SERVICE MANUAL

Starke Energy Mini Series

FBT15-MINI

2019-12

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STARKE ENERGY

head is in 300mm distance from the shelf), lower the fork down to about 200-300mm off the ground, the truck leave the shelves. Then park the truck after travel to the needed position, at last, lower the fork and the goods, make the fork leave the goods completely, shift the fork out of the pallet slowly.

7.3 Treatment of abnormal circumstance in operation:

7.3.1 Pull back the tiller the forks are lifted, but when the tiller released back to the middle position the forks are still ascending. Lifting is out of control. In such case switch off the power immediately. Move the truck to safe place and lower down the goods manually. Inspect the circuit.

7.3.2 If brake is found not working immediately stop operation and inspect and repair the truck.

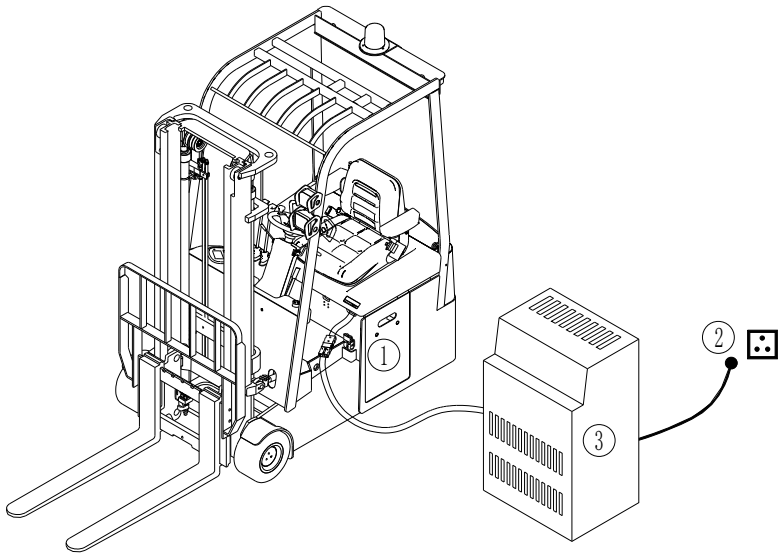
7．4 After use:

Park the truck to fixed area after use and make daily maintenance in line with clause 6. Charge the truck.

8. Usage, maintenance and charge of storage battery

The truck is equipped with external charger, the charging method is as follows.
Charging method of external charger

1. Pull out the charging connector from the side of the truck；
2. Insert the charging connector into the fixed connector of charger；
3. Then insert the plug of charger to two phase AC power system；
4. Turn on the charger, and it starts to charge after several seconds.



Schematic diagram of external charger

Warning

Hydrogen is aggregated in the battery box when charging. For this reason, the charging condition shall be good ventilated. In avoidance of explosion and fire disaster, open flame is forbidden.

8．1 Initial charge

8．1．1 Initial charge shall be made for new battery, i.e. the first time charge. Clean up the surface of the battery before the initial charge, and then check for damage to ensure reliable connection.

8．1．2 Open gas cap.

8．1．3 When the charging equipment is able to operate normally, pour the sulfuric acid electrolyte with a density of 1.260±0.005 (25℃) and a temperature of lower than 30℃ into the batteries. The electrolyte level should be 15-25mm higher than the protective board. In order to reduce the temperature rise caused by chemical reaction of the electrolyte and let the electrolyte fully penetrates into the pores of the polar plates and the baffles, the batteries should be placed still for 3-4 hours, not exceeding 8 hours. The initial charging can only be conducted when the electrolyte temperature reduces to below 35℃. (When necessary, the batteries can be put into cold water for temperature reduction). After the still placement, if the electrolyte level reduces, electrolyte should be added.

8．1．4 The sulfuric acid electrolyte is prepared with battery sulfuric acid complying with the state standard GB4554-84 and distilled water. Never use industrial sulfuric acid and running water. The standard temperature (25℃) and density of the electrolytic solution can be converted as follows:

$$D25 = Dt + 0.0007\ (t-25)$$

Where: D25: the density of the electrolytic solution at 25℃
Dt: the actual density of the electrolytic solution at t ℃.
t: temperature of the electrolytic solution when testing the density.

8．1．5 Dry up the electrolyte spilled on the surface of battery. Connect the positive and negative poles of batteries with those of D.C. source (charger) respectively and then turn on the power. Charge with the current of 30A (the current of the first stage). After the charge voltage achieves 43.2V (18×2.4V=43.2V), switch to the 15A current of the second stage for continuative charge. When charging, the temperature of electrolyte shall never exceed 45℃. When the temperature raising up nearly to 45℃, reduce the current by half or stop charging temporarily. After the electrolyte temperature reduce below 35℃, continue charging. However the charge time need to be extended appropriately.

8．1．6 Fully charged basis: When the voltage during the second stage charging reaches 46.8V (18 ×2.6V = 46.8V), the variation of the voltage is no greater than 0.005 (V). The density of the electrolytic solution reaches 1.280 ±0.005 (25℃), no apparent changes in 2 hours and there are fine air bubbles appear violently, it can be deemed that the batteries are fully charged. The charged power capacity is 4-5 times of the rated capacity and the charging time is about 70 hours.

8．1．7 In order to accurately control the sulfuric acid content of the electrolytic solution, the electrolytic solution density of the batteries should be examined during the last period of charging. If there is inconsistence, adjust with distilled water or sulfuric acid with a density of 1.40. The electrolytic solution density and the liquid surface should be adjusted to the stipulated value within two hours in the charging state.

8．1．8 After the initial charging is completed, the surface of the batteries should be cleaned. Close the cover of the open cover type liquid hole plug and then the batteries can be used.

8．2 Use and maintenance

8．2．1 In order to guarantee the service life of the batteries, the batteries in use should be fully charged. Insufficiently charged batteries must not be used. During the process of use, close attention should be paid to the discharge extent. Over discharge is prohibited---the voltage reduces to 1.7V per battery (when the total voltage reduces to 1.7V×18 = 30.6V). When the density of the electrolytic solution reduces to 1.17, discharging should be stopped and charging should be conducted at once. The batteries should not be placed idle for a long period of time. The supplementary charging frequently conducted during the process of use is called common charge.

8．2．2 Common charge: The first stage current of common charge is 30A and that of the second stage is 15A. The charging method is the same as that of initial charge. The charged volume is 130-140 % of the discharged volume and the charging time is about 12 hours.

