) When travelling,pay attention to passers by,obstacles,irregular road and the clearance of upper side of forklift

(15) Be careful of travelling on slope,when the angle of slope is more than10%,travel forward upslope and travel backward downslope. no turning on slope,no loading or unloading when travelling downslope

(16) Reduce speed when turning on the damp or slick road,take special care and drive slowly when travelling on dock or on temporary board

(17) Operating high lift range truck of which the lifting height is more than 3m,pay attention to the dropping of the load,and take measures to prevent it when necessary

(18) Don't convey unfastened or loosely stacked load,be caref when conveying large-size load

(19) When travelling with load,avoid emergency brake

(20) When leaving the truck,lower the forks to ground;push lever to free position,switch off power,when parking on the slope,pull tight the brake apparatus and plug the wheels with wedge if the parking time is long

(21) The protection valves on multiway valve and on steering device are already regulated,so the users shouldn't regulate randomly when using to prevent that the excessively high oil pressure leads to the damage of the whole hydraulic system and the burnout of the electric motor

(22) Charge the tyres according to the pressure value stated in "tire pressure" indication

(23) Treat the operation of non-load truck with additional apparatus as the operation load truck

## **5. Lithium Battery charging**

(1) In the first time of charging or boost charging of battery,act strictly according to the rules stated in battery specification

(2) When the truck is in working,and when the battery voltage drops to 72V or the meter alarms,stop working immediately,charge the battery or change another fully charged battery

(3) Charge the battery at once after use of the truck,the storage period should be less than 24h;in order not to damage the battery,prevent under charging or over charging of the battery

## Chapter two The main performance parameters of forklift truck

### I . The truck's outline dimension and performance parameters.

#### 1. The truck's outline dimension see figure 1-1

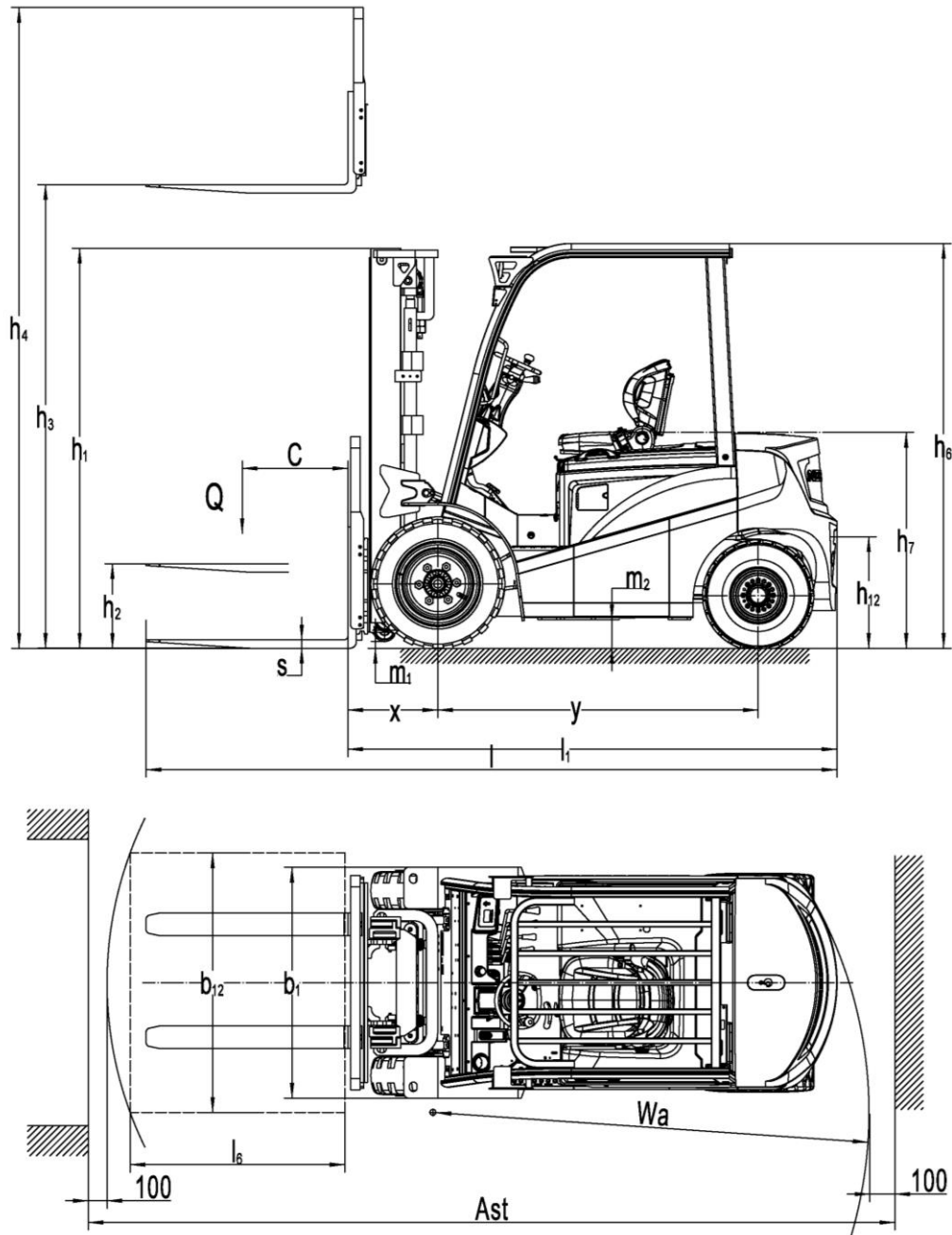


Figure 1-1 outline

## 2. Technical data

### 2.1 FE4P30-35Q Technical data (list 1-1)

Model number		FE4P30Q	FE4P35Q
Drive mode:		Electromotion	
Operation mode:		Seat-driving pattern	
Rated capacity	Q(kg)	3000	3500
Load center distance	C(mm)	500	
Load distance	x(mm)	487	492
Wheelbase	y(mm)	1700	1700
Service weight including battery	kg	4200	4700
Axle loading,laden front/rear	kg	6450/750	7360/840
Axle loading,unladen front/rear	kg	1830/2370	1970/2730
Tyres size,front		28×9-15-14PR	28×9-15-14PR
Tyres size,rear		6.50-10-10PR	6.50-10-10PR
Track width,front	b <sub>10</sub> (mm)	1004	1004
Track width,rear	b <sub>11</sub> (mm)	982	982
Mask/fork carriage tilt forward/backward α/β(°)		6/10	6/10
Lowered mast height	h <sub>1</sub> (mm)	2070	2185
Freelift height	h <sub>2</sub> (mm)	135	140
Lift height	h <sub>3</sub> (mm)	3000	3000
Extended mast height	h <sub>4</sub> (mm)	4115	4115
Overhead load guard height	h <sub>6</sub> (mm)	2150	2150
Seat height	h <sub>7</sub> (mm)	1130	1130
Traction pin height	h <sub>10</sub> (mm)	580	580
Overall length	l <sub>1</sub> (mm)	3673	3678
Length to face of forks	l <sub>2</sub> (mm)	2603	2608
Overall width	b <sub>1</sub> (mm)	1226	1226
Fork dimensions	s/e/l(mm)	45/125/1070	50/125/1070
Fork carriage width	b <sub>3</sub> (mm)	1100	1100
Ground distance,centre of wheelbase m <sub>2</sub> (mm)		150	150
Turning radius	Wa(mm)	2350	2350
Travel speed,laden/unladen	km/h	11/12	10/11
Lift speed,laden/unladen	m/s	0.26/0.34	0.25/0.34
lowering speed,laden/unladen	m/s	<0.6	
Drawbar pull,laden/unladen S <sub>2</sub> 5 minute %		15/15	13/15
Drive motor rating S <sub>2</sub> 60min	kw	11	11
lift motor rating S <sub>3</sub> 15%	kw	12	12
battery voltage,nominal capacity v/A.h	K <sub>5</sub>	80/200	
battery weight	kg	250	
working pressure of attachments MPa		17.5	
oil volume for attachment	l/m	36	

(list 1-1)



# Chapter Three Operation, use and safety for forklift

## I . Driving and operation

There are some information for operating normally as below and it favor you about good running performance, using safely, running economically.

### 1. Usage of new vehicle



·All of the parking parts from the new vehicle should be reclaimed according to the establishment of local government.

·In order to insure the new vehicle can work normally, Make a trial run of it before use it.

The life-span of vehicle depends on how you begin to use your new forklift. At initial 200 hours running, please to notice as follow.



·Whatever season, you have to run machine warmly before operating.

·Do maintenance better in normally.

·Do not abuse machine and unreason using.

### 2. Connection between load and stability

Under load curve, forklift take front wheel for pivot to keep balance of vehicle and load on fork, please pay attention to load centre and load capacity to keep vehicle stable.

· If exceed load curve, rear wheel should be uplifted and be in danger, forklift should be overturned to lead severe injury. Saying as below figure, load close to fork prong is the same effect as increase weight. As in such condition, load shall be decrease.

### 3. Load center and load curve

Load centre means the distance between front end surface of fork and cargo cg. Said figure of load curve show you relation of 2t forklift load centre and permitted load. figure of load curve is adhibited on vehicle, if figure damaged, to renew it in time.

·If forklift is equipped disposal accessories such as side-move device, scraper bucket or rotating fork, its permitted load is less than normal truck(no any accessories), the reason as follow:

(1) Subtract load from rated load, its weight equal to weight of accessories.

(2)Because accessories length lead load centre to move forward, rated load is also decrease.

Accessories equipped lead load centre moving forward, this phenomena is called “Load centre loss”.

Do not load exceeding the rated load shown by figure of load curve pasted on vehicle or accessories.

### 4. Forklift stability

There are regulations in ISO or other standard about forklift stability, but said regulation is not applicable for all of running condition, forklift stability vary on different running condition.

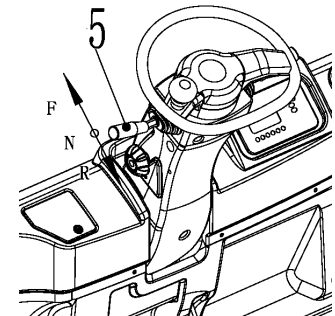
Maximum stability is assured under below condition:

(1) Level and firm ground.

(2) Running under standard load or unloaded condition.

Standard no-load state: Fork or other bearing accessories lie 30cm upto ground,tilting mast backward enough without load.

Standard load condition:Fork or other loading accessories lift up about 30cm from ground,rated load on standard load centre, mast tilting backward to max.angle.



□ □ ·When loading,keep min.tilting angle forward or backward as can as possible, do not tilting forward unless load fixed on load backrest or rigidity loading goods frame, or low lift height.

### 5. Transporting and loading for forklift

(1) Transportation of forklift

⚠ ·Transporting with truck,Wedge forklift wheel or tighten forklift by rope to prevent it moving during transportation.

·Pay attention to obey regulation of full-length, full-width, full-height of forklift during transportation on traffic road.

(2) Loading and unloading for forklift

⚠ ·Please use gangplank with enough length, width and intensity.

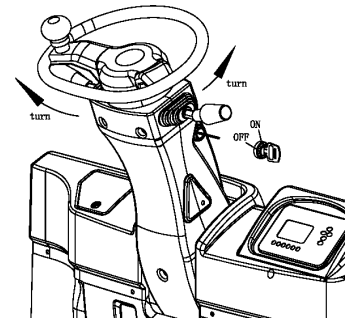
·Brake lorry firmly and wedge wheel.

·Gangplank shall be fixed on middle of carriage firmly, no grease on gangplank.

·Both height of left and right gangplank shall be same.

·Do not turn or transverse move during operating on gangplank.

·When loading on lorry, in order to let forklift board on simultaneously, please backing lorry slowly.



### 6. Preparation before driving

(1) Check position of direction switch handle⑤,and push it to neutral position(N).

(2) Turn on ignition key

Catch hold of handle of steering wheel,then turn on ignition key and keep it at “ON”position.

⚠ ·Even after ignition key is turned to “ON”position,1 second is needed between brake circuit starting to work and starting to move.

·If gear shift lever is in forwardposition“F” or backwardposition“R”,before turn ignition key to“on”position,push gear shift lever to neutral position“N”

·Do notice that if step down accelerating paddle suddenly,vehicle will probably accelerate suddenly.

(3) Tilting backward of mast

Pull backward lifting handle to lift fork

150-200mm upto ground,and pull backward tilting handle to tilt mast backward.

(4) Operation of direction switch handle⑤

Direction switch handle decide travelling direction ( forward-backward )

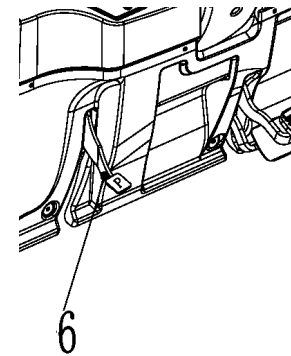
Forward F:push forward direction switch handle

Backward R:pull backward direction switch handle

(5) Loosen parking brake handle

Step down brake paddle

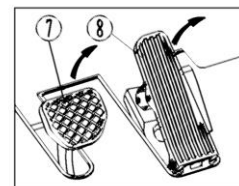
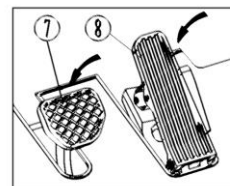
Let go parking brake handle forward entirely,catch hold of steering wheel with left hand,put right hand lightly on steering wheel too.



### 7. Steer

(1) Starting up

Move food away from brake paddle and step down accelerating paddle slowly,then,the vehicle will start to



move.

Acceleration rate is decided by how much accelerating paddle is stepped down.



**·Do not startup or brake suddenly to prevent cargo falling down .**

(2) Speed slow down

Release accelerator slowly. If necessary, step brake pedal down. Except emergency brake, release accelerator to make slow down slowly until parking. If even release accelerator suddenly, emergency brake is also impossible. When emergency situation, step brake pedal down to make emergency brake.



**·Please slow down if situation as follow:**

- (a) turning at crossing.
- (b) Closing to cargo or pallet.
- (c) Closing to goods pile.
- (d) Traveling through narrow chunnel.
- (e) Ground/Road surface is bad.

**· When backing forklift you have to look at rear direction to be sure condition is safe.**

**It is dangerous when backing forklift depending only on rearview mirror.**

(3) Turning

It is not same as car, forklift depend on rear wheel to turn. When turning you shall be slow down and be careful for tail swing of forklift when operating steering wheel.



**·During turning, when turning radius is small, the fast speed the forklift is, the more possibility the forklift overturn. Be careful for this situation.**

(4) Traveling and lifting simultaneously (Inching operation)

- (a) Traveling first, let fork prong be close to goods about 3—5m distance.
- (b) Step brake pedal down perfectly.(standstill)
- (c) Step accelerator down to be in optimum speed.
- (d) Operating lift and lowering handle to operate fork

to be lifting operation.



**· Traveling and lifting simultaneously (Inching operation) is a professional work to ask forskilled operator. Be definite to know well the shape and cg of goods to identify the vehicle stability, make a slow lifting and lowering performance of the vehicle,and please be careful in operation.**

**·Tilting fork to operate when fork is at a much height is very dangerous , except for fork's in and out operation , please do not operate the vehicle on the load stage.**

**·In order to reduce the danger of tilting fork to operate when fork is at a much height,make lifting operation when the vehicle is very close to load stage.**



## 8. Parking and temporary parking



**·Parking safely**

**·Parking place shall be broad and level as much as possible.**

**·When unladed forklift have to park on ramp, please make mast face downward and block wheel by wedge.**

**·Parking vehicle outside workplace or qualified place.**

**·If necessary, to use signs or signal light.**



- Parking on firm and level ground.
- If fork can not lower because of fault, hang cloth on fork prong forward dead corner.
- Pay attention for road surface slide or cave in.
- To lower fork after parking perfectly, it is very dangerous to lower fork during traveling.

- Do not jump off vehicle.
- When get off forklift, you have to face vehicle and take favour of footboard.
- Slow down first and step brake pedal down and standstill and put gearshift on “N”.
- Parking vehicle at place where is convenient to other vehicle and operating as follow:

(a) Pull backward the parking brake handle enough to its position,actuate the parking brake.

(b) Let fork lower to make it touch ground.

(c) Turn ignition key to“off”position.

(d) Take off key and keep it carefully.

(e) Be careful to get on or get off vehicle.

(f) Parking forklift

·When get off forklift, pull brake handle up and to tilt mast forward. Lower fork on ground. When parking on ramp, block forklift by wedge.

·When leaving forklift, take ignition key

### 9. Usage of battery

(1) Charging battery

To choose right charger according to instruction of operating manual.

(a) Keep liquid on normal level.


 ·Keep liquid level on normal situation to prevent battery from being over-hot or being burn out.

·If electrolyte is not enough, the life-span of battery will be shorten

(b) Infuse distill water.

(c) Do not overcharge.

(d) Charging place shall be ventilated enough.

 ·Battery charging shall be at ventilated and dry place.

(e) Open battery cover.

 ·There is hydrogen to be generated when charging,so and please open battery cover.

(f) Check terminal, cable and connector.

 ·Before charging, check connector and cable to ensure there is no injury

·Not charging under the situations as follow:

—Connector terminal has been injured.

—There are rust and abrasion in Terminal and cable.


These situations will lead spark to burn and to explode.

(g) Charge after turning off ignition key.

(h) Check proportion

Before charging, check each cell for electrolyte proportion to detect for abnormal condition to prevent certain accident happen.

(i) When pulling out or insert power connector, hold connector or handle not the cable.

 ·Do not pull out cable.

·If cable and connector failure, please inform manufacturer to replace by new one.

(j) Break up charging procedure

**⚠** ·According to 《operation and maintenance manual》 of the used charger to break charging procedure.

·Do not pull out charger plug during charging, otherwise there will be spark take place to lead to danger.

