SERVICE MANUAL

Starke Energy Series

EDS30-40

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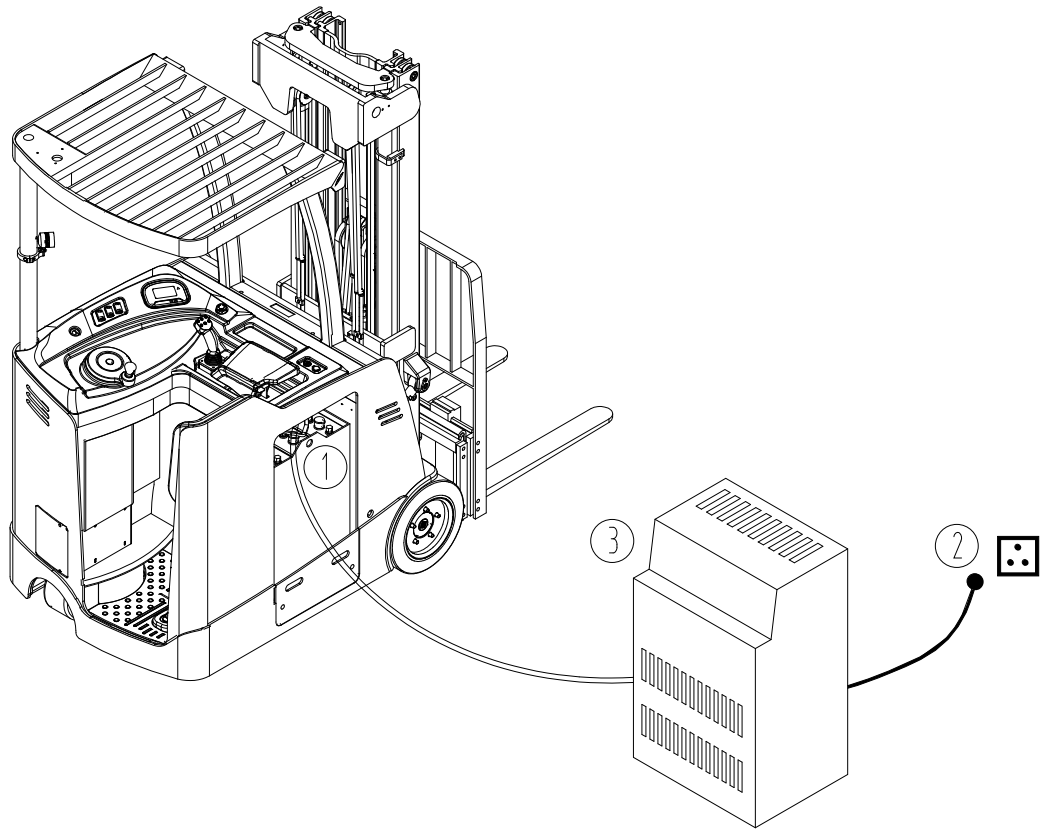
STARKE ENERGY

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 down the general power switch;
2. Connect the charging plug of storage battery to output connector of charger;
3. Then link the input connector of charger to 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.

8.1.1 Open gas cap.

8.1.2 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.

8.1.3 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.

8.1.4 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.

8.1.5 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.

8.1.6 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.

8.1.7 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. equalizing 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.

8.2.4 Equalizing charge:

a. Charge with a 4A current

b. When the charge voltage reaches 46.8V (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.

8.2.5 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 equipment when operating the electrolyte.

8.3 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).

8.4 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 every day.

⑵ Treatment 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.

8.5 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.

8.6 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 0.25mm.
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 line	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	Damaged or not. If there is any crack.
	15	Function	Check that whether lifting, lowering, forward & backward movement and emergency reverse 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.

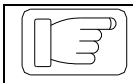
11.1 Precautions during maintenance:

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.

a) Places for maintenance:



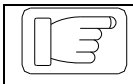
Notice

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.

b) 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 5.1

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	21	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 0.25 mm

Capability of electrolyte	24	Inspect the liquid level of electrolyte, pure water can be used for supplement if the liquid level is too low.
Density of electrolyte	25	The specific gravity should be1.28g/ml after charged.
Clean the storage battery	26	Cover the lid, and flush with tap water.
Inspect the contactor	27	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	Foot pedal	When we step on the foot pedal to see whether there is a noise from the brake.
	4	Brake clearance	The clearance between brakes should be kept between 0.2mm and 0.25mm.
	5	Operation handle	Degree of tightness and rotary flexibility.
	6	Truck frame and fastener	Function, and check cracks, lubrication and tightness of fasteners.
	7	Connecting rod and wheel carrier	Function and check the cracks, bending, and deformation and lubrication condition.
	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	Inching 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	Steering motor	Wearing status of carbon brush and selenium rectifier.
	20	Fuse	Whether it is perfect or not
	21	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 selenium rectifier.
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 by using sand paper.
	Replace according to the status when the function is not well.
Motor	Wearing status of carbon brush and selenium rectifier.
Decelerate 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:

1) Hydraulic oil:

A 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 is over 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.