8．2．3 The batteries in normal use should avoid over-charge, but over-charge must be properly conducted for the batteries in following situation, i.e. balance charge.

a. The "lag-behind" batteries--- batteries with a voltage lower than that of the other batteries in the discharging process and the batteries having been repaired for failure. (When balance charge is conducted, the positive and negative poles of the "lag-behind" battery should be respectively connected with the positive and negative ends of the charger, the DC power supply, and the charge should be conducted independently.)

b. Balance charge should be conducted for the batteries in normal use every 2-3 months.

c. Balance charge should be conducted for the batteries that have not been used for a long period of time before use.

2. 4 Equalizing charge:

a. Charge with a 4A current

b. When the charge voltage reaches46.8V (18 ×2.6V = 46.8V) and air bubbles occur in the electrolyte, the current should be reduced by 50% (2A) and continue to charge.

c. When the batteries are fully charged, stop charging for 0.5 hour and charge again with a 1A current for one more hour.

d. Stop charging for another 0.5 hour and charge with a 1A current for another one hour.

e. Repeat according to item d till air bubbles occur violently in the batteries once the charger is switched on.

8.3 Storage

The storage battery shall be kept in clean, dry and ventilated warehouse within the temperature range of 5 to 40℃. The valid storage period is 2 years. Safekeeping shall be made within storage period according to the following requirements:

a. Avoid direct sunlight. The distance from heat source shall not less than 2m.

b. Avoid contact with any harmful substance. No metal impurity shall fall inside the battery.

c. No inversion, no mechanical collision or heavy weight is permitted.

d. Storage with electrolyte is forbidden. Under special cases that the storage with electrolyte is necessary, the density and solution level of electrolyte shall be adjusted to the specified value. Whenever one month of storage period expires, a complementary charge shall be made with the common charge method.

Warning

The operator has to wear the protective equipments when operating the electrolyte

8.4 Operation of electrolyte

⑴ Density check

The suction type density meter shall be used to check density. During operation, avoid spilling out the electrolyte, and do wear protection appliance.

⑵ Operation besides check

Consult professional personnel, especially when complementing electrolyte (dilute sulfuric acid).

⑶ Electrolyte leakage

As for the electrolyte leakage resulting from storage battery tilting and damage, emergency treatment shall be made at once (See emergency treatment item).

8.5 Operation of storage batteries during the final stage of their lifetime

⑴ Operation of storage batteries during the final stage of their lifetime

When the lifetime of storage battery is about to terminate, the electrolyte in single battery reduces very fast. For this reason, distilled water shall be complemented everyday.

⑵Treatment of waste battery

As for the waste battery, draw out the electrolyte and decompose the battery. It can be discussed that

whether the waste battery shall be recycled by the battery manufacturer. The waste electrolyte can be disposed according to relevant local rules and regulations.

8.6 Emergency treatment

⑴The electrolyte spills on skin: wash with large amount of water

⑵The electrolyte spills into eyes: wash with large amount of water, and then seek help from specialized doctor.

⑶The electrolyte spills on clothes: take off clothes right away, wash with water, and then flush with week basic soap solution.

⑷The electrolyte leakage: in case of electrolyte leakage outside, neutralize it with lime, strong carbonic acid soda or carbonic acid soda, and then flush with large amount of water.

8.7 Charger

If the charger you use is full automatic type. It must meet with the following 2 requirements:

a The output voltage of charger: 36V

b The output current of charger: 100A

If the charger you use is semi-automatic or manually adjustable, please charge the battery pack according to the requirements of use and maintenance mentioned in the second tip.

9. Inspection before operation:

For the sake of safety operation and good situation of the electric truck, it is compulsory to check the truck completely before operation. Contact the sales department of our company when founding problems. Unless authorized or trained, the manufacturer cannot modify any adjustment values (including motor speed, etc.). In particular, the safety equipment and switches are not allowed to dismantle and adjust, incorrect repair and adjustment, will cause the occurrence of dangerous situations when operation.
Any inspection, maintenance, investigation and other work related to forklift truck, please contact our dealer. Worthy of note is that our company does not take any responsibility of the secondary damage caused by improper operation and maintenance or incorrect repair and the usage of the unoriginal parts of our company.

9.1 Check point and check content:

	No.	Check point	Check content
Braking system	1	Operation handle	When we rotary concentrated control handle to see whether there is a noise from the brake.
	2	Brake clearance	The clearance between brakes should be kept between 0.2mm and 0.5mm.
Steering system	3	Operation handle	Degree of tightness and rotary flexibility.
	4	Oil pipe	Leakage or not.
	5	Hydraulic oil	Appropriate oil quantity.
	6	Lifting oil cylinder	Whether there is any oil leakage.
Wheels	7	Pins, screws and all the fasteners	Check all the fasteners of the truck's wheels, i.e. pins or screws, loose or not.
	8	Wearing status	Compare the parameter list, replace the wheel when its diameter reduces by 5%.
Battery	9	Charge	Confirm the display state of the battery capacity.
	10	Electrolyte	The solution level and density of electrolyte.

	11	Connecting wire	The connecting line and socket shall be firm.
Horn	12	Horn	Press down the horn button to check whether the horn sounds.
Instrument	13	Function	Turn on the switch of electric lock to check whether the instrument displays normally.
Others	14	Truck frame, etc	No damage, crank.
	15	Function	Check that whether lifting, lowering, forward & backward movement and support legs of the truck is normal, and if there is any abnormal noise.

10. Inspection after operation:

After operation, the smudge on truck shall be wiped out. Besides, the following check shall be carried out:
Keep visibility of all graphics context marks such as warning signs, nameplate and notice board. These marks are able to instruct, caution and warn the operator to some degree.
The situation about deformation, distortion, damage or breakage
Add lubricating oil and grease if necessary.
Replace faulty components.

11. Periodic maintenance and repair:

Comprehensive check for truck can avoid malfunction and ensure the service life. The hours listed in maintenance procedures is based on the cases that the truck works for 8 hours per day and 200 hours per month. For the sake of safety, maintenance shall be carried out according to maintenance procedure.

Notice
All the repair work shall be carried out by professional personnel.

Please contact the sales department of our company if you need to adjust or replace the components.

11.1 Precautions during maintenance:

Notice
The components for replacement shall be produced completely by our company. When replacing components of the truck, the components with the same safety requirement with the original design shall be used.
The lubricating oil and hydraulic oil in use shall be recommended by our company.

⑴ Places for maintenance:

Notice
The places for maintenance shall be appointed and can provide other services such as hoisting and safety protection facility etc.
The places shall have level ground and good ventilation.
The places shall be equipped with fire-extinguishing devices.