(2) Replace battery

When forklift has been used continuously for a working period and the battery has entirely exchanged,replace the battery with another fully charged one and charge the battery been replaced.

**⚠** ·In replacing, to be sure that new battery mates with forklift well, otherwise there will be dangerous to shorten lifespan of forklift or overturn during traveling.

·Replacement of battery shall be done on level table.

According to the steps as below to replace battery:

**⚠** ·When using another forklift as hoisting equipment to lift battery, you shall choose a proper lifting tool(accessary).

·Only qualified person can operate battery.

(a) Pull out plug of battery.

(b) Open upper cover of battery.

Use gas spring or other methods to ensure block upper cover of battery to avoid cover fall down to injure human or bodywork.

(c) When hoisting battery out forklift, be careful for touching steering wheel or other forklift parts.

(d) After finish installation of battery, connect and fasten the battery pin.

(e) Close upper cover of battery.

**⚠** · When close upper cover of battery, be careful to injure your finger.

·During hoisting battery, be careful to prevent swing of battery box to injure bodywork.

## 10. Stacking

**⚠** ·Check the following items before operation:

(a) Be sure that there are no falling of load and damaging of load in loading region.

(b) Be sure that there is no goods or pile possible leading to unsafety

Stack as follows:

(1) Slow down when getting close to goods.

(2) Parking in front of goods.

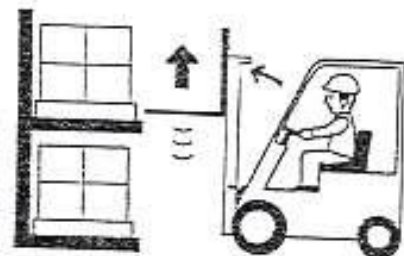
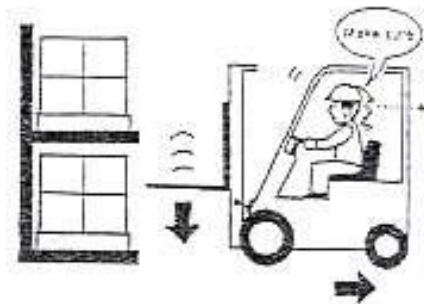
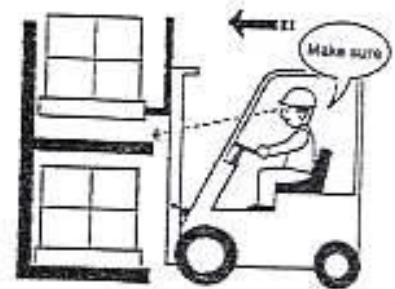
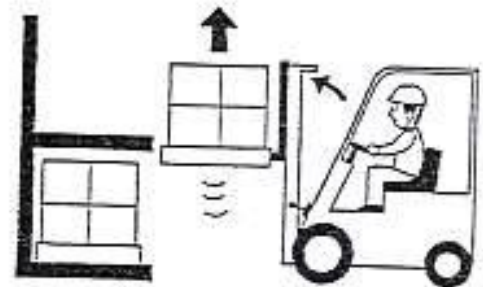
(3) Check the safety of goods area.

(4) Adjust the position of vehicle until it lies in front of goods

(5) Make Mast vertically ,lift fork up more than the height of goods.

(6) Check goods'location and park the vehicle to optimum position.

(7) Ensure that the load higher than the stacked goods and lower fork slowly and place load correctly and safely.



- Before load placed on shelves or bracket:**
  - (a) Lower load until fork no longer carry any load.
  - (b) Backing forklift for distance of 1 / 4 length of

fork.

- (c) Lift fork 50—100mm up and drive forklift forward for stacking to be optimum.
- (8) Look at rear space, backing forklift in order to avoid impact between fork and pallet or goods.
- (9) Ensure fork prong to be off goods or pallet, lower fork to avail driving.(from ground 150—200mm)

### 11. Unstacking

Unstack referring to the procedure as below

- (1) Slow down when close to goods.
- (2) Park in front of goods(30cm between goods and fork prong)
- (3) Adjust the vehicle position in front of goods
- (4) Be sure that there is no overloading.
- (5) Adjust the Mast upright to ground.
- (6) Observe the vehicle position and move it forward until the fork inserts the pallet completely

- When it is difficult to insert the fork completely into pallet:**

- (a) Inserting 3 / 4 length of fork and lift pallet little more (50—100mm), then pull fork out pallet 100-200mm, then lower pallet.

- (b) Insert fork into pallet completely.
- (7) After fork insert pallet, lift pallet (50-100mm) up.
- (8) Look at ambient space to move forklift backward to lower load.

- (9) Lower load at the height of 150-200mm from ground.
- (10) Tilt backward the mast to ensure the stability of goods.
- (11) Transport the goods to destination

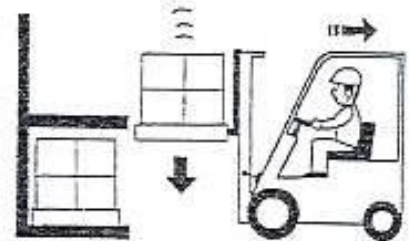
### 12 Deposit

- (1) Before deposit  
Before forklift deposits,clean it thoroughly, check up as following:

- (a) If necessary, clean grease and oil of bodywork by cloth and water.
- (b) When cleaning, check the vehicle entirely especially for hollow or damage of bodywork, if tires punctured, and if there is any nail or stone in tire surface groove.
- (c) Check for leakage.
- (d) If necessary, infuse grease.
- (e) Check wheel hub nut and joint face between piston rod and piston for loose, check piston rod surface for injury.
- (f) Check mast roller for rotation stability.
- (g) Actuate lift cylinder to its max. height to let cylinder be full of liquid.

- As long as there is any failure or malfunction or unsafe factor of forklift to be known,report to related person and stop using forklift until repaired.**

- (2) Daily deposit
  - (a) Parking forklift on appointed place and block wheel by wedge.
  - (b) Put shift gear on neutral and actuate parking brake.
  - (c) Take off ignition key and keep it in safe area.
- (3) Long time deposit.

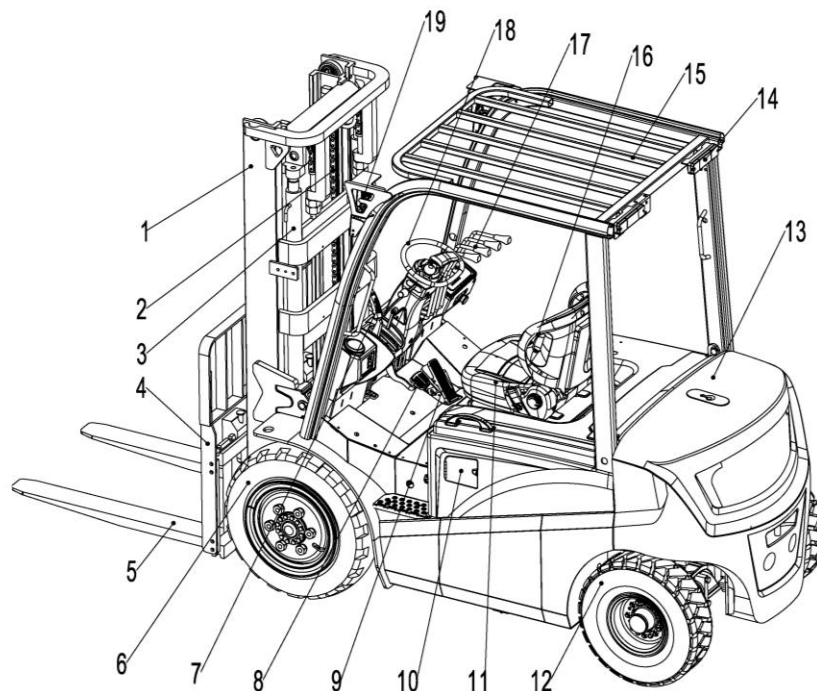


Based on daily deposit, please make check and maintenance according to the follow items.

- (a) Considering the raining season, park the vehicle on high and rigid ground.
  - (b) Unload battery from forklift. even indoor parking, if the place is muggy, dry and shade-cool are necessary for the battery depositing. Charge the battery once a month.
  - (c) Rub anticonosive oil on bared surface of piston rod and shaft ect.
  - (d) Cover parts prevent raining and wet.
  - (e) Startup vehicle at least once a month, install battery, clean the grease on piston and shaft, startup engine and preheating, make vehicle move forward and backward slowly, meanwhile operating hydraulic control for several times.
  - (f) In summer, do not park forklift on floppy surface such as asphalt ground.
- (4) Operation after long time deposit.
- (a) Take off dampproof cover.
  - (b) Cleaning pickling oil from bared parts.
  - (c) Cleaning impurity and water of hydraulic tank.
  - (d) Install full charged battery on forklift and connect it.
  - (e) Check carefully before startup.

## II . Using instruction of operating devices

### 1. Components, schematic diagram for operating devices ( see following figure )



- |                                 |                          |                    |
|---------------------------------|--------------------------|--------------------|
| 1.mast                          | 2. lifting oil cylinder  | 3. Lifting chain   |
| 4. load-backrest                | 5.fork                   | 6.front wheel      |
| 7. parking braking              | 8. service braking sytem | 9. accelerator     |
| 10. charge Jack                 | 11.hood                  | 12.rear wheel      |
| 13. counterweight               | 14.rear combination lamp | 15. overhead guard |
| 16.seat                         | 17. operating lever      | 18. steering wheel |
| 19. Headlights and turn signals |                          |                    |

## 2. Instrument unit

see figure 2.4 Electrical system ( page 30 ).

## 3. Switches

### (1) Emergency stop button

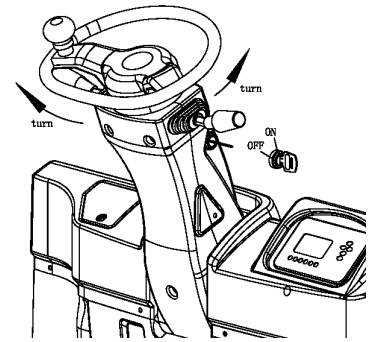
When emergency, press red mushroom-head button down to cut off power to stop function of traveling, turning, lifting. To resume the function, rotate the button according to the arrowhead indication.

### (2) Key switch

key can turn on or turn off controlling power

Turn off (OFF): In this position, power is cut off and key can be inserted and pulled out

Turn on (ON): Turn forward from off position, switch is turned on, forklift starts up.



Emergency switch



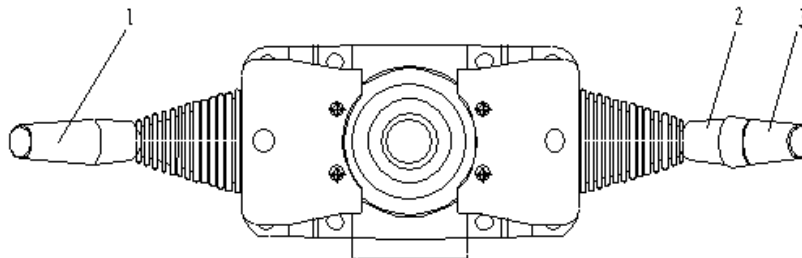
**Do not turn on ignition key and step accelerator down simultaneously.**

·Take off key to prevent unqualified operating when get off forklift.

·Take off key when charging or parking to prevent unqualified operating.

### (3) Switch unit

Switch unit is combined by direction switch, steering switch and big and small light switch.



1- direction switch

2- steering switch

3- big and small light switch

Direction switch controls travelling direction and delivers signal to instrument to display. Push handle forward, vehicle travel forward, and pull handle backward, vehicle travel backward. Neutral position is vacancy. When handle is on backward, back-up light and caution light will open, back buzzer has sound.

Steering light shows rotation direction of forklift, when handle is on turning position, steering light will blink.

push forward	left steering light is bright
middle	neutral
pull backward	right steering light is bright

Big and small lights switch control relevant lights. Small light will open when rotate to the first gear, both big and small lights will open when rotate to the second gear.

light \ gear	OFF	first gear	second gear
width light	×	○	○
tail light	×	○	○
fore light	×	×	○

○: lightening    ×: blanking

### (4) Rear big light switch



Tail light switch is a single gear which controls on&off of the light. Pull switch up, light open; push down, light off.

#### 4. Control

(1) Steering wheel①and steering wheel handlebar②

Steering wheel operation is traditional: steering wheel turn right, vehicle move right; steering wheel turn left,vehicle move left. There is steering wheel at backside of forklift to make backside of forklift swing toward outside when turning.

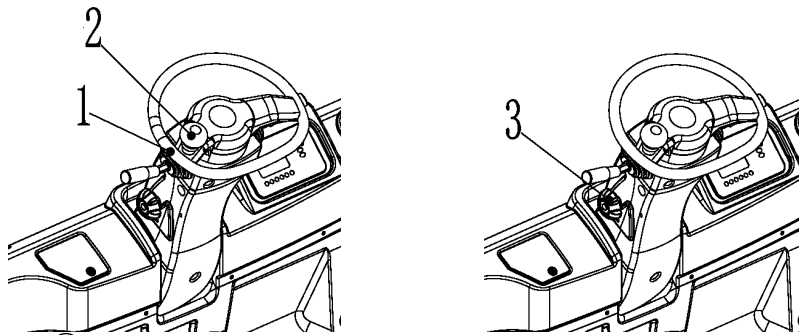
When turning, catch steering wheel by left hand and right hand on steering wheel or control handle of multiway valve.

Both hydraulic steering system and steering wheel tilting device are standard equipment of forklift.



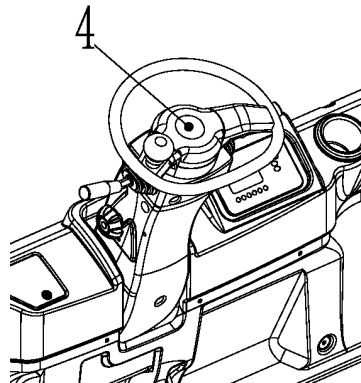
·According to driver seat to adjust steering wheel to optimum angle.

·Lock steering pipe by tilting handle after adjusting steering wheel tilting angle.



(2) Horn button④

Push down rubber cover located in the center of steering wheel to make a buzzing sound. Even when ignition key is turned off,the horn can also sound.



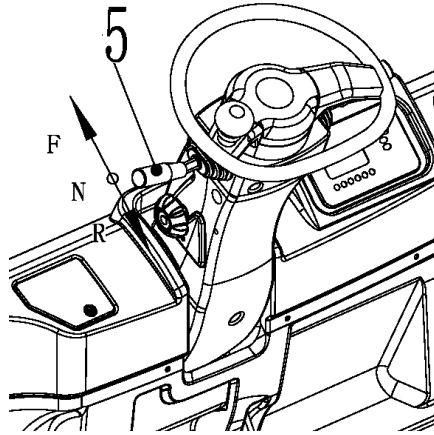
(3) Direction switch handle⑤

Indicate travelling direction

Travel forward (F): Push forward handle and step down accelerating paddle

Travel backward (R): Pull backward handle and step down accelerating paddle

When parking forklift,direction switch handle should be put in neutral position(N).

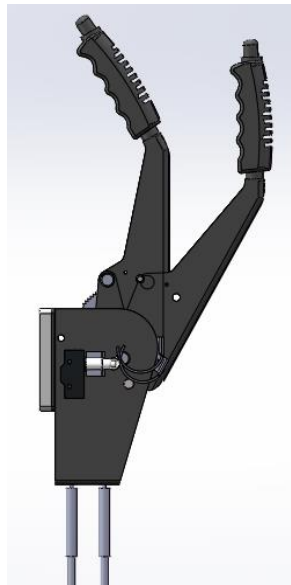


(4) Parking brake handle⑥

In order to prevent forklift from moving,when park forklift,pull up entirely parking brake handle. It is necessary to push parking brake handle to end before driving.



·When operating the parking barke handle,step down the parking paddle.



(5) Brake paddle⑦and accelerating paddle⑧

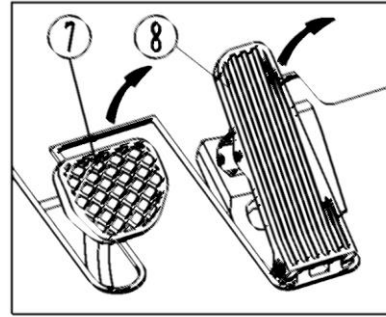
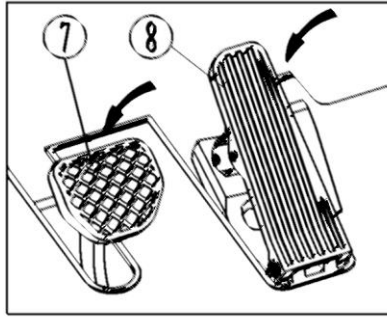


·Do not step accelerator pedal suddenly to prevent the vehicle from starting or accelerating suddenly.

·Ensure your foot remove from accelerator pedal when step brake pedal down.

From left to right,there are brake paddle⑦ and accelerating paddle⑧ in turn.

Step down accelerating paddle slowly,forklift speed is decided by stepped angle of accelerating paddle.



#### (6) Lifting handle⑨

Pull backward lifting handle, fork lifts, and push forward lifting handle, fork lowers. Lifting and lowering speed depend on tilting angle of handle, the larger the angle, the faster the speed is.



**Lifting operation can't be made, if push or pull lifting handle when turn on ignition key.**

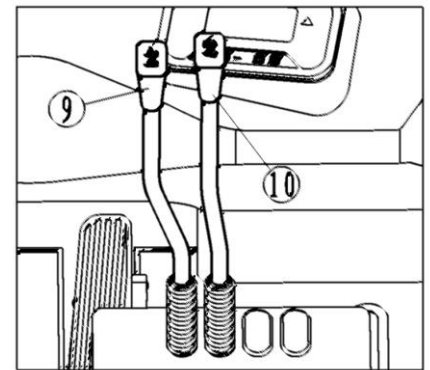
**Don't lower fork suddenly or stop suddenly when lowering fork.**

#### (7) Tilting handle⑩

Pull backward tilting handle, mast tilts backward; push forward tilting handle, mast tilts forward. Tilting speed is decided by tilting angle of handle, the larger the angle is, the faster the speed is.