2) Gear oil:

Heavy load gear oil 85W-90 (GL-5).

3) Lubricating grease:

No.3 lithium grease

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	
Fork 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	1000hours	

12. Storage, Transportation and Loading:

12.1 Storage:

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 by using appropriate contacts spray.

12.2 Transportation:

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.

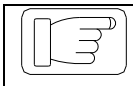
12.3 Loading:

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 back the storage battery 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 Trouble Shooting:

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 Em brake 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 cannot stop 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	①Em brake loose or damaged	fasten the screw or repair EM brake
		②Em brake plate worn out	change the brake plate
5	Steering failure	① Steering gear damaged.	repair or change
		② steering motor damaged	repair or change
		③Oil pump motor damaged	repair or change
		④ 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 be lifted	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	charge the battery
		⑥magnetic valve damaged	repair or change

		⑦pump motor damaged	repair or change
		⑧pump damaged	repair or change
		⑨multiple valve damaged	repair or change
		⑩electric lock not open or damaged	repair or change
		⑪voltage of the battery is severely not enough	charge the battery
		12) front door opens	close
8	After ascending the forks cannot descend	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
		⑥magnetic valve out of control	troubleshooting magnetic valve
		⑦ chain is loose	repair or tighten chain
		⑧front door opens	close
9	Battery end voltage decreased (after charging)	①individual battery damaged	repair or change
		②battery liquid level low	add electrolyte
		③there is impurity in electrolyte	replace electrolyte
10	Travel speed does not decelerate as the forks are lifting	1) encoder damaged	repair or adjust
		2) zero stroke switch damaged	repair or adjust

1) Cause and troubleshooting table of controller faults

The controller shell is red and yellow two LED lights, different flashing is for different fault conditions, see the table below

Display	Meaning
Two lights are not bright	The controller does not have the power, because there is no electricity or line fault battery
The yellow light is flashing	Controller work normally
Yellow and red lights are often bright	Controller is updating the software
Yellow and red lights are flashing	Controller fault

Code	Fault display	Causes
1, 2	Controller Over current	1.Motor wiring U, V or W phase short circuit 2.Motor parameter setting error 3.Controller failure
1, 3	Current Sensor Fault	1.U, V, W relative to the vehicle body (motor stator short circuit short circuit) 2.controller failure
1, 4	Pre charge Failed	1. Connected to the capacitor group (B+ terminal) to prevent the external load capacitor charging. 2. View capacitor voltage under the monitoring menu.
1, 5	Controller Severe Under temp	1. Controller in extreme condition (lower than -40 ℃). 2. View temperature controller under the monitoring menu.
1, 6	Controller Severe Over temp	1. The controller working in extreme temperatures (higher than 95 ℃). 2. Overloading of vehicles. 3 The controller is not installed properly. 4 View temperature controller under the monitoring menu.
1, 7	Severe Under voltage	1 The battery voltage parameter setting error. 2 The battery runs out. 3 The internal resistance of the battery is too high. 4 Drive when the battery is not connected. 5 Capacitor voltage monitoring under the view menu. 6 B+ fuse or main contractor is not closed.
1, 8	Severe Overvoltage	1 The battery voltage parameter setting error. 2 Regenerate braking current when the battery resistance is too high. 3 Regenerative braking when the battery is not connected. 4 View capacitor voltage under the monitoring menu.
2, 1	Controller Under temp Cutback	1 Low cut function effective controller. 2 The controller working under extreme conditions. 3 Temperature controller for monitoring under the menu.
2, 2	Controller Over temp Cutback	1 Controller overheating cuts took effect. 2 The controller working in extreme conditions. 3 Overloading of vehicles.