⑵ The matters needing attention before maintenance:

Notice

No smoking.

Arrange the self-protection work.

Wipeout the effusive oil in time.

Before adding lubricating oil, clean up the dirty oil or dust on the joint with brush or cloth.

Except certain situation, turn off the key switch and pull off the power socket.

Lower down the fork arms to the lowest point when carrying out maintenance.

Ensure no goods on the truck when demounting the high pressure oil pipe. Besides, the fork arms shall be descended to the lowest position, by this way, the pressure of hydraulic system can be released.

For the reason that there are capacitors storing a little amount of electric energy in circuit, so before contacting the binding post of the main circuit, discharge at first.

Clean the electric section with compressed air, never flush with water.

When the truck requires high-position maintenance, the altitude safety protection must be carried out for the repairing and maintenance personnel.

11.2 Inspection and maintenance before the new truck put into operation

In order to follow the industry related regulations and ensure the absolute security to the truck in the transportation, for new ex-factory truck, it is possible that there is no electrolyte inside storage battery before the first use (except the inland sale).

The electrolyte of storage battery is prepared well before the truck leave the factory, and it is filled into the storage battery by the professional personnel before the first use. First, place the truck to the site with good ventilation, open the lid of storage battery box, and open all the top plastic lids of storage battery. The plastic pot with storage battery electrolyte inside is raised using plastic funnel, and the electrolyte is poured into the storage battery in a slow way until the liquid level can be seen. After all the storage battery is filled, conduct initial charge to the storage battery timely according to the operation requirements of initial charge 6.1

11.3 Daily inspection

Inspection of hydraulic oil level: lower the fork to the lowest position, oil charge is 24L. Recommendatory trademark for the hydraulic oil should be chosen.

Check the capacity of storage battery: refer to the use and maintenance of storage battery.

11.4 The inspection according to the need

Clean the truck

Inspect and screw down each fastener

Inspect the damage state of wheels

11.5 The inspection and maintenance after 50 hours (Weekly)

Braking system	1	When we rotary concentrated control handle to see whether there is a noise from the brake.
	2	The oil dirt and dust on the turning gearwheel should be cleaned.
	3	The clearance between brakes should be kept between 0.2mm and 0.25mm
Capability of electrolyte	4	Inspect the liquid level of electrolyte, pure water can be used for supplement if the liquid level is too low.

Density of electrolyte	5	The specific gravity should be1.28g/ml after charged.
Clean the storage battery	6	Cover the lid, and flush with tap water.
Inspect the contactor	7	Burnish the coarse surface of contacts using sand paper.

11.6 The inspection and maintenance after 200 hours (Monthly)

Besides the weekly maintenance, the following maintenance should be carried out, and when the parts must be adjusted and replaced, please contact with maintenance personnel of our company. (keep monthly maintenance record)

	No.	Check point	Check content
Whole truck	1	Whole status	Abnormal or not.
	2	Horn	Sound
Steering system, braking system, hydraulic system and lifting system	3	Safety seat switch	Seat safety switch closes when seated, there is a noise from the brake.
	4	Brake clearance	The clearance between brakes should be kept between 0.2mm and 0.8mm.
	5	Operation handle	Degree of tightness and rotary flexibility.
	6	Truck frame and fastener	Function, and check cracks, lubrication and tightness of fasteners.
	7	Fork clip mechanism	Function and check the cracks, bending, deformation.
	8	Oil pipe	Whether oil pipes leak or not.
	9	Hydraulic oil	Proper quantity of oil.
	10	Lifting oil cylinder	Whether there is any oil leakage or not.
Storage battery, charger and electric system	11	Electrolyte	Liquid level, specific gravity and cleanness
	12	Plug	Function, whether it is damaged or not
	13	Key switch	Function
	14	Contactor	Contact performance and function
	15	Micro switch	Function
	16	Controller	Function
	17	Driving motor	Wearing status of carbon brush and selenium rectifier.
	18	Lifting motor	Wearing status of carbon brush and selenium rectifier.
	19	Fuse	Whether it is perfect or not
	20	Wiring harness and connection terminals	Whether flexible and whether damaged or not.

11.7 Maintenance for 600 hours (every three months)

During the maintenance every three months, the monthly maintenance process shall be repeated. When the

parts must be adjusted and replaced, please contact with maintenance personnel of our company.

Contactor	Burnish the coarse surface of contacts using sand paper.
	Replace according to the status when the function is not well.
Motor	Wearing status of carbon brush and commutator.
Brake	Clean the dirt and dust on friction plates of the brake, meanwhile check the wearing status of the friction plates.

11.8 Maintenance for 1200 hours (every six months)

During the maintenance for a half year, the maintenance process for three months shall be repeated. When the parts must be adjusted and replaced, please contact with maintenance personnel of our company.

Contactor	Burnish the coarse surface of contacts using sand paper.
	Replace according to the status when the function is not well.
Motor	Wearing status of carbon brush and selenium rectifier.
Reduction box	Replace the gear oil
Oil filter	clean
Brake	Clean the dirt and dust on friction plates of the brake, meanwhile check the wearing status of the friction plates.
Hydraulic system	Replace hydraulic oil. Check that whether there is any leakage in the lifting cylinder or not and replace the seals when necessary.
Fork wheel and bearings	Check the wearing condition, and replace them if necessary

11.9 Recommended working medium:

⑴ Hydraulic oil:

When it is normally loaded, we advise:

Hydraulic oil: LHPISOVG46, in accordance with standard DIN51524T.2, the average sustained temperature should between 40 degrees to 60 degrees.

B Heavy loaded, we advise:

Hydraulic oil: LHPISOVG68, conform to the standard of DIN51524T.2, the average continuous temperature isover 60 degree.

C Low temperature light load, we advise:

Hydraulic oil:HLPISOVG32, conform to the standard of DIN51524T.2, the average continuous temperature is below 60 degree.

Various load, we advise:

D Use the hydraulic oil:LHPISOVG46 that conforms to the standard of DIN51524T.2 in the above working condition.

The viscosity of the lubrication oil is high.(most use the hydraulic oil) .

Use the SAE20W/20 engine oil instead of the HLP68 hydraulic oil when it is difficult to buy the hydraulic oil .

⑴ Gear oil:

Heavy load gear oil 85W-90(GL-5)。

⑶Lubricating grease:

Lithium grease of type 3

All kinds of depleted hydraulic oil, gear oil and grease will pollute the environment. For this reason, recycle the replaced working medium or treat according to local pertinent regulations.