**When turn ignition key on, push or pull tilting handle, you can not tilt mast.**



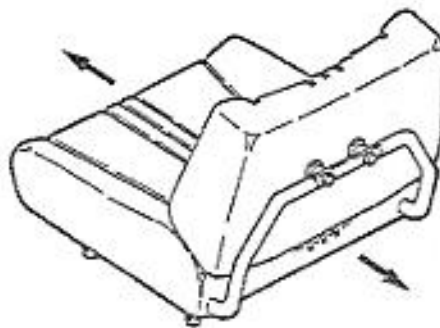
## 5. Truck body

### (1) Seat

Make you fit to drive seat by adjust operating handle.

Lock will be released after pull the handle up. you can move seat to and fro gently. To be sure seat locked after adjusting.

Seat adjusting range To and fro is 120mm. When traveling on dry cement road, driver is given a perpendicular acceleration is 2.130m/s<sup>2</sup>-2.237m/s<sup>2</sup>, integrative acceleration is 2.252m/s-2.356m/s.



### (2) Roof guard

**!** ·Roof guard protect you from falling down of goods. Its top is a fence-type shape, the space between two bars is 150mm, so, if goods size is less than 150×150mm, you have to adopt another measure to protect yourself from danger of falling down of weights. Abnormal installation of roof guard or no roof guard or changing roof guard shall lead terrible accident.

(3) Goods rest

**!** ·Goods rest is an important device to protect operator from being impacted when cargo slides toward operator. Loose installation, usage after dismantling and usage after modification are all dangerous.

(4) Traction rod

Only in the following situation shall be possible to use traction rod.

- To escape from the trouble of being not able to travel(for example wheel trapped in ditch)
- Forklift need to be loaded on or be unloaded from lorry.

**!** ·No using for towing or to be towed operation absolutely.

(5) Fitting pin for fork

Fork fitting pin lock fork on certain position. When need to regulate clearance of fork, pull pin out up, rotate pin 1 / 4 circle to make fork at position required. Regulation of clearance of fork depend on goods need to be loaded .

**!** ·According to principle of goods gravity centre shall be on centre of vehicle, we have to regulate space of forks for equal distance either left and right.after regulated, to fixup fork by fitting pin firmly.

· When adjust space of fork, lean against your body on goods rest, after standing stably, push fork by your foot. Do not regulate by your hands absolutely.

(6) Foot pedal and armrest

There are foot pedal on each side of forklift, armrest located on left front brace of roof guard, when get on or get off, please use foot pedal and armrest to ensure your safety.

(7) Lamps

There are head light and front light assembled on the head of vehicle direction indicator lamp, parking light, width light). Also there are back light assembled on backside of vehicle which consists of tail light, turning light, brake light, parking light, back light and flasher.

**!** ·Identify the working status of lamps, Replace and repair lamps immediately if lamp burning out, lamp shield injury or dirty.

(8) Rear view mirror

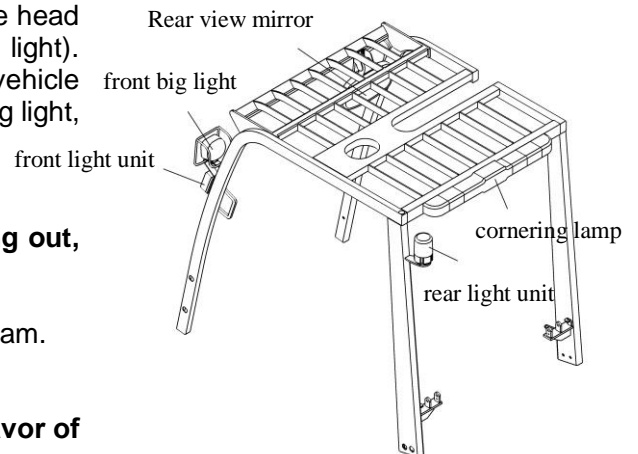
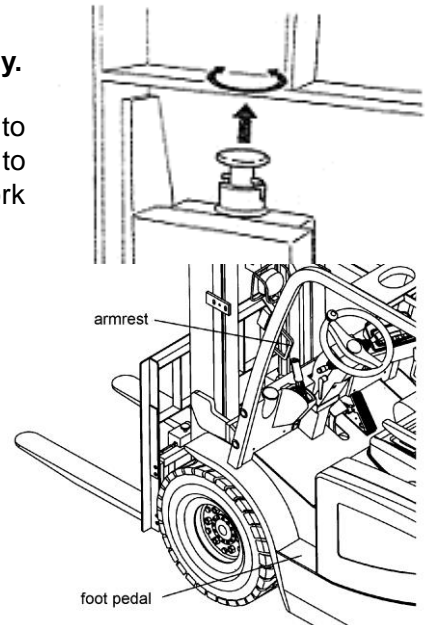
Rear view mirror locates in right of roofguard front beam.

**!** ·Keep rearview mirror surface cleanness.

·Regulate rearview mirror for good position in favor of good sight of driver.

(9) Battery plug

Battery plug is used to join or cut off power, in normal situation, it should always be connected.





If checking electrical parts of inside location, please cut off power to prevent danger.

·Even if ignition key on “OFF”, main circuit Still has voltage.if you want to switch off power,it is necessary to pull out this connector.

·Do not pull out plug of battery during Driving unless emergency, because it can lead steering malfunction.

### III. Safety issues

Safety is your business and responsibility. This section describes the typical forklift often used in the basic safety regulations and warnings, but also applies to the door frame with special specifications.

#### 1. Operation place and working environment

(1) Ground conditions

The operation place of forklift should be ground with flat and firm surface,a good ventilation is needed.

Forklift's performance depends on the situation of the ground; running speed should be adjusted appropriately in ramps or rough pavement to be especially careful when driving. Driving on a ramp or rough roads will speed up the forklift tire wear and increased noise.

(2) Work environment

Forklift use ambient temperature should be 5 ° C ~ 40 ° C, the ambient humidity should less than 80%.

(3) Weather condition

When it's rainy,snowy,foggy or windy,to assess the safety before use forklift,the best is not to use for out door work,if must,driving and operation should be more carefully.

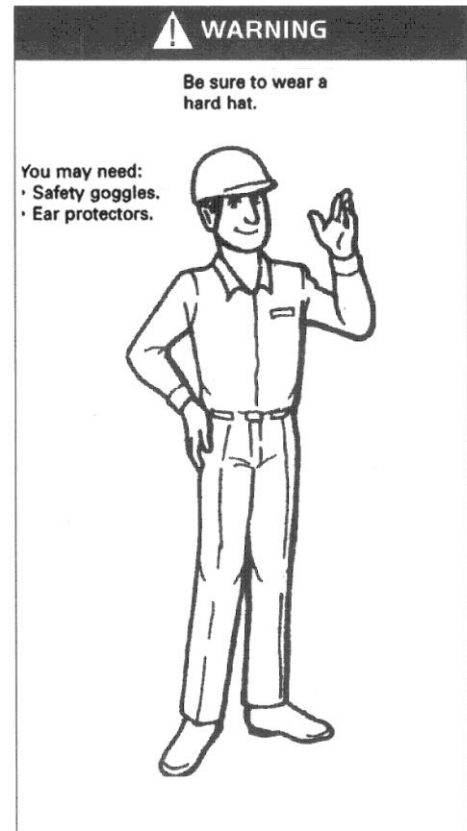
#### 2. Safety rules



Only qualified people who has been trained and has driver license can operate the forklift!



Forbid to drive on the highway!



Put fatigue dress on before driving!



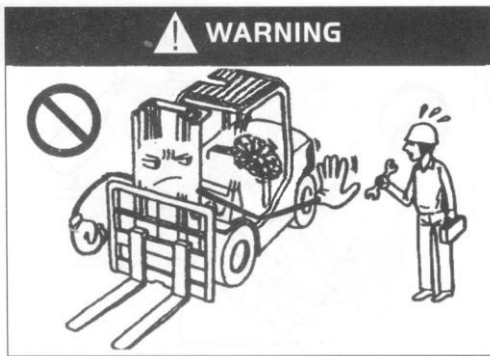
Vigilant: injuries, the ambulance!



Do not change parts on forklift arbitrary without permission.



Read the instruction manual carefully before driving!



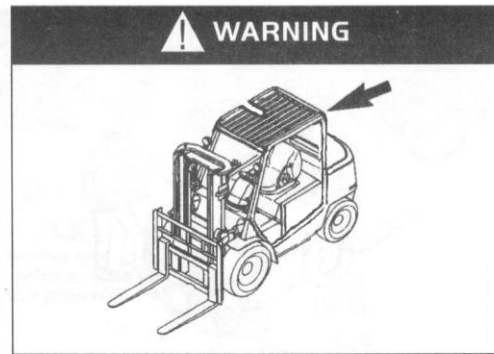
Turn off the engine before maintenance!



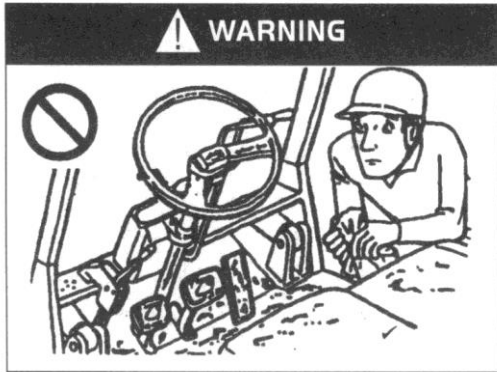
Understand traffic regulations



Before use, please check on the truck!



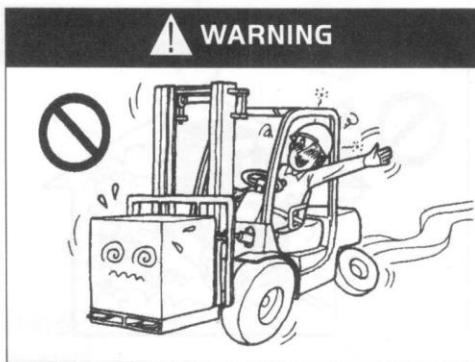
Do not move the overhead guard!



To keep driver's cap clean!



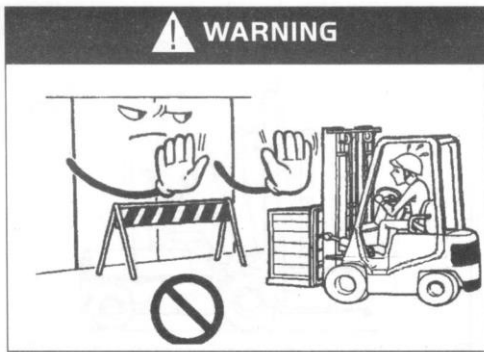
Do not drive an unsafe forklift!



Drivers should have a healthy body!



Be sure your truck is safe!



Work in specified area



Do not drive a damaged truck!



Hold tightly when get on the truck!



Start forklift correctly!



Adjust seat before driving!



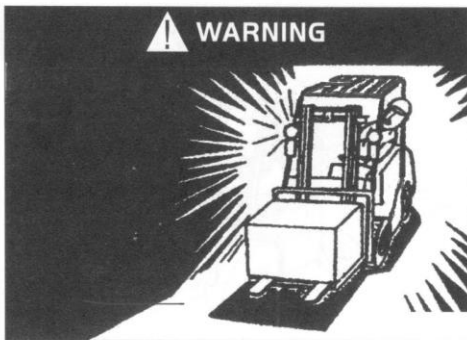
Make sure your forklift is in safe operating condition!



Appropriate fasten seat belts!



Always pay attention to the height of work place!



Turn on lights in dark area!



Do not put arm and body outside of the overhead guard during work!

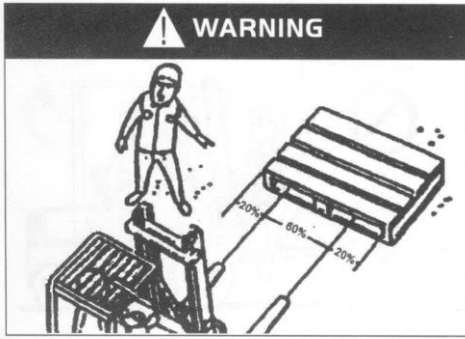


Avoid driving on soft ground, only allowed to run on solid and flat ground.



Keep body under the guards!





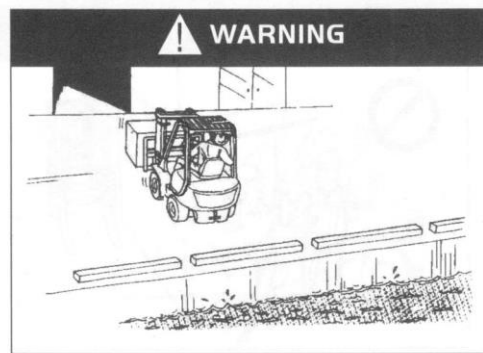
Avoid eccentric loading!



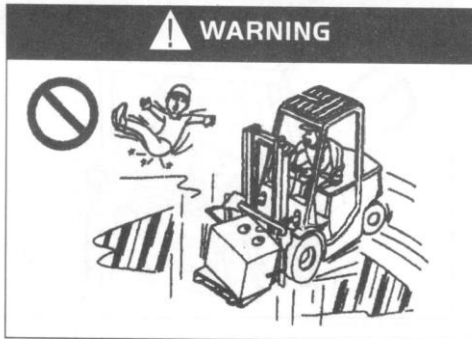
Pay attention to encounter item by front fork when loading!



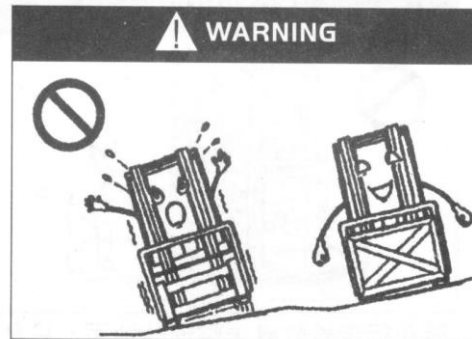
Check fork pin position!



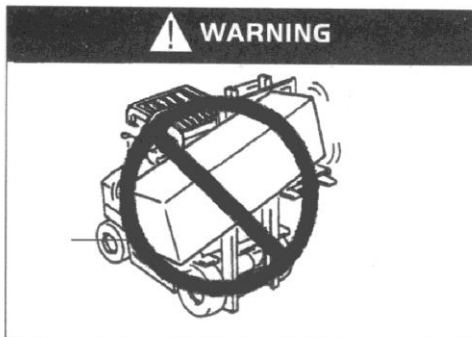
Note the security of the work region!



Do not run on smooth or slippery ground!



Note the horizontal driving stability of the truck when it is un-load!



Be especially careful when handling long



Forbid handling people!

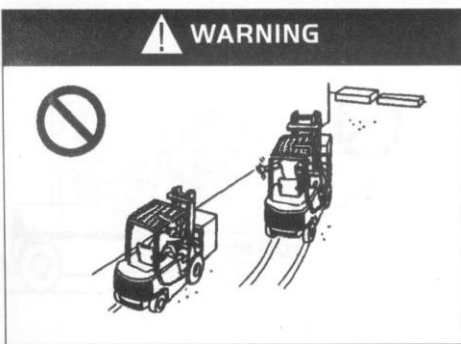
or wide cargo!



If can not see the front when turning, please whistle and drive slowly.



Use appropriate pallets or sleeper when handling small objects!



Do not chase each other through the traffic!



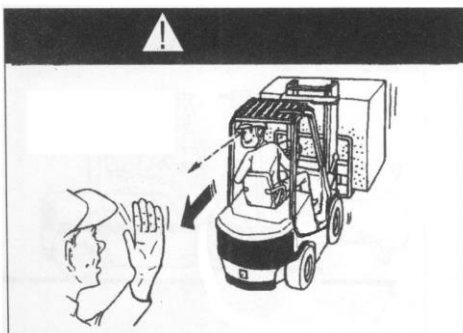
Not allowed to stand on the goods!



Not allowed to gaze around while driving!



Do not use the forklift to do stunt!

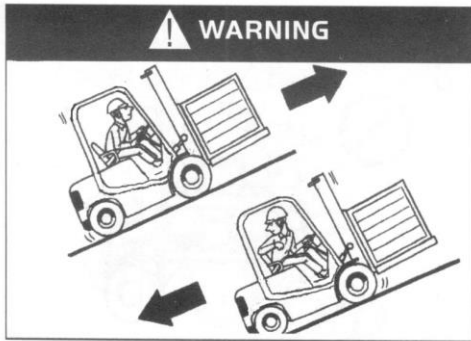


when goods is so high to keep out line of sight,drive backward or forward under



Should obey the traffic rules and all warnings and signs!

direction of others



when loading, travel forward in upgrade and backward in downgrade



Pay attention to the steep uphill slopes and goods lifting height!



When no-load, travel backward in upgrade and travel forward in downgrade!



Note using brake when start truck on the slopes!



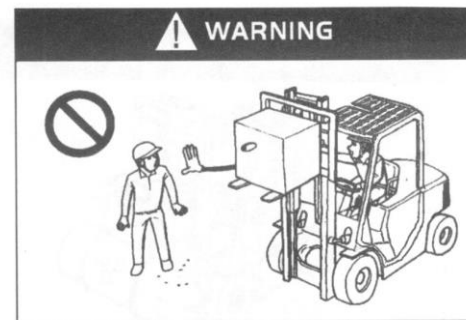
Not turn when driving on a slope!



People or things moving on road should be warned by whistle!



Be careful to crush people or goods when turning!



Operators are not allowed to close when the truck is working!



While turning a high speed can cause accident because of unstable center of gravity!