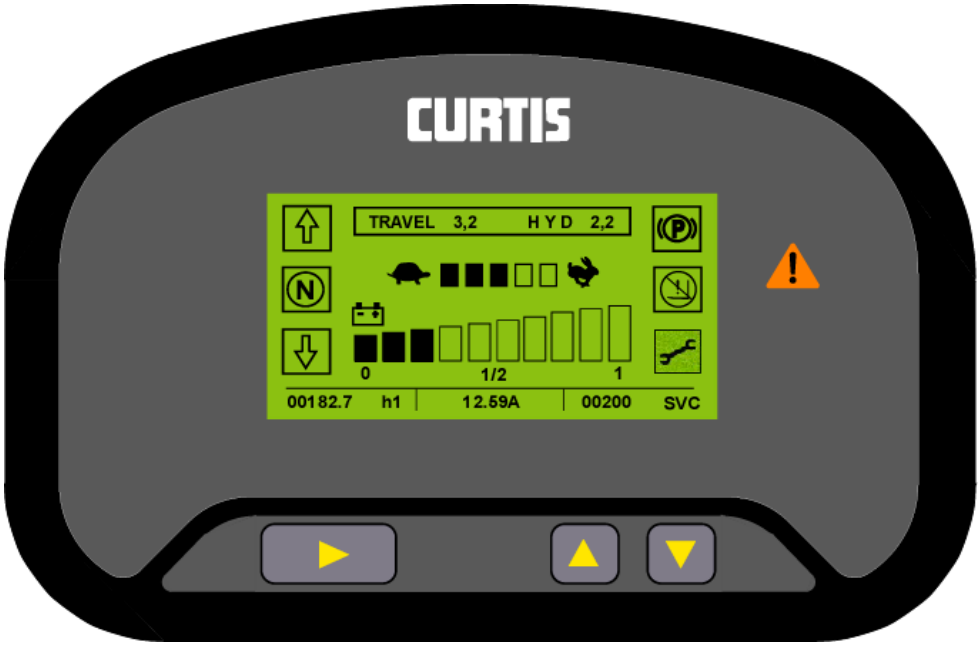
		4 The controller is installed properly. 5 Temperature controller for monitoring under the menu.
2, 3	Under voltage Cutback	1 The normal operating conditions, the battery needs recharging, controller for low voltage limiting function effect. 2 The battery voltage parameter setting error. 3 The battery runs out. 4 The internal resistance of the battery is too high. 5 When the battery disconnect the drive line. 6 Capacitor voltage programmer monitoring under the view menu. 7 B+ fuse or main contractor is not closed.
2, 4	Overvoltage Cutback	1 Normal operation. Regenerative braking current during the regenerative braking of the battery voltage is too high and fault display, effective controller overpressure limit parameters 2 The battery voltage parameter setting error. 3 The regenerative braking current when the battery resistance too high. 4 Regenerative braking when the battery connection open. 5 Capacitor voltage programmer monitoring under the view menu.
2, 5	+5V Supply Failure	1 Connected to the +5V supply end (pin26) of the external load resistance is too low. 2 To view the 5V and Ext supply current programmer monitoring menu.
2, 6	Digital Out 6Overcurren	1 Connected to the digital output drive end 6 (pin19) of the external load resistance is too low.
2, 7	Digital Out 7 Overcurrent	1. Connected to the digital output drive end 7 (pin20) of the external load resistance is too low.
2, 8	Motor Temp Hot Cutback	1 Motor temperature exceeds the set of parameters, so the current request to be cut. 2 The motor temperature control parameters are not adjusted correctly. 3 The temperature of the motor and the Analog2 input view programmer monitoring under the menu. 4 If there is no regulator for heating, temperature compensation and temperature cut should be set to OFF.
2, 9	Motor Temp Sensor Fault	1 The motor temperature sensor is connected properly. 2 If there is no regulator for heating, temperature compensation and temperature cut should be set to OFF 3 Motor temperature exceeds the setting maximum temperature.
3, 1	Coil1 Driver Open/Short	1 The connected load open circuit or short circuit. 2 Connecting terminals are pollution. 3 Wire harness damaged or link fault.
	Main Open/Short	1 The main contactor coil open circuit or short circuit. 2 Connecting terminals are pollution. 3 Wire harness damaged or link fault.
3, 2	Coil2 Driver Open/Short	1 The connected load open circuit or short circuit. 2 Connecting terminals are pollution. 3 Wire harness damaged or link fault.