11.10 Maintenance period of consumables and partial parts:

Items	Maintenance content	Maintenance period	Remarks
Bearings of fork wheel	Replacement	1200 hours	
Wheel	Replacement	1200 hours	
Seals	Replacement	1200 hours	Replace when finding out damage
Gear box	Replacing lubricant grease	1000 hours	
Hydraulic oil	Replacement	1000 hours	
High pressure oil pipe	Replacement	2000 hours	Replace when finding out damage
Strainer of hydraulic reservoir	Cleaning	1000 hours	
Driving motor	Check for carbon brushes and bearings	1000 hours	
Steering motor	Check for carbon brushes and bearings	1000 hours	
Oil pump motor	Check for carbon brushes and bearings	1000 hours	

12. The storage, transportation and loading of truck:

12.1 The store of truck:

If the electric pallet truck is not used for over two months, it should be placed in the room which is in good ventilation, no frost, clean and dry; also the following measures should be taken:

Clean the truck thoroughly.

Lift the forks completely for several times, check it is normal or not.

Lower the forks to the lowest position.

Support the side near to driver of truck with square timber to lift the driving wheels of truck from the ground.

Apply a layer of flimsy oil or grease on all the bared surface of mechanical parts.

Lubricate the truck.

Check the status of storage battery and electrolyte, and imbrue the non-acid lubricating grease to the binding post of storage battery.

All the electrical contacts should be sprayed using appropriate contacts spray.

12.2 transportation of truck:

If the truck needs to be transported for a long distance, support the side near to driver of truck with square timber to lift the driving wheels of truck from the ground. The two front wheels of truck shall be fixed stably by sphenoid wood block. Fasten the truck to transport vehicle with ropes.

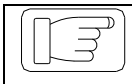
12.3 Loading and unloading of truck:

Before loading the truck, check out the nameplate for the total weight of truck to choose appropriate hoisting handling equipment. The hoisting of truck shall be kept level, and landing shall be kept slow and stable. The personnel around shall watch for safety. One of the personnel is responsible for conducting. If the other truck is used for loading and unloading, please watch the bottom situation of the truck. Take care to insert the fork arms to the bottom, in avoidance of damaging the driving wheel, balance wheel and forward wheel.

13. Replacement of storage battery

the replacement procedure of storage battery is as follows:

1. Open the side door of storage battery and take it down.
2. Pull down the socket connector of storage battery from the truck.
3. Pull out the storage battery from the side way and take the storage battery away with special car or using hoisting method.
4. The mounting method of putting the storage battery back into the battery pack is opposite to the above procedures.



Note

Handle the storage battery gently during hoisting and transportation of the battery. Otherwise it will cause damage to the battery or bring danger to human body.

14. Common faults and troubleshooting:

No.	Faults	Possible cause	Trouble shooting
1	The forklift cannot start (shout down of main contactor)	①blown fuse of controller circuit	change
		②power switch is not well connected or damaged	repair or change
		③blown fuse of main circuit	change
		④electric lock is not well connected or damaged	repair or change
		⑤connection of battery is loose or fall off	fasten
	The order picker cannot start (shout down of main contactor)	①steering wheel Embrake does not suck, the truck is in brake condition	repair or change
		②Potentiometer loose or the screw loosened	repair or change
		③walking motor magnetic coil is broken or terminal is not well connected	repair or change
		④tip of contactor is not well connected	repair or change
		⑤ MOSFET tube type circuit board in trouble	repair or change
		6) guardrail is not put down or guard rail switch damaged	put down or repair or change
2	Forklift can only move forward (or backward)	①contactor is not well connected or burned	repair or change
		②circuit board in trouble	repair or change
3	Forklift cannotstop in travelling	tip of contactor damaged, tip does not release when touching it	power off in emergence, change the contactor tip
4	shutdown of brake	①Embrake loose or damaged	fasten the screw or repair EMbrake
		②Embrake plate worn out	change the brake plate
5	steering failure	① steering gear damaged.	repair or change
		② steering motor damaged	repair or change
		② Oil pump motor damaged	repair or change
		③ Steering pipeline leaks.	repair or change
6	steering wheel is heavy to steer, with noise, motor is overloaded	①gear and bearing is blocked	clean or replace the bearing
		②there is clearance in bearing installation	adjust the clearance
		③front wheel bearing damaged	replace the bearing
7	forks cannot lift	①overloaded	reduce the load
		②pressure of overflow valve is too low	adjust higher
		③abnormal inside leakage in lifting cylinder	replace the seal
		④hydraulic oil is not enough	add appropriate amount of filtered hydraulic oil
		⑤voltage of the battery is not enough	charging
		⑥ manual multivalve damaged	repair or change
		⑦Oil pump motor damaged	repair or change

		⑧ Oil pump damaged	repair or change
		⑨voltage of the battery is severely not enough	Charging
		⑩electric lock not open or damaged	repair or change
8	The fork cannot lower after lifted.	①inner mast overloaded or deform	repair or change
		②outside mast overloaded or deform	repair or change
		③mast rolling wheel blocked	repair or adjust
		④mast guiding rod bended	repair or adjust
		⑤speed adjust valve blocked	adjust
		⑥ Solenoid valve is out of control	eliminate faults
		⑦chain loose	repair or tighten chain
9	voltage decreased (after charging)	①individual battery damaged	repair or change
		②battery liquid level low	add electrolyte
		③there is impurity in electrolyte	replace electrolyte

15. List of accessories, spare parts and wearable parts

No.	Name	Position for use	Specification	Quantity	Remark
1	electric key	switch on electric lock	JK404C	2	
2	plug, socket	match the charger	REMA SR 175	1set	
3	fuse	Electrical parts	10A	2	
5	fuse	Electrical parts	300A	1	
7	Seal ring	Side cylinder	UHS40	1	
8	Dust ring	Side cylinder	DHS40	2	
10	O- seal ring	Side cylinder	47.5X2.65	2	
11	Combined ring	Oil tube	D22	2	
12	Combined ring	Oil tube	D20	2	
13	Combined ring	Oil tube	D14	2	
14	Combined ring	Oil tube	D12	2	

16 Structure diagrams, schematics of main components

Hydraulic principle diagram refers to attachment 1
Electrical principle diagram refers to attachment 2
Exploded view refers to attachment 3

17. Packing list

Item	Name	Q'ty	Remarks
1	Complete truck	1 unit	
2	Forks	1 pair	
3	Technical document	1 pcs	table 1
4	Random tooling	1 pcs	table 2