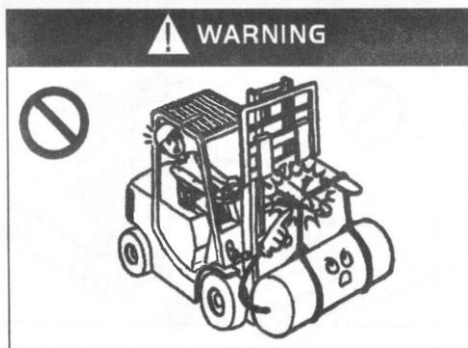
People are not allowed to start in work place!



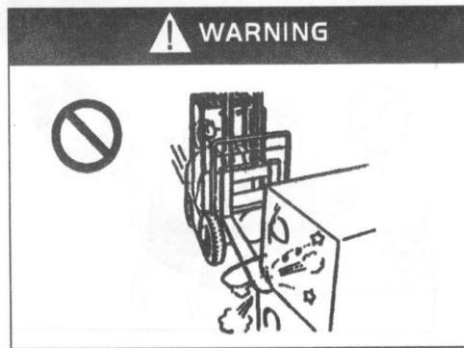
Notice the change of rated load weight before use forklift.



Pay attention to the area where forklift is driven!



Use the fork correctly when loading!



Slow down when loading!



Do not move the truck when there is



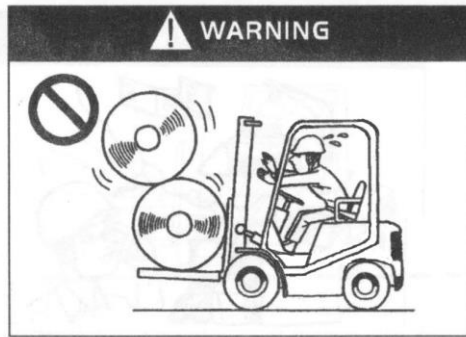
It is forbidden to stand or walk under

someone in front of the truck!

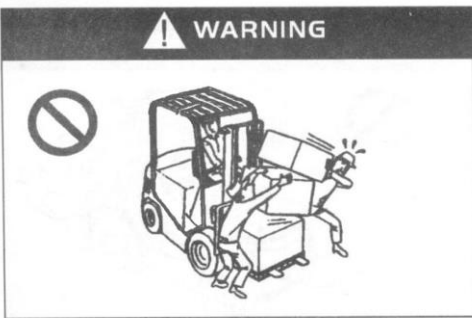


Do not load the goods which is higher than the goods rest.

the elevatory fork!



Please bind the goods which is difficult to fix before load!



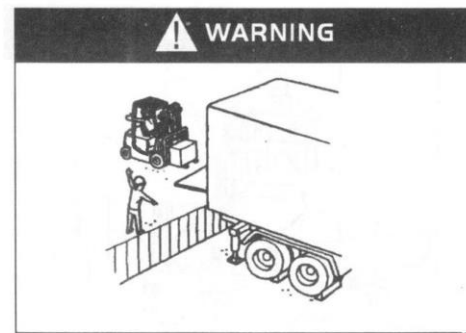
Do not carry the goods from forklift by manpower!



Do not let people to carry the goods have been damaged!



Do not misuse the fork!



Be careful when load the container!



Do not pick up people!



Do not misuse forklift!



Do not extend any part of body outside when driving!



Drive the truck smoothly to avoid sudden acceleration and deceleration!



Must use special equipment to lift people safely to work at height!



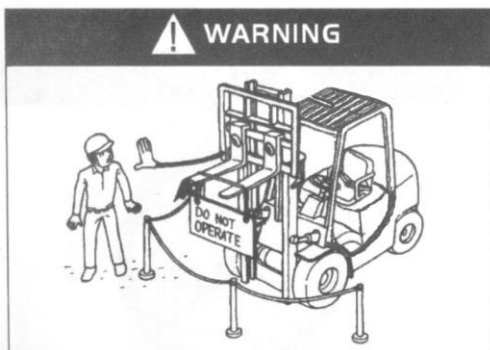
Do not overload!



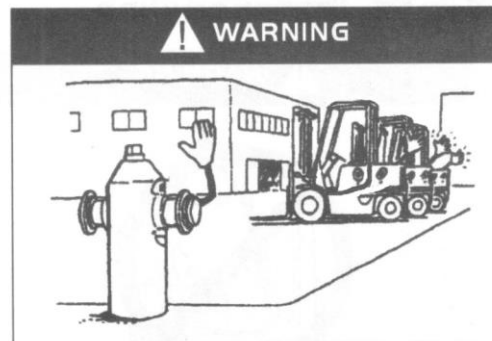
Do not lift when there is excessive wind!



Not allowed to work in explosive environments!



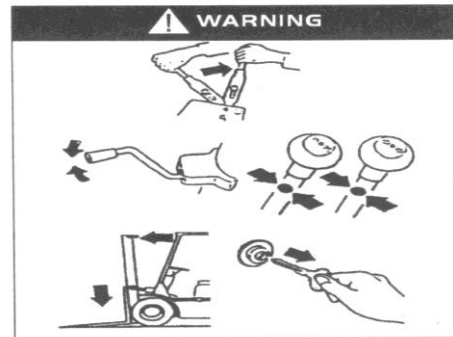
The faulty trucks should be put into the indicated area!



park the forklift to the indicated area!



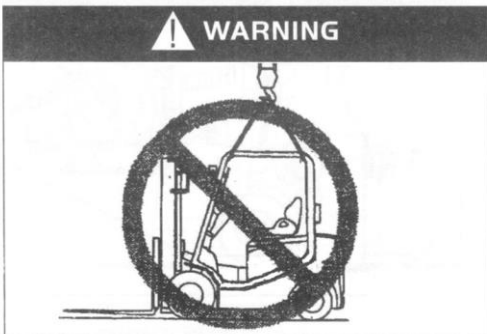
Do not park the forklift on the slope!



When the forklift is not in use, please do the follow.

- Brake
- Put direction pole in neutral position.
- Lower the fork to the ground
- Frame forward tilt.
- Take off the key

### 3. Move the truck



Forbid hoisting from the top!



Forbid hoisting on the frame!



Hoisting the forklift correctly!

#### **Hoisting the forklift**

·Tie firmly steel cable on two terminal holes of outer mast beam and on counterweight hoisting hook,then,hoist forklift with hoisting device.the side of steel cable connecting to counterweight should go through notch of roofguard without exerting pressure on roofguard.

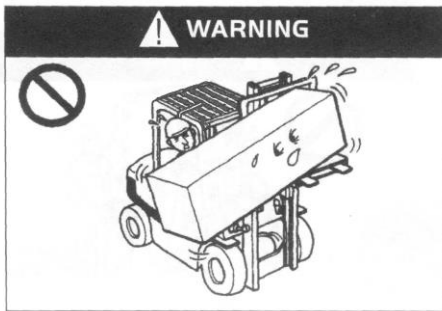
- ⚠️ ·When lifting the truck, be sure not to wire rope and overhead guard around together.
  - Wire rope and lifting equipment to be very strong, enough to secure bearing fork lift, because the truck is extremely heavy.
  - Do not use the cab (overhead guard) to hoist the forklift.
  - Forklift upgrade, do not enter the truck underneath.
4. How to avoid overturning,how to protect yourself



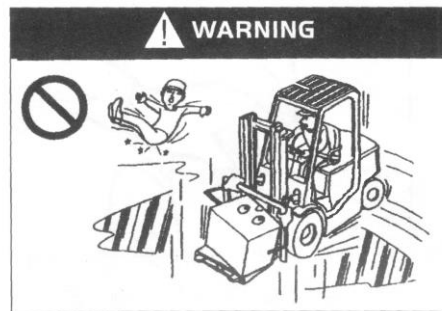
Prohibit forward tilt to enhance loading, so as to avoid tipping!



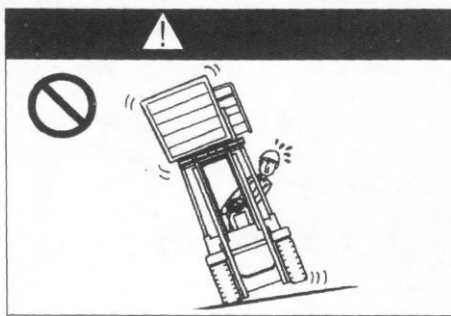
Prohibit lifting goods tipsily!



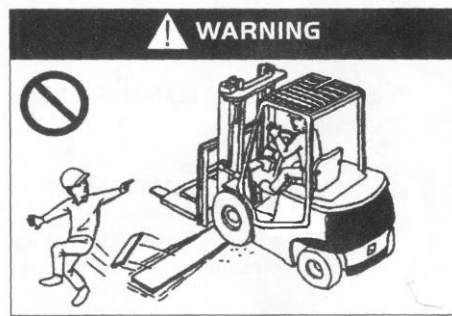
Prohibit eccentric loading of goods!



To avoid driving on slippery roads!



When the truck is not in the horizontal position, do not load or unload!



Prohibit crossing the obstacle such as trench, mound and railway!





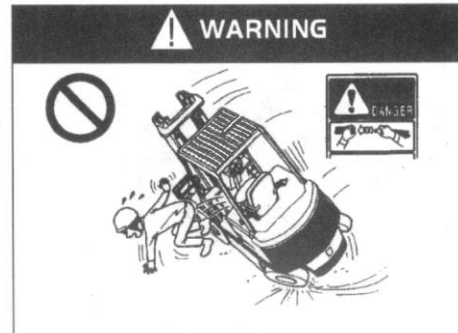
When moving, the distance between fork and ground should be less than 150mm to 200mm!



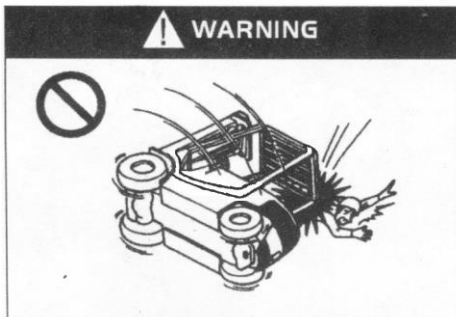
whether load or no-load, don't turn in a high speed or in a large radius!



when no-load fork is lifted, please turn with a narrow range.



Be sure to fasten seat belts!



Do not jump in the event of forklift rollover!



Please wear helmets when driving!

**!** It is more safe to stay under the protection of seat belt than jump down the truck. If the forklift began to tip over:

1. Tap foot and clench the steering wheel tightly.
2. Do not jump.
3. The body bend to the opposite direction of the rollover.
4. Forward the body.

### 5. Safety problem in Maintenance

(1) Maintenance location

**!** Designated areas should be available to service providers and adequate equipment and security facilities.

- The site should be level ground.
- The site should be well ventilated.
- The site should have fire-fighting equipment.

(2) Precautions before maintenance



- No smoking
- Wear all protective equipment (helmets, shoes, glasses, gloves and boots), and suitable clothing.
- Wipe out the oil in time.
- When add lubricating oil, you should clean out dirty oil or dust with a brush or cloth, then add oil.
- In addition to the needs of some cases, should turn off the key switch and pull the battery plug out.
- Lower the fork to ground when maintaining.
- Clean the electrical components with compressed air.

(3) Matters need attention.

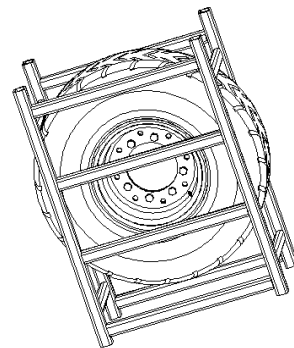


- You should be careful not to put your feet under the descensive fork, do not be tripped over by fork.
- When fork is lifted,place cushion block or other object under inner mast to prevent fork and mast from falling down suddenly.
- You should be careful when you open and close the noseplate and cover plate of battery.
- When you can not finish your work in one time,please make mark and go on next time.
- Use the right tools, do not use makeshift tools.
- Because of high pressure hydraulic circuit, do not carry out maintenance work before reducing the internal pressure oil-way.
- When shocked by high-voltage,search for medical treatment immediately.
- Do not use the door frame assembly as a ladder.
- Strictly forbidden to put your hands,feet and body between frame and door frame assembly.

(4) Inspect and replace tires.



- Assembly and disassembly of tires must be operated by professionals.
- High-pressure air should be carried by professional.
- Wear goggles when using the compressed air.
- When disassemble tires, do not loose rim junction bolts and nuts, there is high-pressure gas inside the tire, bolts, nuts and rims loose cause very dangerous situation.
- Junction disassembly rim bolts and nuts, the tire must be exhausted within the high pressure gas, and carried out special tools.



(5) Use jack (replacement of tyres)



- When lift the forklift truck with a jack, do not bore into the botton of forklift.
- Before lift the forklift truck with a jack, ensure there is no person or load on the truck.
- When forklift is of ground,stop using jack and put pad under it to prevent it from falling down
- Before lift forklift with jack,affirm there is nobody and no load on it


(6) Emission (electrolytic liquid, oil, etc.) requirement.



- Forklift scrapped parts (plastic parts, electrical components, etc.), liquid (hydraulic oil, brake fluid, etc.) should be recycled according to local government stipulation,do not dispose them at will.

## 6. Safety problem in battery usage

(1) No smoking


 Batteries produce hydrogen gas. Short circuit will produce sparks when lit cigarette near the battery, it will cause an explosion and fire.




(2) Avoid electrical attack

 Battery with high voltage, when the installation and maintenance, do not touch the battery conductor, which can cause serious burns.


(3) Correct link

 When the battery charging, the positive and negative can not be reversed, otherwise it will cause heat, fire, smoke or explosion.

(4) Do not put metal objects on the battery

 Do not let positive and negative contacts cause a short circuit by bolts or tools, which will result in injuries and explosions.

(5) Against excessive discharge

 Do not use forklift until it can not move, otherwise the battery life will be shortened. The batteries need charging up when the battery capacity warning light flashes continuously.

(6) Keep clean


 Keep the battery surface clean.

Do not use dry cloth, chemical fiber cloth to clean the battery surface. Do not use polyethylene film covered battery.

Static electricity can cause an explosion.

Clean the top of the battery not covered with a moist cloth.

(7) Wear protective clothing

 When maintain the batteries, you should wear goggles, rubber gloves and rubber boots.



(8) Battery electrolyte is harmful



·Battery electrolyte is made of diluted sulfuric acid, be careful when handling.  
·When electrolyte adhesion conglutination on eyes, skin and clothing, it will result in vision loss and burns.

(9) Emergency dealing methods



·When the accident occurred, deal according to the following methods of emergency treatment and contact a doctor immediately.

- Splash on the skin: wash with water for 10-15 minutes.
- Splash into the eyes: wash with water for 10-15 minutes.
- Contaminated for a large area: counteract(baking soda)electrolyte with dry soda or clean it out with water
- Swallowed: to drink plenty of water or milk.
- Spilled on clothing, immediately take off clothes.

(10) Close battery cover tightly.



·Cloth battery upper cover tightly to prevent electrolyte from leaking.  
·Do not add too much electrolyte, electrolyte overflow will cause leakage.

(11) Waterproof



·Batteries can not be wet with rain or sea water, this will damage the battery or cause fire.

(12) Battery anomaly



·When the battery has the following situations, please contact our sales department:  
·Battery stinks.  
·Dirty of electrolyte.  
·Electrolyte temperature becomes higher.  
·Electrolyte reduces too quickly.

(13) Prohibit disassemble



·Do not drain the electrolyte from the battery.  
·Do not split the battery.  
·Do not repair the battery.

(14) Stored



·When the battery is not in use for a long time, it should be stored in well-ventilated place and difficult to fire.

(15) Disposal of waste batteries



·Disposal of waste batteries should contact our sales department.

## Chapter four Electrical system

Electrical system of FE4P30-35Q is powered by 80V battery set, Electrical system of FE4P30-35N is powered by 80V battery set .traction power of the truck is powered by AC motor , lifting power is produced when AC motor is driving the oil pump to produce oil pressure. Lighting system is powered by battery 80V to 24V voltage.