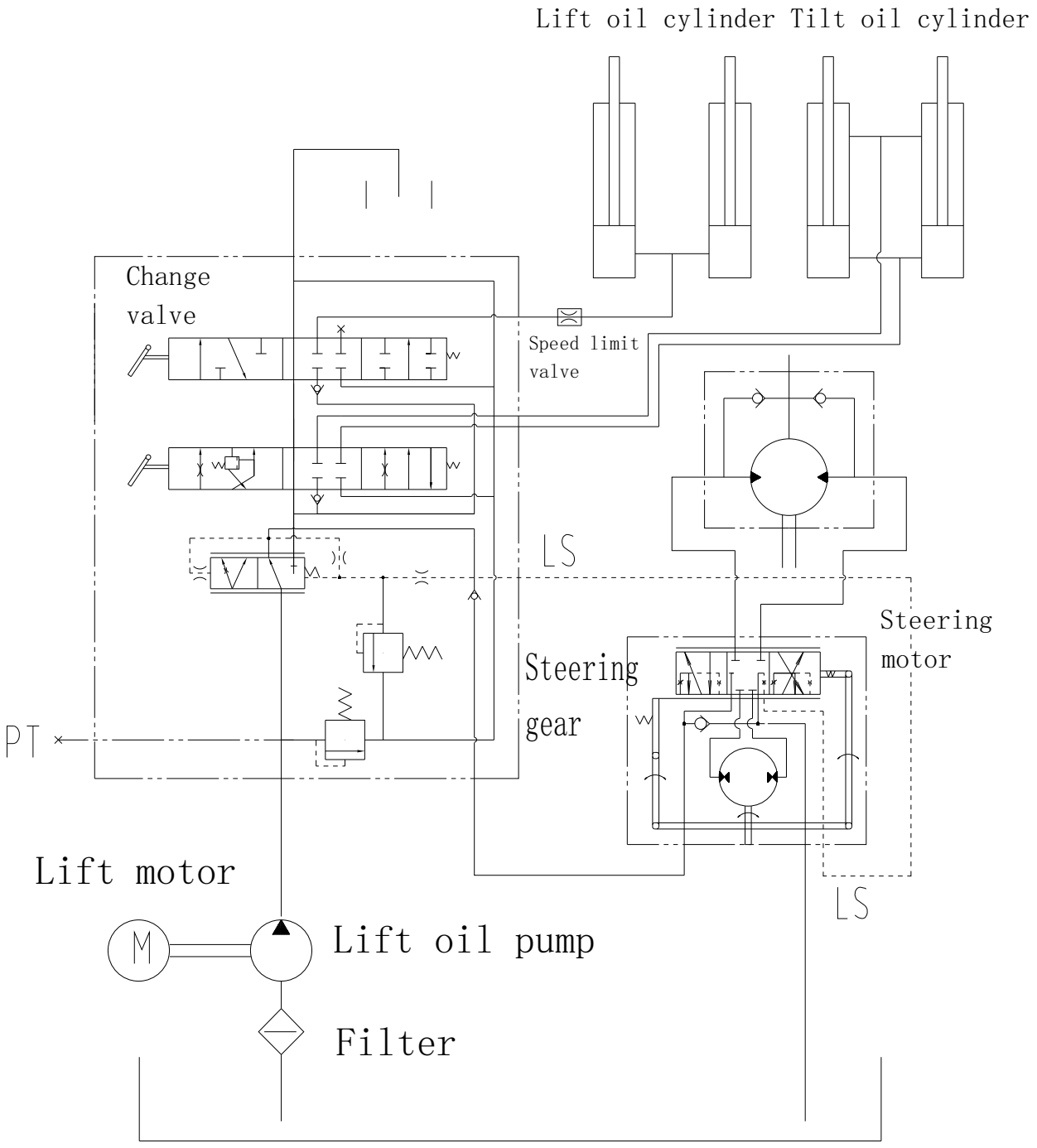
Table 1. Technical document

Item	Name			Q'ty	Remarks
1	Content	1.1	Certificate of qualification	1	
		1.2	Random list	**1**	
		1.4	Use instructions	**1**	
		1.5	Parts catalogue	**1**	
2	Key			1	

Table 2. Random tooling

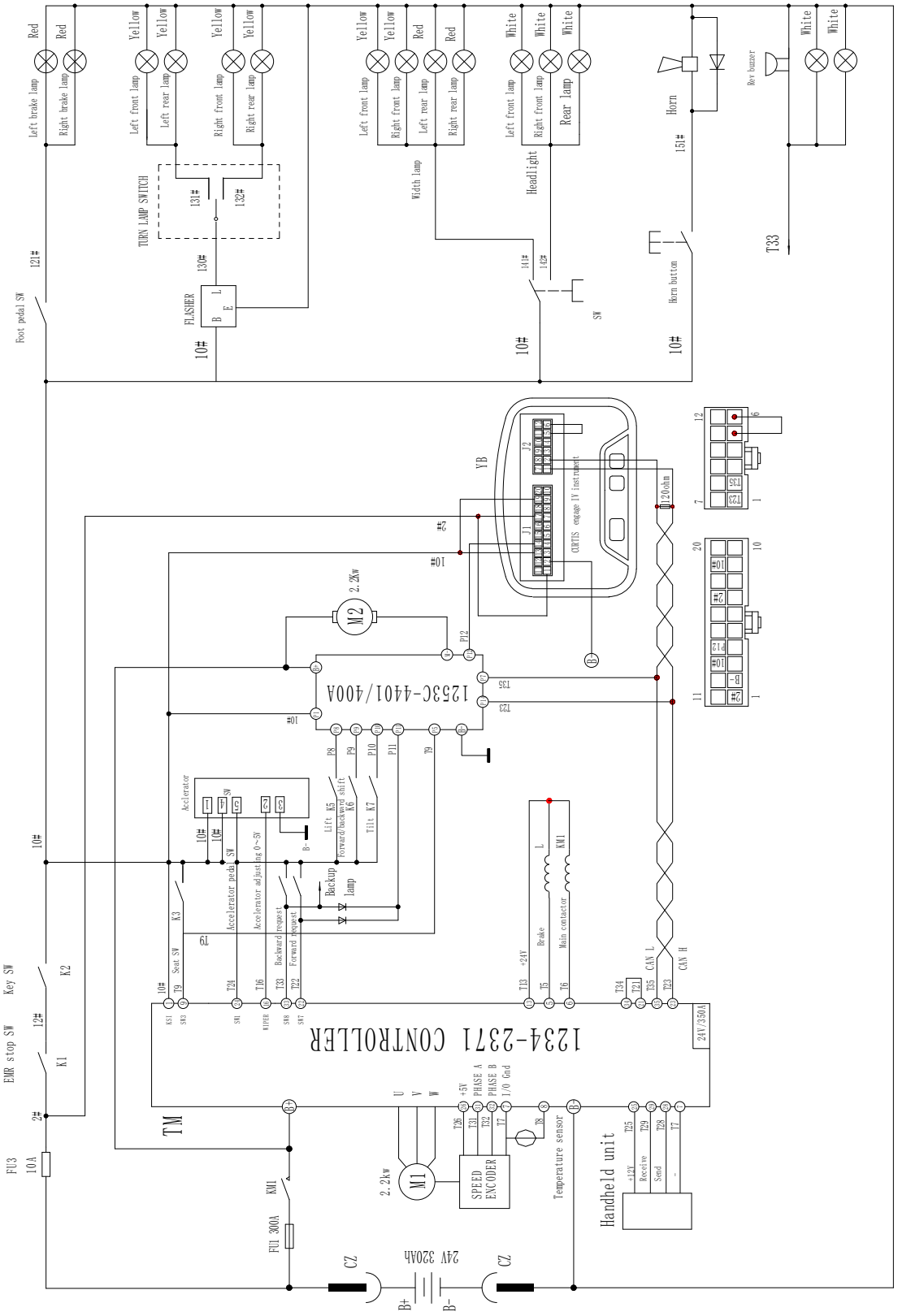
Item	Name	Q'ty	Remarks
1	Sleeve extension bar	1	
2	Wheel hub nut sleeve 22	1	
3	Wheel rim nut sleeve 17	1	
4	Hook spanner for the lift, tilt oil cylinder	1	
5	Double-ended spanner 8~10	1	
	Double-ended spanner 14~17	1	
	Double-ended spanner 17~19	1	
	Double-ended spanner 22~24	1	
	Solid spanner 13	1	
	Solid spanner 16	1	
	Solid spanner 18	1	