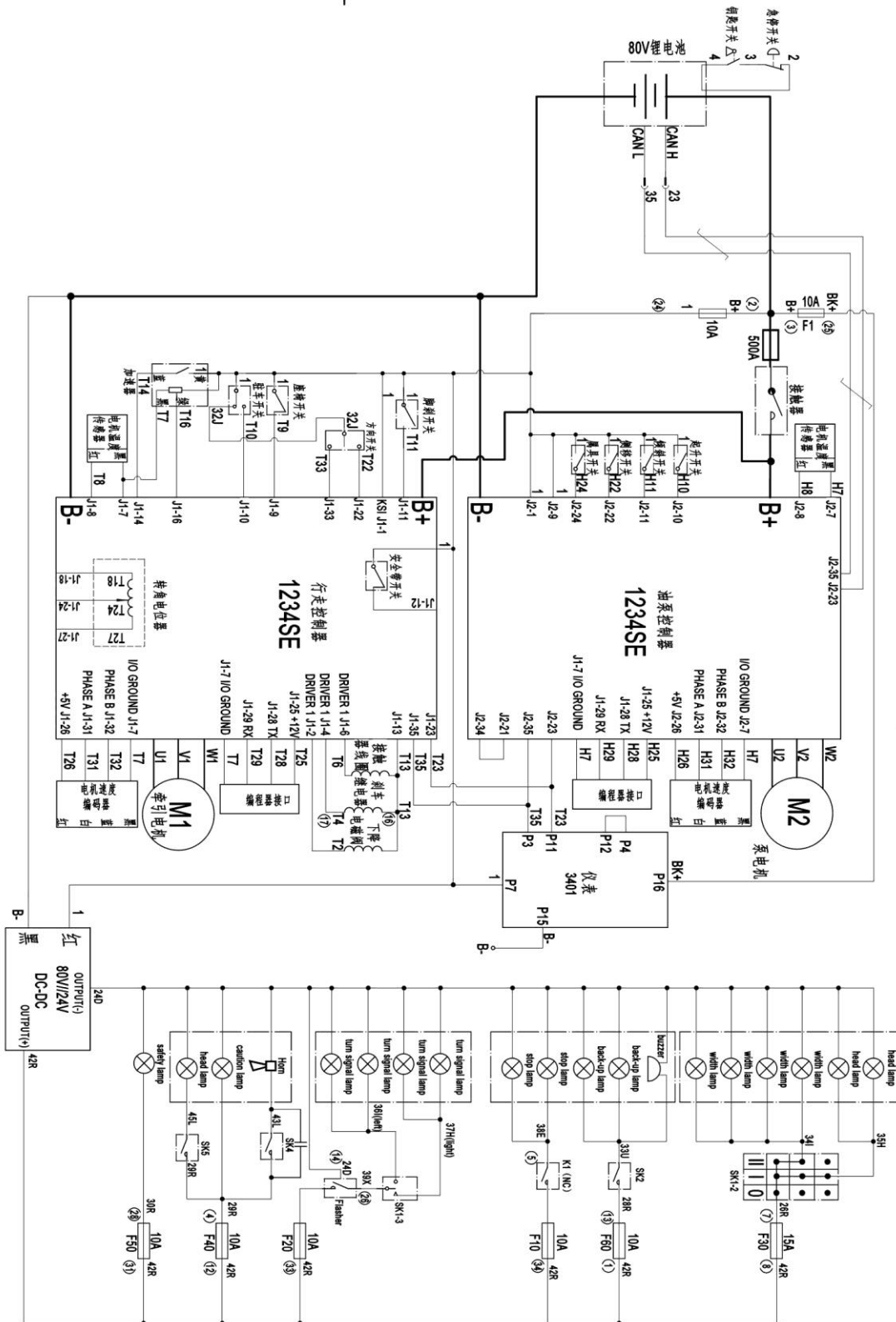
### 1 Electric control assembly (Curtis)



(Figure4-1)

Forklift traction is AC variable-frequency motor, steering is AC variable-frequency motor controller, the dashboard display screen and AC drives adopes products from Curtis, the world's leading supplier of electric vehicle system in the United States. The adopted AC variable-frequency motor is high efficient, durable and maintenance free, basically because it has no DC motor commutator (commutator can limit the acceleration performance of truck, especially in high speed situation, it will limit braking torque), so its accelerating ability is faster. Controller is used for eelectric truck which use CANopen protocol controller for communication, through its analog and digital I/O and communications devices, it is very suitable for management of forklift movement, I/O operation, control and information display, it can discharge of battery monitoring, with all kinds of protection function. Dashboard display can show many data, undertake factory or user setting, can input multiple functions such as user commands.

Electrical principle chate(Figure4-2)



(Figure4-2)

## 2 Main functions and settings

Safe and high efficient working performance and complete operating performance of electric forklift can be achieved by setting correctly each motor technique data and control technique data and function value of controller.

1. The creeping speed of electric forklift can be set, the electric forklift work for a long time under a low speed, through creeping speed setting function of controller.

2. Acceleration can be set. Acceleration is the sense of softness or hardness of accelerating pedal when operating electric forklift. By setting rate of rate, forklift can meet the need of accelerating operation under different working condition.

3. Plug braking and regenerative braking. In the course of travelling, there appears, when reversing direction rod, plug brake signal which, through the controlling of motor driver to pulling motor, presents a brake moment so as to brake the vehicle. The amount of brake power can be controlled by accelerating pedal. A proper setting of maximum brake power can ensure to brake electric forklift smoothly under different speed. Regenerative brake is, under the condition that the vehicle speed is higher than the rated value of accelerating pedal, generated by the controlling of controller. The brake power can transfer to electric power and present back to battery. Especially when the vehicle is coasting downwards slope, in order to properly reduce the speed, regenerative brake can be achieved by properly releasing the accelerating pedal. The presenting back of electric power to battery prolongs the one-charge-travelling distance of it.

4. Function of backward slip prevention on slope, when the vehicle is stopped on slope, it will slip downward the slope acceleratedly if hand brake or foot brake pedal is released. The function of backward slip prevention can prevent the phenomenon of slipping downward acceleratedly and ensure that electric forklift slips downward uniformly with a low speed.

5. The maximum travelling speed can be set. The setting of the maximum travelling speed of electric forklift can prevent pulling motor from overloading caused by excessive vehicle speed.

6. Shut down static recovery, controlling device will be shut down if seat switch or ignition key is off. Only when the direction controlling rod is switched to neutral position can the vehicle be restarted. That is to say, if the driver leaves vehicle at any time and returns back to it, it is necessary to switch the direction controlling rod to neutral position to restart. This function can prevent unexpected insecurity. There is two seconds of time delay at the input end of seat switch, which allows seat switch can be off in trashing.

7. Safety protection function. When the power element in controller is damaged in vehicle travelling, the controller will cut off main contactor as quickly as possible. When the temperature ascending speed of controller is too high, the controller will automatically limit the armature current of motor. And when the battery voltage is too low, the controller will stop working to keep safe.

8. There is self-diagnose function in pulling motor controller and oil pump motor controller. Once malfunction occurs in the working of controller, there will display malfunction code in indicating instrument, which will stop the controller from working to ensure the safety of operating system.

9. Display instrument will show battery power and the cumulative working hours.

## 3 Maintenance of circuit system

(1). Check the contact wear condition; replace the contact if it's worn and the contact should be checked every three months.

(2). Check the pedal and tiller micro switch; Measuring the voltage drop at the ends of the micro switch, there is no resistance when the micro switch micro open closure should be without resistance, when released should have a clear voice. Check once every three months.

(3). Check the main circuit: battery- controller- connecting cable of the motor. To ensure that the cable insulation is good, the clamp circuit connection is fixed. Check once every three months.

(4). Check the pedal mechanical movement to see whether the spring will deform, whether potentiometer spring can stretch out or draw back to the maximum level or setted levels. Check once every

three months.

(5)、 Check the contactor mechanical movement, the contactor should move freely without adhesion, mechanical movements of the contactor shall be inspected once every 3 months.

#### 4 Combination instrument

Using new combination instrument, the main function is to realize auxiliary control and provide the vehicle display interface to the driver. It is composed of control circuit, the cumulative time counter (liquid crystal display), battery meter, fault code display and other circuit. Based on the current electric car demand, this instrument have new design in the control circuit and display form, which can provide drivers intuitive vehicle state information. This instrument has many advantages, such as compact structure, beautiful outline, high automatic degree and reliable quality.

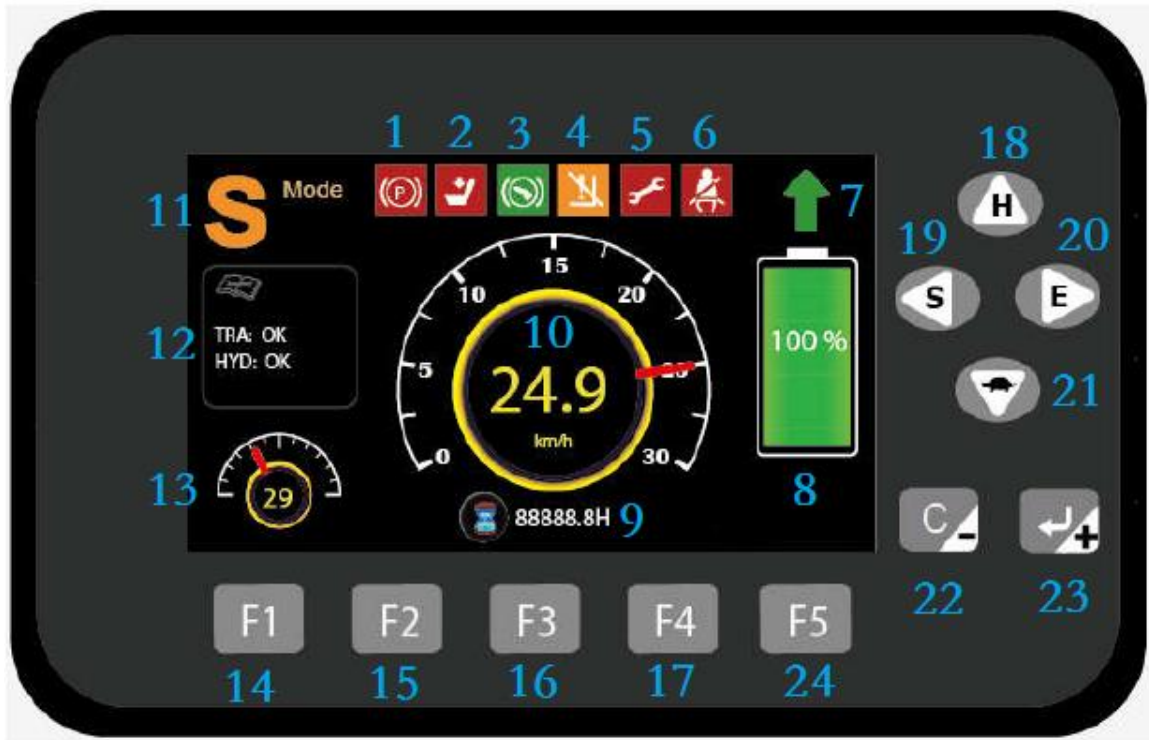


Figure 4-3 CURTIS instrument

- 1)、 “TRVAL”means the situation of traction controller, digital code indicates controller failure, specific code please refer to 4.4 failure analysis.
- 2)、 “HYD”means situation of pump controller, digital code indicates controller failure, specific code please refer to 4.4 failure analysis.
- 3)、 the letter on the upper left means truck operating mode:“H”means high efficiency mode; “S”means normal mode; “E”means economic mode.
- 4)、 Adjustment of instrument internal parameter is finished before leaving the factory, contact the after-sales department if someone wants to change it.



## 5 Failure analysis

1234SE Controller fault table and diagnostics guide

Code display on the programmer	Code display on the instrument	Troubleshoot	Fault cause
Controller Overcurrent	1.2	controllercurrentoverload	1、 motor outside U,V or Wconnection shour current 2、 motor parameter mismatching 3、 controller failure
Current Sensor Fault	1.3	Current sensor failure	1, motor U、 V、 W truck circuit, lead to current leakage 2, controller failure
Precharge Failed	1.4	Precharge failure	1, battery can't chagge
Controller Severe Undertemp	1.5	Controller temperature too low	1, The controller working environment is too harsh
Controller Severe Overtemp	1.6	Controller temperature too high	1, The controller working environment is too harsh 2, truck overloaded 3, the controller is wrongly assembled
Severe Undervoltage	1.7	Voltage too low	1, battery parameter is wrongly setted 2, non controller system power consumption 3, The battery impedance is too large 4, battery connection is disconnected 5, the fuse is disconnected, or main contactor is not connected
Severe Overvoltage	1.8	Voltage too high	1, Battery parameter is wrongly setted 2, The battery impedance is too large 3, Regenerative braking when the battery connection is disconnected
Controller Overtemp Cutback	2.2	Controller temperature too high, as a result the performance is not good	1, The controller working environment is too harsh 2, truck overloaded 3, the controller is wrongly assembled

Undervoltage Cutback	2.3	Voltage too low, as a result the performance is not good	<ol style="list-style-type: none"> <li>1, battery power is insufficient</li> <li>2, Battery parameter is wrongly setted</li> <li>3, non controller system power consumption</li> <li>4, The battery impedance is too large</li> <li>5, battery connection is disconnected</li> <li>6, the fuse is disconnected, or main contactor is not connected</li> </ol>
Overvoltage Cutback	2.4	Voltage too high, as a result the performance is not good	<ol style="list-style-type: none"> <li>1, during the process of regenerative braking, regenerative braking current lead the battery voltage to rise</li> <li>2, Battery parameter is wrongly setted</li> <li>3, The battery impedance is too large</li> <li>4, when regenerative braking</li> </ol>
+5V Supply Failure	2.5	Controller output 5v, poer supply failre	<ol style="list-style-type: none"> <li>1, external load impedance is too low</li> </ol>
Digital Out 6 Failure	2.6	Drive 6 output overcurrent	<ol style="list-style-type: none"> <li>1, external load impedance is too low</li> </ol>
Digital Out 7 Overcurrent	2.7	Drive 7 output overcurrent	<ol style="list-style-type: none"> <li>1, external load impedance is too low</li> </ol>
Motor Temp Hot Cutback	2.8	The motor is too hot, as a result the performance is not good	<ol style="list-style-type: none"> <li>1, The motor temperature reach or above the setted program alert temperature, lead the current output to reduce</li> <li>2, motor temperature parameter is wrongly setted</li> <li>3, If the motor has not used the temperature sensor, programming parameters "Tempcompensation"and"Temp cutback"must be setted"OFF"。</li> </ol>
Motor Temp Sensor Fault2.9	2.9	Motor temperature sensor failure	<ol style="list-style-type: none"> <li>1, Motor temperature sensor is wrongly connecttdly</li> <li>2, If the motor has not used the temperature sensor, parameter programming"Motor Temp Sensor Enable"must be setted"OFF"</li> </ol>
Coil 1 Driver Open/Short	3.1	Drive 1 output linkng coil is open circuit or short circuit	<ol style="list-style-type: none"> <li>1, connected load is open circuit or short circuit</li> <li>2, connecting pin is stained</li> <li>3, wrong wiring</li> </ol>

Main Open/Short	3.1	Main contactor coil is open circuit or short circuit	1, connected load is open circuit or short circuit 2, connecting pin is stained 3, wrong wiring
Coil2 Driver Open/Short3.3	3.2	Drive 2 output linkng coil is open circuit or short circuit	1. connected load is open circuit or short circuit 2. connecting pin is stained 3. wrong wiring
EMBrake Open/Short	3.2	Electromagnetic brake coil is open circuit or short circuit	1, connected load is open circuit or short circuit 2, connecting pin is stained 3, wrong wiring
Coil3 Driver Open/Short	3.3	Drive 3 output linkng coil is open circuit or short circuit	1, connected load is open circuit or short circuit 2, connecting pin is stained 3, wrong wiring
Coil4 Driver Open/Short	3.4	Drive 4 output linkng coil is open circuit or short circuit	1, connected load is open circuit or short circuit 2, connecting pin is stained 3, wrong wiring
PD Open/Short	3.5	Proportional driving is open circuit or short circuit	1, connected load is open circuit or short circuit 2, connecting pin is stained 3, wrong wiring
Encoder Fault	3.6	Encoder failure	1, motor encoder is failure 2, wrong wiring
Motor Open	3.7	Motor is open corcuit	1, motor phase 2, wrong wiring
Main Contactor Welded	3.8	Main contactor adhesions	1, Main contactor contact welding 2, motor U or V disconnected or default phase 3, circuit that connecting B+ terminal will electricize the battery
Main Contactor Did Not Close	3.9	Main contactor is not closed	1, main contactor is not closed 2, Main contactor pin is oxydic, melted, or not stable when connected 3, external device electricize the battery 4, fuse is disconnected
Throttle Wiper High	4.1	Accelerator output is high	1, accelerator and potentiometer output voltage is too high
Throttle Wiper Low	4.2	Accelerator output is low	1, accelerator and potentiometer output voltage is too low
Pot2 Wiper High	4.3	potentiometer 2 output is too high	1, potentiometer 2 output voltage is too high
Pot2 Wiper Low	4.4	potentiometer 2 output is too low	1, potentiometer 2 output voltage is too low

Pot Low Overcurrent	4.5	potentiometer current is too low	1, potentiometer impedance is too low
EEPROM Failure	4.6	EEPROM failure	1, EEPROM storage failure
HPD/Sequencing Fault	4.7	High pedal protection /operation order failure	1, The key start, interlock, direction, and the accelerator input order is wrongly set. 2, Wiring, switch key, interlock, direction, or accelerator input failure
Emer Rev HPD	4.7	Emergency reverse high pedal protection	1, Emergency reverse operation is over, but the forward, reverse input and interlock of the accelerator are not reset
Parameter Change Fault	4.9	Parameter change failure/wrong	1, In order to ensure the safety of the truck, some specific parameter changes must come into force after the key switch is restarted
CAN Communications Fault	5.1		
BMS PDO Timeout	5.2		
BMS First Level Fault	5.3		
BMS High temp fault	5.4		
Battery type mismatch	5.7	Connecting Lead Acid	Replacement of lithium batteries
Display Config Fault	6.3		
BMS Overvoltage	6.4		
BMS Undervoltage	6.5		
BMS Low AH	6.6		
BMS voltage difference	6.7		
VCL Run Time Error	6.8	VCL running time is wrong	1, VCL code running time is overtime
External Supply Out of Range	6.9	External battery output is out of range	1, external loading is between 5V and 12V, battery current is too big or too small 2, in the "inspection menu (CheckingMenu)", parameter is wrong, such as "ExtSupply Max", "Ext Supply Min"
OS General	7.1	Operation system failure	1, internal controller failure
PDO Timeout	7.2	PDO overtime	1, CAN PDO information reception time exceeds PDO time limitation

Stall Detected	7.3	Motor stalling	<ul style="list-style-type: none"> <li>1, Motor stalling</li> <li>2, motor encoder failure</li> <li>3, wrong connection</li> <li>4, input motor encoder battery failure</li> </ul>
Motor Characterization Fault	8.7	Motor matching failure	<ul style="list-style-type: none"> <li>1, In the process of motor matching, code contrast: 0=normal</li> <li>1= The controller receives the encoder signal, but impulse quantity is undefined. Please manually set pulse value</li> <li>2= motor temperature sensor failure</li> <li>3= motor high temperature response failure</li> <li>4= motor overheating response failure</li> <li>5= motor low temperature sensor failure</li> <li>6= low voltage response failure</li> <li>7= high pressure response failure</li> <li>8= Controller cannot detect the encoder signal, channel signals disappears</li> <li>9= Motor parameter settings exceed the scope</li> </ul>
Motor Type Fault	8.9	Motor type failure	<ul style="list-style-type: none"> <li>1, motor type (Motor_Type) parameters exceed the scope</li> </ul>
VLC/OS Mismatch	9.1	VCL/OS not matched	<ul style="list-style-type: none"> <li>1, VCL and OS of the controller program are not matching</li> </ul>
EM Brake Failed to Set	9.2	Electromagnetic setting failure	<ul style="list-style-type: none"> <li>1, the truck still not move after the electromagnetic brake command is setted.</li> <li>2, Electromagnetic brake braking force is too small</li> </ul>
Encoder LOS (Limited Operating Strategy)	9.3	Encoder operation is limited	<ul style="list-style-type: none"> <li>1, Because motor blocked or encoder failure, the limited operating state is activated</li> <li>2, wrong wiring</li> <li>3, truck stall</li> </ul>
Emer Rev Timeout	9.4	Emergency reverse response time is overtime	<ul style="list-style-type: none"> <li>1, because EMR Timer expires, so the emergency switch is actiated overtime</li> <li>2, emergent reverse switch has been on the "on" position all the time</li> </ul>
Illegal Model Number	9.5	Controller type is wrong	<ul style="list-style-type: none"> <li>1, controller moder can recognize</li> <li>2, software and hardware type are not matching</li> <li>3, controller is damaged</li> </ul>

# Chapter five Truck's regular check and maintenance

Conduct a comprehensive pre-inspection of forklift trucks and forklifts to avoid failure and fail to produce the life it deserves. Maintenance program is based on the number of hours listed in forklift work 8 hours a day, working 200 hours a month the case may be, in order to maintain safe operation and maintenance procedures should be maintained on the forklift.

Routine maintenance and repair work carried out by the truck drivers, and other inspection and maintenance by professional maintenance personnel.

## I . The check before operation

For safe operation and to make sure the truck in good condition, a comprehensive inspection of truck should be conduct before operation, which is a statutory duty. If find problems you should contact our sales department.



**·A small mistake will cause a major accident, do not operate or move the forklift truck before the completion of repair work and inspections.**

**·The forklift should be checked on the platform.**

**·When checking on electrical system of the truck, the key switch should be switched off and the battery plug should be unplug before the test.**

**·Replacement of inappropriate handling of waste oil down (into the water pipe under the soil, burning, etc.) will pollute the water, soil, atmosphere, etc., which is prohibited by law.**

### 1. Checking point and checking content

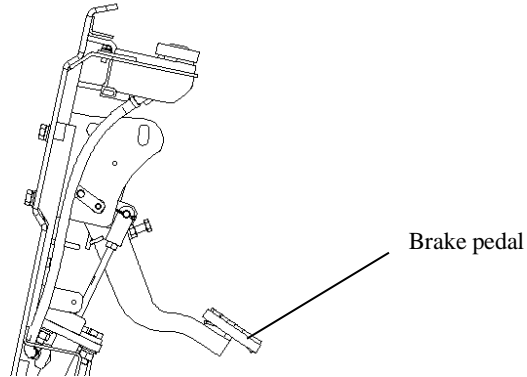
	No.	Checking points	Checking contents
Brake system	1	Brake pedal	Foot brake pedal travel and braking force
	2	Brake oil	Quantity and cleanliness
	3	Parking brake	Parking brake handle travel and the size of operation force
Steering system	4	Steering wheel control	Elastic, rotation and movement before and after
	5	Hydraulic steering operation	Operation of all components
Hydraulic system and the frame	6	Function	Function, it has cracks, lubrication condition
	7	Pipe	Whether the pipe is leakage
	8	Hydraulic fuel	The appropriate fuel
	9	Lifting chain	Left and right should be consistent with two chain tightness
Tyre	10	Tyre	Pressure size, whether abnormal breakage.
	11	Wheel nut	Tighten firmly
Battery	12	Charging	Determine the battery capacity display status, the proportion of the plug should be firmly connected.
Lights, horn and switch	13	Headlights, taillights, reversing lights, horn turn signals, and emergency power off switch	To see if the light off, listening to speakers if sound, emergency power off switch is abnormal.
Detection and display	14	Function	When connected to key switch should display "test state normal"

Others	15	Owerhead guard, load backrest	Bolts, nuts are tightened
	16	Nameplate and marks	Integrity
	16	Other parts	Normal or not

## 2. Checking procedure

### (1) Check the brake pedal

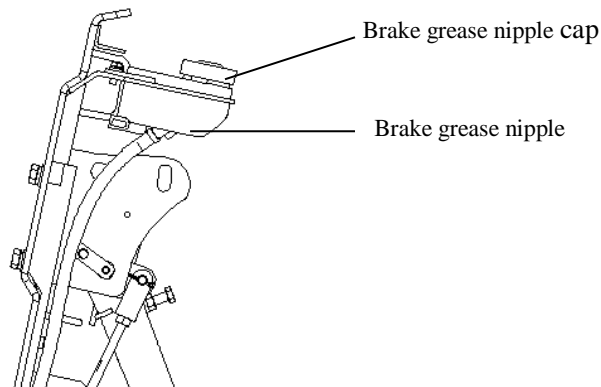
Check brake condition and to ensure a fully depresses the brake pedal when the plane from the floor counting down the brake pedal travel should be more than 50mm, no-load forklift truck braking distance about 2.5m.



### (2) Check the brake oil

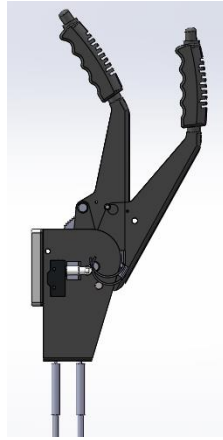


Open the lid and check the brake oil and other conditions.



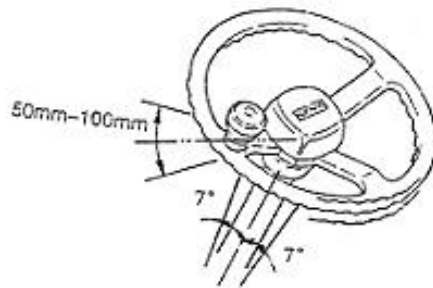
### (3) Check parking brake handle

- Push forward parking brake handle and observe following status.
- If there is proper pull journey
- Brake force value
- Damaged parts or not
- Handle operating force value is suitable to operator or not
- Operator may adjust by the screw installed on the top of handle.



(4) Check the steering wheel rotation case

The steering wheel clockwise and counterclockwise rotating gently, check whether there is rebound phenomenon, a suitable spring trip to 50-100mm. Steering wheel before and after the trips of about 7 °, if the above situation, turn the steering wheel shall be normal.



(5) Check the function of steering system

The steering wheel clockwise and counterclockwise rotation, check the power steering work.

(6) Check hydraulic system and frame function

Check the upgrade and after dumping the normal operation is smooth

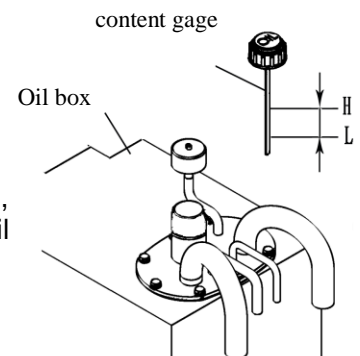


(7) Check pipeline

Check lift cylinder, tilt cylinder, and all pipeline whether oil leak.

(8) Check the hydraulic oil

Land the fork to the ground, check oil level gauge hydraulic oily bits, when the oil level in the H to the L range, the volume of hydraulic point oil suitable range.





model	H	L
FE4P30-35Q	36L	30L

(9) Check the lifting chain

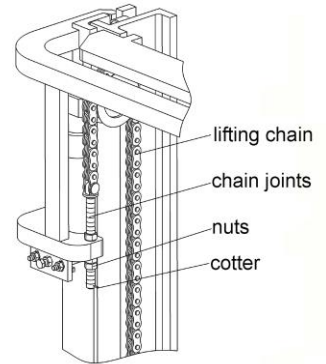
Bring fork to the ground 200-300mm high, to ensure the tightness around the same chain. Check finger stick is in the middle, if different tightness can be adjusted through the chain joints.

**⚠️ After adjustment, should be double nuts tighten.**

(10) Check tires (pneumatic tires)

Unplug the nozzle cap, measuring tire pressure with a tire air pressure. After check air pressure, nozzle mouth should ensure that gas will not leak before installed the cap.

**⚠️ Forklift tire pressure is higher than the car's; it should not exceed the prescribed pressure value.**



	model	tyre pressure
front tyre	28×9-15-14PR	970 bar
rear tyre	6.50-10-10PR	790 bar

Check tyre (solid tyre)

Check if there is dilapidation or leakage on tyre and its sides, and if there is deformation or damage in wheel rib and locking collar

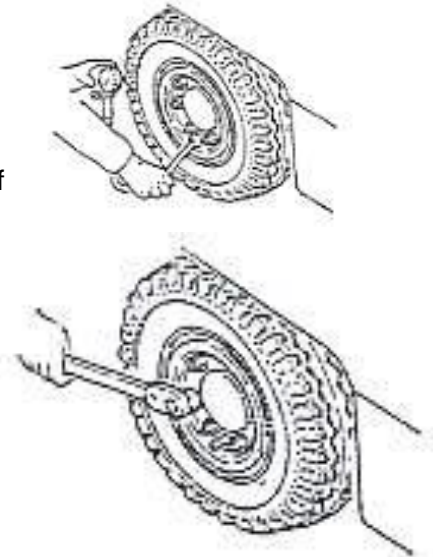
(11) Check wheel nut

**⚠️ Wheel nut loosening is very dangerous, if loose, the wheels may fall off, resulting in vehicle flip. Check the availability of loose wheel nut, it is very dangerous even one of them is loose, so be screwed to the provisions of pre-torque value.**

**Wheel nut tightening torque**

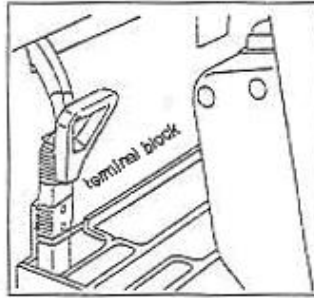
**Front wheel: 28X9-15-14PR 280-320N.m**

**Rear wheel: 6.50-10-10PR 130-150N.m**



(12) Check charge condition

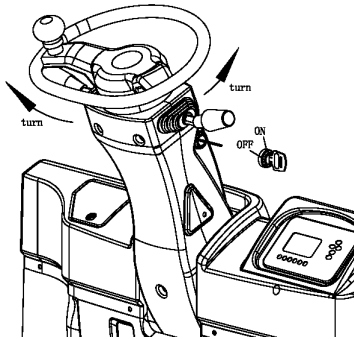
Measuring the proportion of battery, when converted to 30 °C, the battery proportion from 1.275 to 1.285, indicating the battery is fully charged, and check whether the terminal block is loose, and whether the cable is damage.



(13) Check headlights, turn signals and horn

Check whether the normal bright lights, speakers is normal (when pressing the horn button, horn ring)

Check whether the emergency stop is normal.



L	left steering light is bright
N	neutral
R	right steering light is bright

(14) Check instrument panel features

Normally, after a few seconds turn the key switch, the dashboard will be the following graph shows



1. Parking

2. Seat

3. Brake Pedal

4. Lift lock

- |                                   |                                  |                                     |                   |
|-----------------------------------|----------------------------------|-------------------------------------|-------------------|
| 5. Fault alarm                    | 6. Safety Belt                   | 7. “ ↑ ” Forward ;<br>“ ↓ ” Reverse | 8. Battery level  |
| 9. Working Time switch indication | 10. Travel Speed indication      | 11. Speed Mode                      | 12. Control Fault |
| 13. Steering Angle                | 14. Display Menu                 | 15. Display Menu                    |                   |
| 16. Display Menu                  | 17. Curtis motor controller menu | 18. H Mode                          | 19. S Mode        |
| 20. E Mode                        | 21. Tortoise Mode                | 22. Cancel/-                        | 23. Enter/+       |
|                                   |                                  |                                     | 24. Nothing       |



**In addition to checking lights and operating conditions, the key switch must be turned off and disconnect the battery plug before check the electrical system.**

## II. Check after operation

After the completion of the work remove the dirt on forklift and check the forklift according to the follow items:

- (1) Check all the parts if there is damage or leakage.
- (2) If there is deformation, distortion, damage or breakage?
- (3) Add lubricating grease according to the situation.
- (4) Let fork upgrade to the max hight for several times after work. (When the daily work is not up to the fork with the arrival of the maximum height of the situation, it would allow oil flow through the tanks of the entire journey, to prevent rust.)
- (5) Replace the faulty component which caused malfunction during work.



**A small mistake will cause a major accident. Do not operate or move the forklift truck before completion of repair work and inspections.**

## III. Truck cleaning



- Stop the truck at the specified location.
- Pull the parking brake handle.
- Press the emergency stop switch.
- Turn off the key switch and remove the key.
- Disconnect the battery plug.

### 1. Truck surface cleaning .



**Do not use flammable liquid to clean trucks, take safety measures to prevent short circuit.**

- Use water and soluble detergent to clean the truck.
- Clean the oil filler and periphery of grease tap carefully.



**If regular cleaning truck, please lubricate timely.**

### 2. Chains cleaning



- Do not use chemical detergent, acids or other corrosive liquid to clean the chain.
- Place a tank in the bottom of the frame.
- Use gasoline or other petrochemical derivatives to clean the chain.
- Do not add any additive when use the steam nozzle cleaning.
- Dry immediately after cleaning of the chain pin and the water stain on chain surface.


### 3. Electric system cleaning

 ·Do not use water to clean the pump control and a variety of connectors, so as not to cause damage to electrical systems.

Use non-metallic brush or low-power hair dryer, according to the manufacturer instructions to clean the electrical system; do not move the protective cover.

### 4. After cleaning


- Thoroughly dry water stains on the truck (use compressed air as a example).
- Start the forklift according to the procedures.

 ·If moisture penetration into the motor, you must first remove the moisture, to prevent short circuits

Moisture will reduce brake performance, brake truck briefly to drying the brake.

### IV. Regular maintenance

- Thoroughly dry water stains on the truck (use compressed air as a example).
- Start the forklift according to the procedures.

 ·If moisture penetration into the motor, you must first remove the moisture, to prevent short circuits

Moisture will reduce brake performance, brake truck briefly to drying the brake.

### 1. Regular maintenance schedule

√—Check , calibration, adjustment    ×—Change

#### (1) Battery

Mainten- ance item	Maintenance item	Tools	Every- day (8h)	Every week (50h)	Every month (200h)	Three months (600h)	Six months (1200h)
Battery	Electrolyte levels	Eye survey		√	√	√	√
	Electrolyte specific gravity	Gravi- meter		√	√	√	√
	Quantity of electricity		√	√	√	√	√
	Terminals are loose		√	√	√	√	√
	The cable is loose		√	√	√	√	√
	Surface cleanliness of the battery		√	√	√	√	√
	Battery surface has placed Tools		√	√	√	√	√
	Ventilation cover is tightened, vent is unimpeded			√	√	√	√
	Away from the fireworks		√	√	√	√	√

(2) Controller

Mainten- ance item	Maintenance item	Tools	Every- day (8h)	Every week (50h)	Every month (200h)	Three months (600h)	Six months (1200h)
Controller	Check the wear condition of contactors					√	√
	Check if contactor mechanical movement is good					√	√
	Check micro switch operation of the pedal is normal					√	√
	Check if the motor, battery and power unit is a good connection					√	√
	Check if the malfunction analysis system is normal						At the beginning of 2 years

(3) Motor

Mainten- ance item	Maintenance item	Tools	Every- day (8h)	Every week (50h)	Every month (200h)	Three months (600h)	Six months (1200h)
Motor	Remove the eyewinker from the motor shell				√	√	√
	Clean or change bearing						√
	If Carbon brushes, commutator is worn, the spring force is normal				√	√	√
	If Wiring is correct, reliable				√	√	√
	Clearing brush and commutator surface for the film end on toner					√	√

(4) Transmission system

Mainten- ance item	Maintenance item	Tools	Every day (8h)	Every week (50h)	Every month (200h)	Three months (600h)	Six months (1200h)
Gearbox and Wheel Reducer	Noises		√	√	√	√	√
	Check leakage		√	√	√	√	√
	Change oil						×
	Check the working condition of brake		√	√	√	√	√
	Check the moving of gear wheel					√	√
	Check the junction with the frame bolts loose situation				√	√	√
	Check wheel bolt tightening torque	Torque wrench	√	√	√	√	√

(5) Wheel(forward, backward wheel)

Mainten- ance item	Maintenance item	Tools	Every- day (8h)	Every week (50h)	Every month (200h)	Three months (600h)	Six months (1200h)
Tyre	Wear, cracks or damage		√	√	√	√	√
	If there is nails,stone or other foreign items on tire matter				√	√	√
	Wheel damage		√	√	√	√	√

(6) Steering system

Mainten- ance item	Maintenance item	Tools	Every- day (8h)	Every week (50h)	Every month (200h)	Three months (600h)	Six months (1200h)
Steering wheel	Check clearance		√	√	√	√	√
	Check axis loose		√	√	√	√	√
	Check radial losse		√	√	√	√	√
	Check operation condition		√	√	√	√	√
Steering gear and valve block	Check if mounting bolts are loose				√	√	√
	Check valve block interface with steering leak case		√	√	√	√	√
	Check seal of connectors		√	√	√	√	√
Rear-axle	Check whether the rear axle mounting bolts loose				√	√	√
	Check if there is bending, deformation, cracks or damage				√	√	√
	Check or replace the lubrication of bridge bearing.					√	√
	Check or replace lubrication of bridge bearing					√	√
	Check steering cylinder operating conditions		√	√	√	√	√
	Check whether steering cylinder is leaking		√	√	√	√	√
	Check rack and pinion gear case					√	√
	wiring and working condition of sensor					√	√