Attached picture (I)



Hydraulic schematic diagram

Attached picture (II)



Electrical schematic diagram

Appendix I
ISO3691-1980

Motor industrial vehicle—Safety Norms

The Second Part Safety Norms of motor industrial vehicles in service, operation and maintenance

14 Safety rules for the user and driver

In order to use the motor industrial vehicle well, this part set up some rules. The 14.1 is applied to the user, the 14.2 is for the driver.

14.1 Applied to the user

The users are the owner or the leaser individual or corporation of the truck.

14.1.1 The qualification of the driver

The driver of the motor industrial vehicle should be trained, pass examination and get the operation qualification.

14.1.2 The truck working in flammable and explosive circumstance

Only the industrial motor truck getting the qualification of the national authoritative department and getting the license of working in the flammable and explosive circumstance, should work in the circumstance.

This kind of truck should be marked with proper stamp sign, and the relevant building or the plant should be marked too.

The classification of the building or the field condition should agree on by the user and the national relevant authoritative department.

14.1.3 Passenger

Except for special seats, the vehicle cannot carry passengers. The passengers are forbidden to step on the ascent machine or the attachment.

14.1.4 The use of the forklift

14.1.4.1 The change of the capacity and nameplate of the truck

The truck in use shall not exceed the rated capacity stipulated by the factory.

Without the permit of the factory, any amendment of the design is forbidden, and should not add any attachment on the truck, in order to prevent the influence of the capacity and operation safety of the truck.

Any changing because of adding attachment should not reduce the security and accord to the requirement of this rule. After adopting the attachment, the capacity of the truck, the operation and the repair direction board, label or pattern should be altered correspondently.

The user should ensure all the nameplate and label in proper position, and maintain handwriting clear.

14.1.4.2 Stability

The user should pay attention to section 6 of the code, which is about the stability of the truck in the working conditions.

When operating correctly, the high lift truck accord with the section 6 is steady, but the incorrect operating or the wrong maintenance could let the truck working unsteadily.

The factors that may influence the stability are: the condition of the ground and the floor, grade ability, speed, load, the weight of the storage battery, the dynamic force and the static force as well as the judgment train conditions of the drivers.

When the truck is working in the condition differ to the regular working condition should reduce the load.

When the truck mounted attachment working without load, it should be viewed as partial load.

14.1.4.3 The protection requirement and protection equipment

The truck should be painted with the color differing from the surrounding circumstance.

When it is necessary to denote the working condition, the truck should add caution device, such as light or flash lamp.

14.1.4.4 The charging and changing of the battery

The battery charging station should set in the appointed area. The charging station should prepare the equipment using for flushing and neutralizing the overflow electrolyte, the fire control device, the measure avoiding the truck damage the charging device and the adequacy ventilation facility blow away the fume off from the battery.

In the area of charging, it is forbidden to smoke and alarm with placard.

Only the personnel trained and permitted can change or charge the battery. The battery repairing people should wear protective clothes.

All the work of changing the battery should carried out according to the description of user's manual from the factory. When reinstall the battery, should adopt measures to make the battery connecting, orientation and fixation correctly. Do not put tools and other metal substance on the lidless battery.

Without the special approval (for example the truck factory), the electrical motor truck should not change the battery with different voltage, weight or size.

It is obliged to use the battery stated by the factory. It is obliged to prepare the facility for changing battery safely. When hanging up the battery using hoisting equipment, it is necessary to use insulated sleeve.

If adopting chain hoist, it is necessary to equip chain box. If adopting chain block, the lidless battery should be covered by a piece of rubber blanket or other insulated materials, to prevent the short circuit of chain and the connecting wire or connecting terminal between the battery lattices.

14.1.4.5 The invalid or damaged truck

If finding the motor industrial vehicle existing insecurity factors, it should stop using and give away on the spot. After repairing and recovery to the safety conditions, it can be reused.

14.1.4.6 Accident

Once the accident happens, for example the staff injures, the truck damages the building or the equipment, firstly should organize salvage, do best to protect the accident field and report to the governor.

14.1.5 Operating conditions

14.1.5.1 Channel and stacking field

The ground of the operating field should have enough carrying capacity, and it is necessary to maintain it well not to influence the truck operating safely.

The transporting channel of the truck should have well visual field, and it is easy to turn, and no grade, steep slope, narrows channel and low roof board. The outline or the borderline must be clear.

In the road where it is easy to meet the stepping truck, the width of the channel should be adjusted.

Advising the grade of the channel should not over 10%, the top and the bottom of the slope should transit smoothly, to prevent the load vibration or the bottom of the truck colliding the ground.

When the grade is over 10%, installing a sign is advised.

If the truck is in operation (transport) and the load block off the sight, when the vehicle is operating, the load should located on the backward of the truck operation direction.

For example: in some conditions (for example stacking and climbing), when the vehicle is operating, the load is required on the forward of the vehicle operation direction. Then, the driver should drive the vehicle carefully. It is necessary to attend: if the operation condition require, should equip accessory (assistant) equipment or assistant.

The passage, road, runway, floor or slope should maintain good operating conditions, to prevent the truck or the load from being damaged, and to prevent reducing the stability of the vehicle.

In dangerous state, including the barrier danger on the top should mark on the clear location.

The firefighting passage, the upstairs passage and the firefighting equipment should maintain expedite.

14.1.5.2 Gangplank or transition board

All the gangplank or transition board should has enough safety coefficients to bear the truck with load. On the gangplank or transition board should marked the max passing load perpetually.

The gangplank or transition board should fix firmly, to prevent the accidental move, vibration or slide.

On the gangplank or transition board should equipped handing or other available equipment to the effect of safety transport. On the conditions of possible, should set the fork hole or suspending ear for moving goods.

The gangplank or transition board should have non-slip finishing.

On the both sides of the gangplank or transition board, should mount the facility to prevent the truck from going over its edge.

When the gangplank or transition board is fixed its location, should adopt measures to prevent the reverse joint truck from moving suddenly.

14.1.5.3 Lighting

When the photometric brightness on the operating field is less than 32LX, the vehicle should equipped auxiliary light.

14.1.5.4 The suspending of the truck

The sling should be tied to the lifting spot which the factory appointed.

14.1.5.5 The synchronizing operation of the truck

Conveying bulky or heavy load using two trucks simultaneously is a dangerous operating which requires special care. And this kind of conditions should be taken as special conditions and carried out under the supervision of the operator responsible for operation.

14.2 Applied to the driver

The safety operating of the industrial truck lies on the control manner of the driver ro a considerable degree. The safety rules applied to the drives are as follows:

A） general rule;
B） transporting rule;
C） operating (driving) rule;
D） the rule for the driver maintaining the truck.

Without regard to the rules maybe conduce:

A） the serious danger of damaging the driver or other personnel;
B） Damage the materials.

14.2.1 General rule

Only the personnel who have been trained and get the qualification of operation are permitted to drive the industrial truck.

The motor industrial vehicle could not carry passengers, except for equipped with the facility for the passengers sitting.

The driver should pay special attention to the operating circumstance, including the person nearby other staves and fixed or moving substances, and it is necessary to watch out for the passerby at any moment.

No matter whether there is load on the lifting part of the truck, it is forbidden anyone passing or standing under the lifting part of the truck.

If the people, building, organization or equipment accident happens, it is necessary to report to the relevant officer at once.

The driver should not change, add or demolish the truck components without the permission to influence the performance of the truck .It is not allowed to install accessorial frame or handle on the steering wheel ,except the factory has installed it.

The driver should use the truck in the using range.

14.2.2 Load carriage (lifting and stacking) rule

14.2.2.1 Load

The truck can only convey the load not over its rated load weight.

Any measure of enhancing the capacity of the truck is forbidden.

Only the rank stabilized or safety load can be conveyed, especially when convey the super long or high load, should pay special care.

When convey the load which center of gravity is uncertain, operating the vehicle should special carefully.

14.2.2.2 The loading and unloading of goods.

When loading the goods with forks:

A） The space between the forks should fit the width of the conveying load.
B） The fork should insert into the inner of the load as deep as possible. But pay attention to not make the fork tip touch the substance except the load. Then the fork should lift to the enough height to move the goods.

14.2.3 Running (driving) rule

14.2.3.1 General rule

The driver should drive the truck along the right side of the road, and the driver should see the road clearly and attend other truck, passengers and safety space.

The drivers should abide by all the traffic rules, including the speed limit specified in the factory.

It is necessary to hold a certain space with the front operating truck.

The driver should drive the truck with earnest and responsible attitude at any time. The sudden starting, stopping and turn over at high speed are forbidden. Except for the requirement of the operation conditions, advising the steering wheel should not put on the limiting position when the vehicle is starting. If starting on the limiting position, it is necessary to operate carefully.

In operation (or called transport) state, if the load obstruct the driver’s sight, then when the truck running, the load should be located in the back of the truck's moving direction.

In crossroads and the occasion that would obstruct the driver’s sight, the driver must reduce the speed of the truck, and issue sound signal.

In crossroads and the occasion that would obstruct the driver’s sight or some dangerous occasion, the

truck must not exceed other truck moving at the same direction.

The driver must avoid the truck rolling over some fluffy object in order to avoid article damages or personnel hurts.

When turning, if there are some other trucks or pedestrians, the driver must issue warning signal.

The driver must comply with all labels about ground load carrying capacity and requirements of other instructive labels.

The driver must pay special attention to the load carrying capability of slopes and channels leading to electric elevator.

14.2.3.2 Vehicle speed

The truck speed should coordinate with the status of person's activity, visibility, road or the ground conditions and load conditions of the running area. When the vehicle is moving on wet and smooth road surface the driver must be very carefully.

Under any situation, the vehicle speed must be controlled within the range that the truck can be stopped safely.

14.2.3.3 Running on the slope

When operating on the slope, the following regulations must be obeyed:

A) Moving up and down a slope slowly.

B) Except for the side loading and no lifted load truck, it may as well make the bearing load device's surface towards the downgrade direction.

C) Turning on the slope and bestride the slope are all forbidden.

D) When the vehicle is near the slope, high platform or platform edge, the driver must drive carefully. The distance between the vehicle and the platform or platform edge must keep at least a truck tyre width.

E) When the gradient is more than 10% during the truck's running up and down the slope, the load surface must be in a downgrade direction.

14.2.3.4 Get across a gap

It must be ensured that under hanging devices (such as: lamps, pipeline and fire extinguishing system) there is an enough clearance height.

Before getting across the passage and door, it must be ensured that there is an enough gap among the vehicle, the driver and the load.

14.2.3.6 The truck operating on the gangplank or transition board

Before the motor industrial vehicle pass the gangplank or transition board, it is necessary to make sure the firm of the board.

The overall weight of the truck should not excess the rated capacity of the gangplank or the transition board.

When passing the gangplank or the transition board, the driver should drive the truck carefully and slowly.