## (7) Brake system

Maintenance item	Maintenance item	Tools	Every-day (8h)	Every week (50h)	Every month (200h)	Three months (600h)	Six months (1200h)
Brake pedal	Empty run	Graduated scale	√	√	√	√	√
	Pedal travel		√	√	√	√	√
	Operation condition		√	√	√	√	√
	Whether there is air in the brake pipe		√	√	√	√	√
Stop, brake and control	Whether the brake is safe and has enough travel		√	√	√	√	√
	Operation condition		√	√	√	√	√
Pole and cable	Operating performance				√	√	√
	Whether the connection is loosen				√	√	√
	Wear of reduction gearbox connectors					√	√
pipe	Damage, leakage, rupture				√	√	√
	Loose situation of connection and clamping parts				√	√	√
Brake pump	Leakage situation		√	√	√	√	√
	Check oil level, oil changing.		√	√	√		×
	Pump situation					√	√
	Pump leakage, damage					√	√
	Pump piston cups, one-way valve wear damage, replace						×

## (8) Hydraulic system

Maintenance item	Maintenance item	Tools	Every-day (8h)	Every week (50h)	Every month (200h)	Three months (600h)	Six months (1200h)
Hydraulic oil tank	Check the oil, oil change		√	√	√	√	×
	Suction filter cleaning						√
	Exclude eyewinker						√
Control lever	Whether the connection is loosen		√	√	√	√	√
	Operation condition		√	√	√	√	√
Multitande	Leakage		√	√	√	√	√

m valve	Safety valve and self-locking tilt valve operation condition				√	√	√
	Measuring the pressure of the safety valve	Oil gauge					√
Pipeline joint	Leakage, loosening, fracture, deformation, damage				√	√	√
	Change the tube						× 1~ 2years
Hydraulic pump	Hydraulic pump is leaking or there is noise		√	√	√	√	√
	Hydraulic pump gear wear				√	√	√

(9) Lifting system

Mainten- ance item	Maintenance item	Tools	Every- day (8h)	Every week (50h)	Every month (200h)	Three months (600h)	Six months (1200h)
Chain and chain wheel	Check the chain tension state, whether deformation, corrosion damage		√	√	√	√	√
	Fuel chain				√	√	√
	Rivet pin and loose conditions				√	√	√
	Chain wheel deformation, damage				√	√	√
	If Bearings of chain wheel loosen				√	√	√
Attachment	Check whether in normal state				√	√	√
Lifting and tilt cylinder	Whether Piston rod, piston rod thread and the connection is loose, deformation, damage		√	√	√	√	√
	Operating conditions		√	√	√	√	√
	Leakage		√	√	√	√	√
	abrading and damaging status of pin and oil cylinder				√	√	√
Fork	Damage,deformation,wear of fork				√	√	√
	Damage,deformation,wear of allocation pin					√	√
	cracking and abrading status in hooker welding of fork root				√	√	√
Mast fork frame	welding between inner mast,outer mast and beam is cracking or damaged or not				√	√	√



	Tilt cylinder bracket and the door frame weld whether cracking, damage				√	√	√
	Inner frame, outer frame weld whether cracking, damage				√	√	√
	Fork frame weld whether cracking, damage				√	√	√
	wheel loosen				√	√	√
	Mast bearing wear, damage						√
	Mast bearing cap bolts whether loose				√		√
	Whether Lift cylinder rod bolt head, bending plate bolts loose				√		√
	cracking,damaging status of welding of roller and roller shaft				√	√	√

(10) Else

Mainten- ance item	Maintenance item	Tools	Every- day (8h)	Every week (50h)	Every month (200h)	Three months (600h)	Six months (1200h)
Overhead guard and load backrest	Installation is firmly	Measur- ing hammer	√	√	√	√	√
	Check the deformation, cracking, damage		√	√	√	√	√
Indicator light for steering	Work and installations		√	√	√	√	√
Horn	Work and installations		√	√	√	√	√
Lamps and bulbs	Work and installations		√	√	√	√	√
Reversing Buzzer	Work and installations		√	√	√	√	√
Instrument	Working condition		√	√	√	√	√
Wire	Harness injury, loosening			√	√	√	√
	Electrical connection loose				√	√	√

**2. Regular replacement of key safety parts**

Periodic replacement of critical safety components.

When some parts difficult to find through regular maintenance of injury or damage, in order to further improve security, the user should replace the parts given in the following table for regular.

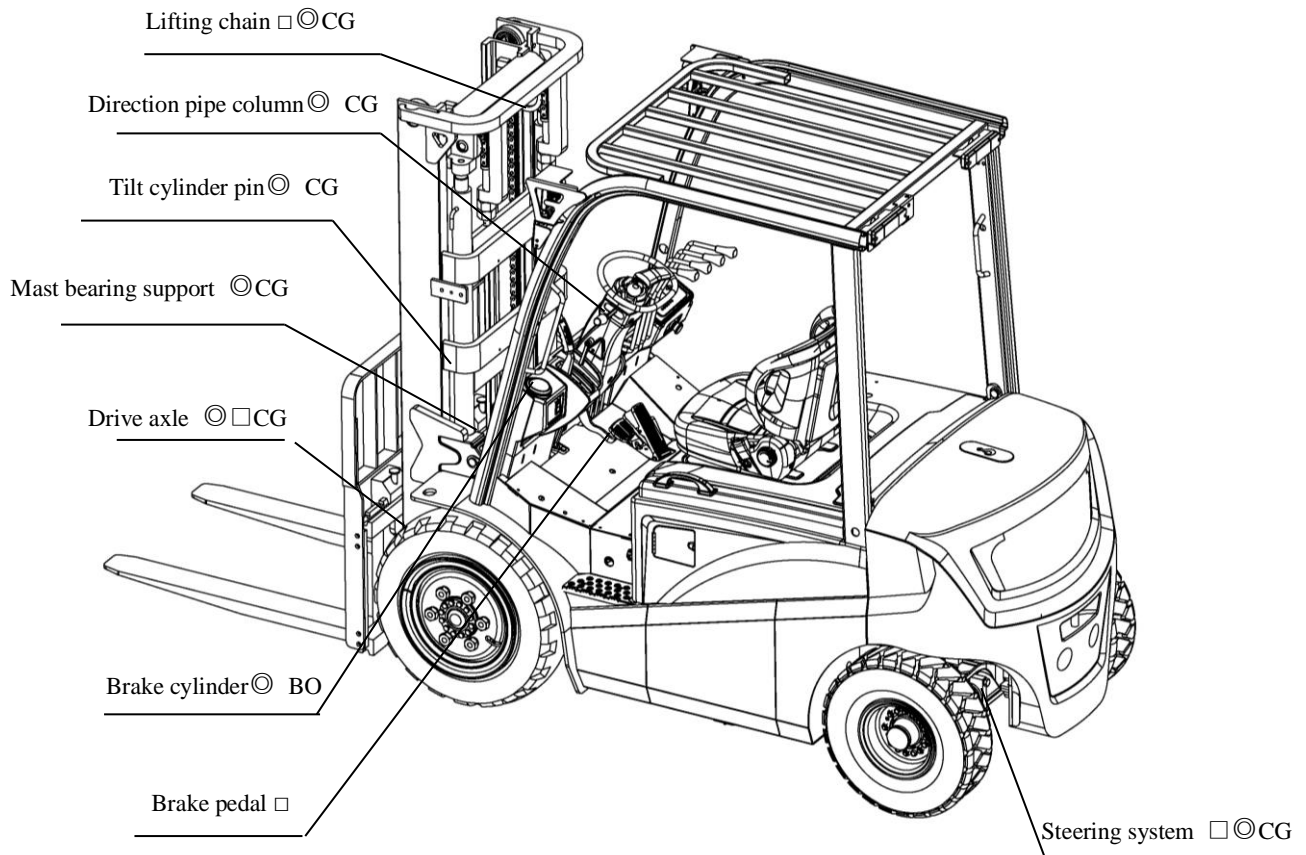
If the parts appeared abnormal before the time comes to replace, it should be replaced immediately.

Name of critical safety components	Useful life
Brake tube or hard pipe	1~2
Hydraulic hose for lifting system	1~2
Lifting chain	2~4
High pressure hose/tube for hydraulic system	2
Oil cup of brake fluid	2~4
Cylinder cover and dust cover of brake pump	1
Internal hydraulic system seals, rubber parts	2

## V. Area lubricated and lubricant recommended

### 1. Area lubricated

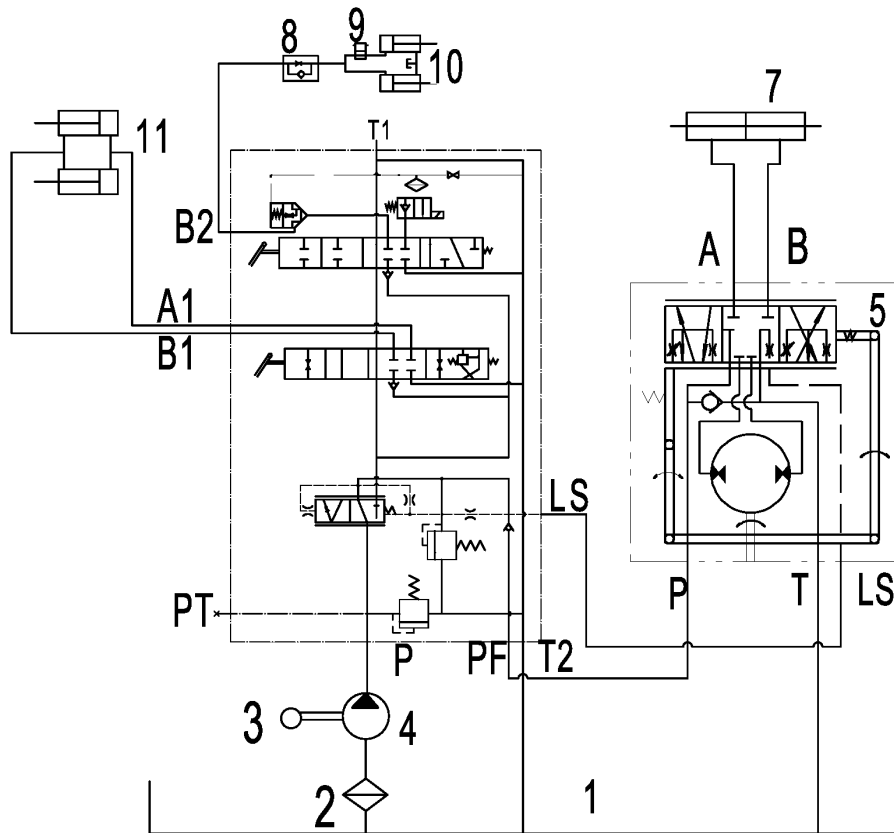
- : Change
- ◎: reinforce
- : Check and adjust
- BO: Brake fluid
- FO: Hydraulic oil
- GO: Gear oil
- CG: Grease
- W: Distilled water



## 2. Lubricant recommended

Name	Trademark	Capability(L)	Remark
Hydraulic oil	L-HM32	Max36	$\geq -5^{\circ}\text{C}$
	L-HV32		$\geq -20^{\circ}\text{C}$
Gear oil	85W/90GL-5	4.5	$-15^{\circ}\text{C} \sim +49^{\circ}\text{C}$
	80W/90GL-5		$-25^{\circ}\text{C} \sim +49^{\circ}\text{C}$
Brake fluid	Caltex DOT3	0.2	
Industrial Vaseline	2#		Battery electrode column
Grease	3# Lithium Grease		

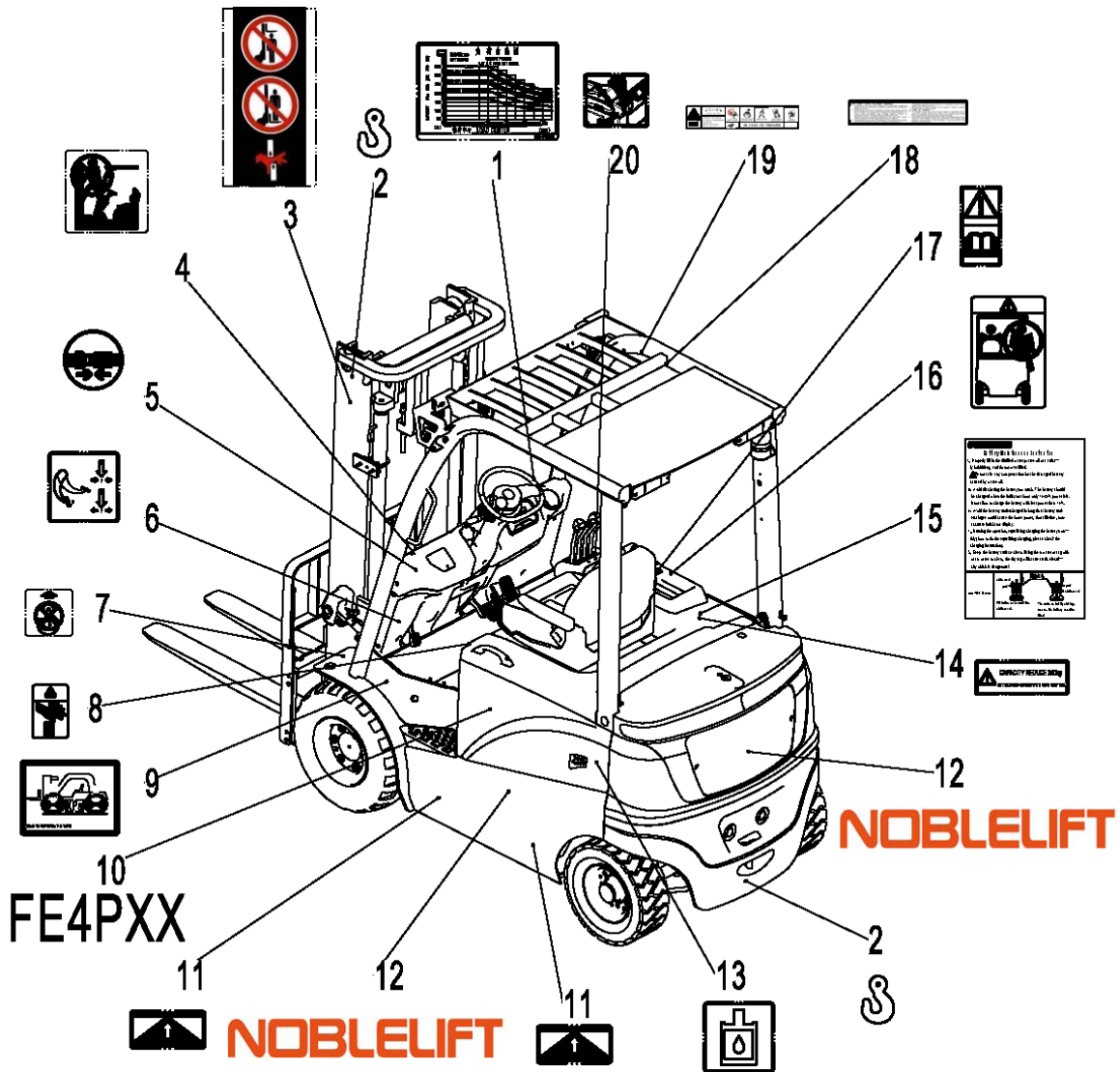
## 3. Hydraulic Schematic Diagram



- |                      |                         |                                      |
|----------------------|-------------------------|--------------------------------------|
| 1、Hydraulic oil tank | 2、Oil absorption filter | 3、Pump motor                         |
| 4、Gear pump          | 5、Steering device       | 6、Multiple directional control valve |
| 7、Steering cylinder  | 8、Governor valve        | 9、Shut-off valve                     |
| 10、Lifting cylinder  | 11、Tilt cylinder        |                                      |

#### 4. labeling

Signs stuck on vehicle are to illustrate using method and attention matters of vehicle, which not only takes consideration of you but also of the vehicle. stick the signs plate on again if they fall off.



- |                     |                         |   |                            |
|---------------------|-------------------------|---|----------------------------|
| 1、 Data plate       | 2、 Lifting point        | 3、 Warning mark                           | 4、 No Climbing             |
| 5、 Life belt        | 6、 Stopping braking     | 7、 Prohibition of lifting                 | 8、 Squeeze marking         |
| 9、 Tire pressure    | 10、 Model               |   | 12、 Company identification |
| 13、 Hydraulic fluid | 14、 Lateral weight loss | 15、 Instructions for the use of batteries | 16、 Prohibit sitting       |
| 17、 Reading hint    | 18、 Use of knowledge    | 19、 Careful driving                       | 20、 Operation prompt       |

# Chapter six Truck's Lithium battery use and safety

## 1. Safety operation procedures

Safety precautions for lithium batteries

- △ Lithium batteries should be kept far away from the dangerous chemicals, fire, dust and other extreme environments.
- △ Incorrect use may lead to external short circuit, overcharge, the temperature is too high, causing the battery to smoke, if this happens please promptly cut off the power, unplug the power plug, use fire extinguisher to keep safe.
- △ The incorrect use may cause the battery internal expansion, will lead to serious rupture, should immediately stop using it if it is detected, turn off the vehicle power, unplug the power plug, and contact our customer service immediately.
- △ Do not disassemble, extrusion, puncture, keep in high temperature environment, or baking battery, avoid high-frequency vibration, external shocks, crashes for the battery.
- △ Do not short connect, avoid any metal or other conductive objects touch the positive and negative poles of the battery expect the pressing bolt or conductive tape of the battery.
- △ It is prohibited to expose the battery in the environment with temperature at 55 °C or above for long time, no heating or put the battery into a fire.
- △ It is strictly prohibited to use the charger without proper charging protection device (Lithium battery protection circuit board, battery management system etc.) or use the battery charging equipment which is not approved by the Lithium manufacturer (charger, DC power supply lamp)
- △ It is prohibited to disassemble the battery by technicians not authorized by the manufacturer.
- △ The battery is prohibited to be put in the water.
- △ Children or any other people who lack of lithium battery safety knowledge are forbidden to use the product.
- △ It is prohibited to connect the battery with other batteries or similar type of batteries in series or in parallel.
- △ It is prohibited to connect the battery sets with battery protection circuit board or battery management system in series or in parallel.