14.2.3.7 The use of the truck in elevator (lifter)

Before the motor industrial vehicle driving into the elevator (lifter), it is necessary to make sure the elevator (lifter) can endure the overall weight of the truck, load and drivers.

Before allow the truck driving in or out of the elevator (lifter), all other personnel should leave away from the elevator (lifter).

After the bridge box floor of the elevator (lifter) is even to the ground, the truck should slowly drive in as the positive direction.

It should be the load go into the elevator (lifter) first not the driver, this is specially adapted to the walking type truck.

After the truck driving into the elevator (lifter), switch off the power.

14.2.3.8 Parking

After the driver leaving, the carrying device must lower to the lowest position, switch off the power, stay steady the vehicle to prevent accidental move or make bold by others without approval.

When parking the truck, the firefighting passage, access stairs and firefighting passages should keep fluently.

The parking location of the truck should keep a safety distance to the railway.

14.2.4 The vehicle maintaining rule for the drivers

14.2.4.1 General rule

Before starting the truck, it is necessary to inspect the technical condition of the truck. According to the different type of the truck, should pay more attention to some special location: [for example: alarm

system, power system, brake, steering equipment, wheel and lifting system.

If the truck is found to be repaired, or during the operation the defect develops, it is necessary to report it to the superior in concern. It is forbidden to repair or adjust the truck by the truck by the driver without permission.

14.2.4.3 The charging and changing of the battery

The charging and changing of all the battery should be carried out by the personnel who has been trained and appointed staves and proceed as the description of the user's manual of the battery or truck factory. As usual the driver can be appointed.

Before charging or changing battery, the truck should be located correctly and brake.

When charging, the exhaust cap should be in the correct position to prevent the electrolyte spilling out, and make sure that the wind hole is in effect. Open the cover of the battery (or separate room) to exhaust the gas and thermal.

In the battery charging area, should adopt measures to prevent open flame, spark or electric arc. Smoking is forbidden.

The tools and other metal substance should put far away from the top of the battery without cover.

The top of the battery should keep dry; the connection terminal should keep clean, wipe a little Vaseline and screw down correctly.

Without approval, the battery of different voltage, weight or size could not replace the former one in the vehicle.

When reinstalling the battery, the battery should be put on the correct place.

Inspecting the liquid surface in the battery using open fire is forbidden.

When getting the solvent in the acid carboy, the acid carboy tilting device or siphon pipe could be used.

When diluting oil of vitriol confect the electrolyte, only adding the oil of vitriol into water is permitted, not add water into oil of vitriol.

15 Maintenance

15.1 General description

Good performance of the motor industrial vehicle depends upon maintenance. Truck may damage personal health and properties in case of maintenance neglect.

15.2 Maintenance items

The items of check, lubrication, maintenance shall be carried out according to maintenance instructions supplied by the manufacture.

Only professional and qualified maintenance personnel are allowed to go along with the inspection, maintenance, modification and repair.

15.2.11 Neither modification in design nor addition to the truck shall be taken without permission of the manufacture for sake of weakening performance or operation security of the truck. Nameplate and instruction manual shall be revised accordingly in that condition.

15.2.13 All the components that are used for replacement must be of the same model, or at least of the same quality with the original part.

15.2.14 Industrial truck must be kept clean for sake of fire. Find loose or defective part in time. Keep clean for lifting device, carrying device, wheel tread, foot pedal, and floor of the truck. No grease, oil stain, or other dirty substances shall be kept.

15.3 Inspection

15.3.1 If any potential defective, abrasion, or damage is found in the vehicle after inspection, which would threaten safe performance, effective measure shall be taken. Truck cannot be put into operation before repair.

15.3.2 Protective maintenance, lubrication and inspection shall be taken in accordance with schedule for the truck. Data that are in demand of record shall be carefully kept.

Recording card of maintenance and repairing:

Items	Maintenance time	Maintenance part	Material used	Maintenance personnel	Remarks

Customer advisement feedback:

Items	Time occurred	Trouble location	Fault cause	Trouble-shooting	Remarks

Edition No.
2016-8

Foreword

1. Usage

The repair parts listed in this manual is for the FBT15-MINI type truck, including electrical, drive, steering, truck frame, accessory and optional parts.

2. Truck identification

A truck plate fixed on the significant position of the truck, display a product model in the nameplate, serial number and date of manufacture of the truck, this is the identification information of the truck.

3. How to order parts

When you want to order parts, your order must specify the type of vehicle, number of trucks, serial number, part number parts and required components name, if you have any questions on the material number of related parts, please inform your dealer, and the project required to do a complete supplement.

4. How to use this manual

This parts manual includes the all parts of the truck or assembly drawings, these drawings include standard parts and accessories.

The part number and parts name were marked in each figure, and provides additional information.

Each BOM. Drawing represents a component, the list of parts is the repair parts.

5. Unnoticed revision of truck

Continuing improvement and advancement of product design may cause changes to your machine.

6. The meaning of comment symbol in the parts manual

O.D external diameter	I.D internal diameter
C represents a change	Y decomposition of graph
Z Not provided separately	X exchange of the main parts
F not shown	

Configuration of product

Product Model：FBT15-MINI

Traction motor

2.2KW/24V (AC)

Controller

Drive controller： CURTIS 1234E-2321

Pump controller：CURTIS 1253C-4401

Battery

320Ah/24V

Brake

Solenoid brake：16Nm/24V

Wheel

Dimension of drive wheel： 280X100 PU wheel

Dimension of load wheel： 305X145 Solid rubber tire

Hydraulic

Pump motor：2.2KW/24V

Pump: 4CC

List of wearable parts

Index	Content	Parts name	Parts ERP No.	No.	Remarks
	1.02	DHS dust ring d58	0902040046	DHS58	
	1.02	UHS seal ring d58	0902030124	UHS58	
	1.02	O-RING65X2.65	0902050106	GB3452.1-92	
	1.02	Guide ring 10	31060501009	GST5800	
	1.03	DHS dust ring d40	0902040025	DHS40	
	1.03	UHS seal ring d40	0902030034	UHS40	
	1.03	O-RING47.5×2.65	0902050168	GB1235-76	
	1.03	Guide ring	31060501010	GST5900	
	12.00	Washer 12	0902010005	JB 982-1977	
	12.00	Washer 14	0902010006	JB 982-1977	
	12.00	Washer 18	0902010008	JB 982-1977	
	12.00	Washer 20	0902010009	JB 982-1977	
	11.00	Fuse 10A	060806031		
	11.00	Fuse.300A	060806012		

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