### Warning

**Battery storage for a long time (storage time for more than 6 months or more), need to cut off the power of the lithium battery completely, it is recommended not to store the battery less than 60% of the capacity, storage environment humidity is not higher than 95%RH.**

**Within a specified period of time, charge and discharge the battery according to the requirements of storage.**

Storage environmental temperature	storage environmental relative humidity,	storage time
-10~0°C	5%~95%	≤6 months 60%SOC
0~40°C	5%~95%	≤6 months 60%SOC
40~45°C	5%~95%	≤2 months 60%SOC

## 2. Introduction and application requirements of lithium batteries

### 2.1 Product Brief Introduction

Lithium phosphate lithium ion battery has good safety, small resistance, volume and quality characteristics of high specific energy, long cycle life, suitable for applications for all kinds of electric forklifts, electric buses, electric motor car, it has been widely used and get the praise of our customers.

Lithium phosphate Lithium ion battery is a lithium ion battery using lithium phosphate as cathode materials, the main application direction is for the power battery, has the characteristics of small volume, light weight, long cycle life, high safety, pollution-free, lithium phosphate The size and space of the lithium ion battery compare to lead-acid battery with same capacity is about 2/3 of the lead-acid battery, and weighs only 1/3 of . The cycle life of ordinary lead-acid battery in about 1000 times, the highest of 1200 times, a forklift for lithium ion battery cycle life can be up to 4000 times, so the performance/price ratio in the same conditions of use of lithium phosphate lithium ion battery is much higher than the lead-acid battery

Lithium phosphate lithium ion battery are subjected to rigorous testing, capacity, storage capacity, high discharge, low discharge, discharge rate and other performance indicators exceeded the national standard, puncture, extrusion, vibration, short circuit, overcharge, over discharge and other safety performance indicators fully meet the national standard, no risk of fire and explosion.

Lithium phosphate lithium-ion batteries do not contain any heavy metals and rare metals, there is no hazardous material to any human and environmental is used for re-manufacture and use of the battery, it is the world's most environmentally friendly battery.



**Warning: Please use the package in strict accordance with the package instructions, otherwise it may not be included in the warranty:**

- Please do not operate electric vehicles equipped with lithium batteries at temperatures above 55 °C or below -20 °C
- Please charge immediately after the use of the vehicle in environment with temperature lower than 0°C
- Please do not flush the battery box directly to prevent the water entering from the battery box.
- If you are not professionals, please do not touch, move, disassemble batteries and corresponding high-voltage cables, or other components with high voltage warning signs



**Attention:**

- In order to achieve better use effect and prolong the battery life, contact the manufacturer every year and check the battery performance and balance charging by the manufacturer and technician

- If a vehicle is hit strongly during transit, stop the vehicle in the safe area and check whether the vehicle battery pack area is damaged
- When a vehicle or battery pack catch on fire, left the vehicle to a safe distance quickly, use dry powder fire extinguisher to stop the fire, use water to extinguish or incorrect fire extinguishers may cause electric shock, according to the characteristics of the battery, the battery capacity within warranty period should reduce from 0% to 25%.

## 2.2 Working temperature of lithium battery

- Charging temperature range: 0~40℃, charge the battery in low temperature environment below 0℃ with high rate will cause damage to the battery. Please charge immediately after the use of the vehicle in environment with temperature lower than 0℃
- Discharging temperature range: -20 to 50 ℃, the discharge capacity in low temperature (-20 to 0 ℃) is lower than the normal temperature. The battery can be used at 40~50 ℃ ambient temperature, but if the battery temperature is too high, especially the battery in the long time high temperature environment, will accelerate the battery internal material aging, shorten the battery life, it is not recommended to use long at this temperature.
- Environmental temperature over the above range of charge and discharge temperature, will have a negative impact on the performance of batteries or damage, may shorten the service life of the battery, please avoid.

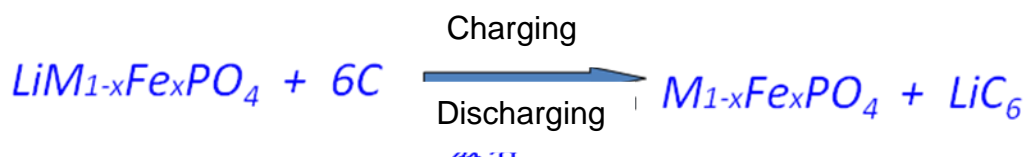
According to the chemical properties of lithium ion batteries, in normal use, the internal energy of chemical reactions between normal and chemical, but under certain conditions, such as the overcharge, over discharge and overcurrent will lead to abnormal chemical reactions occurring inside the battery, it will seriously affect the performance of the battery and service life, and may produce large amounts of gas, so that the internal pressure of the battery increases rapidly after the resulting cell bulging failure, therefore all lithium-ion batteries need a protection circuit for effective monitoring of the charge and discharge state of battery, and in some conditions to turn off the charge and discharge circuit to prevent damage to the battery.

Protection circuit usually includes overcharge protection, over discharge protection, over-current protection, temperature protection, short-circuit protection, insulation protection, etc., so as to effectively protect the normal use of batteries.

## 2.3 Working principle of lithium ion battery:

**Lithium iron phosphate battery:** a lithium ion two cell using lithium iron phosphate as cathode material,

The chemical equation for charging and discharging is as follows:



During charging:

The external current flows from the negative to the positive electrode, causing the lithium ion in the positive electrode to  $\text{Li}^+$  out of the lithium iron phosphate lattice, passing through the diaphragm to the negative electrode, and embedded in the layered structure of the negative electrode of the carbon material.

During discharging:

The lithium ion  $\text{Li}^+$  in the negative electrode is removed from the carbon material layer and moves to the positive electrode through the diaphragm and is embedded in the lattice of the positive material, and accordingly, the current flows from the positive electrode to the negative electrode through an external load.

### 3. Charging operation instructions for lithium batteries



#### **Caution: safety precautions before charging**

Please choose to charge in a relatively safe environment (avoid liquid, fire, etc. extreme environment)

Please keep necessary fire extinguishing equipment (dry powder fire extinguisher) near the charger, emergency firefighting can be carried out in extreme cases

Please make sure there is no dust, water or other articles in the charging plug and charging socket before charging, if there is any, please clean it before charging, otherwise it will lead to the bad connection between the charging plug and charging socket, cause heat and even cause a fire.

Do not modify and disassemble the charging port and charging equipment, which may lead to charging failure and fire. According to the characteristics of the battery, the battery capacity within warranty period should reduce from 0% to 25%.

#### **◆ Charging operation steps:**

1) The forklift stops stable and turn off the key switch

The forklift is stationary and ensures that the key switch in the charging vehicle is in a turn-off position. Open charging door and protective cover.

2) Socket port check

Take off the charging gun from the charger, check the charging gun and the lithium battery charging socket on the vehicle, make sure there is no water or other articles in the port, and the metal terminal is not damaged or affected by rust or corrosion.

3) Instrument display in standby mode;

Power switch is on the rear side of the charger, turn on the power switch of the charging equipment, charging equipment is on with indicator lights, display shows welcome screen as shown in the graph, charger will enter into the standby mode after self-checking, showing the battery voltage, current and charging power, due to charging gun is not connected to the truck at



this time, so state of charging displays "Please connect the battery".

4) Complete the charging connection and the normal charging display

Remove the charging gun, insert the gun into the body end lithium battery charging socket, charger will complete the self-checking and communication with the lithium battery, when there is no fault for the whole system, the charger internal relay will work, charging indicator is on, and the instrument will display the charging voltage, charging time and charging current and fault information.

5) Charging end display and power off operation

When the lithium battery is full, the charger will automatically stop charging, at this time, the green light indicating the battery has full voltage and output meter on the output current is 0, then press the pause button, then unplug the charger gun (Note: the charging gun head is integrated with the lock button as shown in Figure (b) must be pressed to be normal plug operation), winding gun line, out back the charging gun

**If the lithium battery is not fully charged, it is necessary to press the stop button. When the charging current is reduced to 0 (A), the charging gun head can be pulled out.**

Cover the charging cover and the door of the forklift, turn off the charger power and end the charging.



**Caution: to avoid serious personal injury, the following precautions should be taken when the forklift is charging!**

- Do not touch the charging terminals or metal terminals in the charger head.
- When there is lightning, do not charge the vehicle or touch the vehicle. Lightning strikes may cause damage to the charging equipment and cause personal injury.
- After the end of charging, do not use wet hands or stand in the water to disconnect the charging device, because this may cause electric shock, causing personal injury.
- After the charging is finished, please turn off the forklift charging port protection cover, to avoid any objectives enter into charging plug or socket of the forklift, which will lead to charging port damage.



**Note: in order to avoid damage to the charging equipment, please pay attention to the following matters**

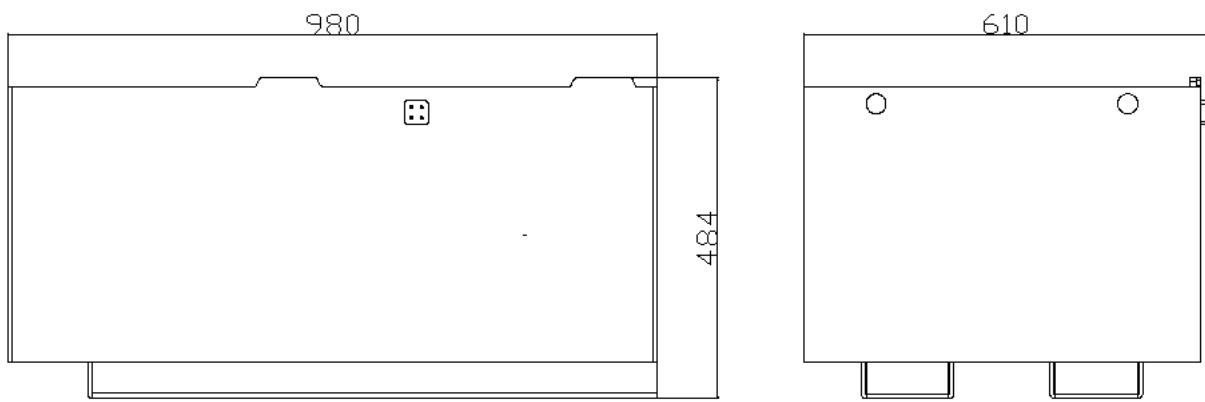
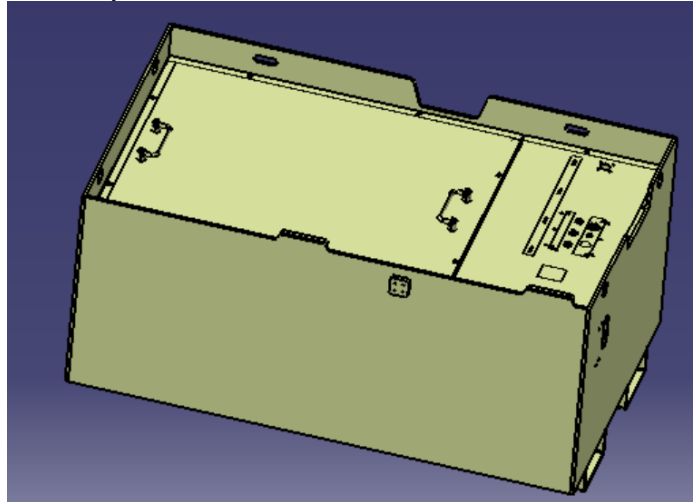
- Do not turn off the charging port door when the charging port is open;
- Do not pull or twist the charging cable;
- Please do not impact the charging equipment;
- Do not store or use charging equipment at temperatures above 55 °C;
- It is prohibited to direct unplug the charging gun when there is still charging current,

which may cause arcing phenomenon, causing the loss of property and personal injury;

- Do not put charging equipment near the heater or other heat sources.

#### 4. Structure and main technical parameters of lithium battery

##### 4.1 Structure of lithium battery



##### Introduction of name and function of main parts :

1. Debug1 RS485. Connect the serial port of the lithium battery BMS system and connect the handheld monitor or the PC por.
2. Alarm. Lithium battery fault alarm
3. Power LED. The lithium battery switch is closed when the light is on.
4. Communication port. Communication port for lithium battery and controller, realizing communication connection between lithium battery and controller.
5. Debug1 CAN. Connect the serial port of the lithium battery BMS system and connect the handheld monitor or the PC por.
6. Power supply positive pole connecting end
7. Negative terminal of power supply
8. Fan. Air outlet
9. Fan. Air intake
10. Charging socket. When the lithium battery is charged, the cover is opened and the charging gun is inserted, and the charging of the lithium battery can be completed.
11. Power plugs. Battery connection plug for lithium battery and forklift.

#### 4.2 Main technical parameters

Forklift Model			FE4P30-35Q
Lithium battery Capacity	STD	Ah	200
	OPT	Ah	300
	OPT	Ah	400
Battery weight	Kg		280/340/410
Nominal voltage	V		80
Operating voltage range	V		70-92
Rated charging current	A		65A/100A/150A/200A
Charging temperature	°C		0~40
Discharging temperature	°C		-20~50

#### Attachment: lithium battery system diagnosis code and processing method

Battery System Failure Maintenance Table					
SN	Fault Type	Posible Cause	Detect Method	Cause Comfirmed	RecoverySolution
1	Battery pack has no output after starting, switch indicator is not on	1. The internal components of the system are damaged; 2. The system voltage is over discharge.	1. measure the total positive and negative voltage with the pen to check whether the total voltage of the system is normal.	<36V, the DCDC converter can not work.	
			2. Choose the multimeter to guide the gears and measure whether the panel communication wire harness S1_A and S1_B are normally connected.	Wire harness failure due to abnormal conduction at both ends of wire harness	Replace wire harness
			3. After measuring the normal connection of the voltage wiring harness, press the start switch to check whether the BMS is on.	After pressing the start switch, the BMS does not turn on the light, preliminary judgment of BMS faul	Replace BMS or DCDC

2	There is no power on the forklift after the battery pack starts, and the battery indicator light is on.	1. Abnormal communication with forklift 2. Damage of internal components of the system	<p>. check the alarm code on the forklift display screen to confirm the specific fault. 2,If it is confirmed as a CAN communication problem, disconnect the discharge connector and measure whether there is 120_ resistance on the CAN ports.</p>	<p>1. if the resistance is Infinity , that the CAN communication cables are disconnected. First, confirm the normal conduction of CANH and CAN between the discharge connector and the panel communication port. And then confirm the conduction between the panel and BMS. 2 the internal CAN chip of BMS may be damaged if there is resistance, but it is much larger than 120</p>	<p>1. Replacement of damaged wiring cables; 2. Replacement of damaged BMS</p>
			<p>1. Disconnect the discharge plug and start the battery pack separately to check whether the discharge plug has output</p>	<p>If there is an output, the internal circuit of the locomotive may be wrong, resulting in the failure of the battery pack to output.</p>	<p>Check forklift communications and power cables</p>
			<p>1. Remove the battery case cover and the electrical case cover to check whether the fuse is normal</p>	<p>Fuse damaged</p>	<p>Before replacing the fuse, the short circuit between positive and negative discharges of locomotive and battery pack should be measured. If there is no short circuit, the fuse should be replaced. If there is, the short circuit fault should be dealt with first, and then the fuse should be replaced.</p>

3	Battery pack can't be recharged. Battery pack indicator light is on	1. Abnormal communication with forklift truck; 2. Damage of internal components of the system	1. Measure whether the 12V, GND, CANH and CNAL wiring harnesses of charging sockets are conducting normally.	Abnormal conduction	Replace wire harness
			2. Connect the charger, check the fault code of the charger display screen, check whether the charging port terminal is loosened or not, and check whether there is 120_resistance at both ends of CAN communication.	No 120_resistance was measured and the CAN chip was damaged.	Replace BMS
4	Battery pack can not be charged, battery pack indicator is not on	1. Charger without 12V auxiliary power supply output; 2. Damage of internal components of the system	1. Disconnect the charger and battery pack, and measure whether there is 12V auxiliary power output after the charger is turned on separately.	NO 12V output	Replace or repair the charger
			2. Measure whether charging socket wiring harness 12V, GND wiring harness is normal	Abnormal wiring harness conduction	Replace wire harness
			3. Confirm that the output of 12V auxiliary power supply of charger is normal and the wiring harness of charging socket is normal. Keep charger on and connected with battery pack to check whether BMS is on.	Preliminary judgement of BMS fault	Replace BMS

5	Battery Pack Can't Shut Down	Damage of internal components of battery pack system	1. The key switch of the car is short circuit; 2. The internal components of the battery pack system are damaged	The battery pack can switch the locomotive on and off normally, and the locomotive switch wiring harness is short-circuiting	Check forklift switch harness
			2. Disconnect the battery pack from the forklift truck and press the switch button on the battery pack. The battery pack can not shut down normally. After the battery box panel is removed, the wiring harness on the switch is disconnected, and the power can be shut down normally.	SWITCH damaged	Replace SWITCH
			3. The battery pack can not be shut down after disconnecting the connection between the battery pack and the forklift truck and the wiring harness on the switch. 。	BMS fault	Replace BMS

## 5 Transportation

- Handling and transportation should avoid severe vibration, greater external impact, no throwing, rolling, upside down, extrusion, and excessive stacking;
- Avoid getting caught in the rain during transit;
- During transit, make sure the battery is disconnected from the vehicle and charging equipment without any form of charging and discharging.

# NOBLELIFT

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