	EM Brake Open/Short	1 The connected load open circuit or short circuit. 2 Connecting terminals are pollution. 3 Wire harness damaged or link fault.
3, 3	Coil3 Driver Open/Short	1 The connected load open circuit or short circuit. 2 Connecting terminals are pollution. 3 Wire harness damaged or link fault.
3, 4	Coil4 Driver Open/Short	1 The connected load open circuit or short circuit. 2 Connecting terminals are pollution. 3 Wire harness damaged or link fault.
3, 5	PD Open/Short	1 The connected load open circuit or short circuit. 2 Connecting terminals are pollution. 3 Wire harness damaged or link fault.
3, 6	Encoder Fault	1. Motor encoder fault. 2. Wire harness damaged or link fault. 3.see motor monitoring menu: motor RPM
3.7	Motor Open	1 motor U, V, W line open circuit. 2 cable damage or link fault.
3, 8	Main Contactor Welded	1 The main contacts of the contactor adhesion. 2 Motor U connection is bad or open. 3 An alternating voltage approaches (such as an external pre charging resistor capacitor (B+) to end) provides a current.
3, 9	Main Contactor Did Not Close	1 The main contactor is not closed. 2 The main contacts of the contactor burned or poor contact. 3 In the capacitor group (B+ end) of the external load block capacitor charging. 4 B+ fuse.
4, 1	Throttle Wiper High	1. Accelerator sliding end voltage too high. 2. See monitoring menu accelerator input.
4, 2	Throttle Wiper Low	1. Accelerator sliding terminal voltage is too low. 2. See monitoring menu accelerator input.
4, 3	Brake Wiper High	1 Brake potentiometer wiper voltage too high. 2 View the monitor menu brake potentiometer input.
4, 4	Brake Wiper Low	1Brake potentiometer wiper voltage is too low. 2 see monitoring menu brake potentiometer input.
4, 5	Pot Low Overcurrent	1 Potentiometer connected to the potentiometer end stop low combination. 2 View the monitor menu low-end output potentiometer.
4, 6	EEPROM Failure	1. Write EEPROM memory failure. EEPROM memory through the VCL, through the CAN bus, by adjusting the 1311 parameters to the controller or by loading a new software is written, these may be the causes of malfunction.

4, 7	HPD/Sequencing Fault	1 The key switch, interlocking, direction and accelerator input sequence error. 2 The key switch, interlocking, direction and accelerator input connection is bad or switch failure. 3 The programmer monitoring menu entry.
	Emergency Rev HPD	1. Emergency reverse operation is terminated, but the accelerator, forward and backward input, interlock switch did not return to neutral.
4, 9	Parameter Change Fault	1. This is set by the 1311 one parameter changes and safety failure, through the new opening switch out. For example, if the user changes the accelerator type, this error occurs, re open the switch to operate the vehicle.
5, 1- 6, 7	OEM Faults	1. These faults are OEM level fault, only more high-level programmer can see.
6, 8	VCL Runtime Error	1 VCL code to run time error. 2 See the 1311 controller monitors the menu: VCL error module and VCL error. 3 This fault can be likened to a running time of VCL module in ID and OS system information file defines error code.
6, 9	External Supply Out of Range	1 connected to the 5V and 12V on any external load input current is too large or too small. 2 check the fault menu parameters of external maximum and minimum input adjustment is not correct. 3 see 1311 input detecting menu: external input current
7, 1	OS General	1 internal controller failure.
7, 2	PDO Timeout	1. CAN PDO communication receiving time exceeds the PDO timeout period.
7, 3	Stall Detect	1 the motor stopped. 2 motor encoder fault. 3 damaged or wiring harness error. 4 encoder power supply problems. 5 see 1311 motor monitoring menu: motor RPM.
8, 7	Motor Characterization Fault	1 motor describe characteristics of motor steps described in the wrong.
8, 8	Encoder Characterization Fault	1 encoder characteristics describe the steps described in the wrong. 2 motor encoder pulse frequency is not a standard value (32, 48, 64, 80ppr)
8, 9	Motor Type Fault	1 motor parameter value out of range.
9, 2	EM Brake Failed to Set	1 in a brake signal, the vehicle is still running. 2 electromagnetic brake cannot hold the motor in rotation.
9, 3	Limited Operating Strategy	1 whether encoder fault (code 36) or stop fault detection (code 73), the result is the restrict operation control mode is active. 2 motor encoder fault. 3 damaged or wiring harness error. 4 vehicle stall.

9, 4	Emergency Rev Timeout	1. Emergency reverse active but emergency reverse has stopped working, because the emergency reverse time out; 2. Emergency reverse signal adhesion

15. Multifunction Liquid Crystal Combined Instrument



Function and application:

1) Receive the fault signal from the travel controller and the pump controller in series mode, and display on the instrument in numbers, "TRAVEL" stands for the travel controller, "HYD" stands for the pump controller;

2) Power display and insufficient power warning; provide lift locking function when power is insufficient;

3) Icon"  "stands for low speed, icon"  "stands for high speed; Five grids between them, display the speed change; This five grids is on the basis of 0～5V output signal of the accelerator, delay response;

4) "  " stands for forward, high level triggers; "  "stands for backward, high level triggers; "  "stands for neutral, low level triggers; "  "stands for park, high level triggers; "  "stands for lift locking, which is controlled by the instrument; "  "stands for the maintenance of the truck, which is controlled by the instrument;

5) Hour meter, clock and maintenance time eliminator;

6) LED flashes and warning;

7) 1A warning drive output (at most 3), which can be used fo the lift locking function or drive other warning device;

16. List of accessories, spare parts and wearing parts

No.	Name	Position for use	Specification	Quantity	Remark
1	Electric lock key	Switch on electric lock		2	
2	Plug, socket	Match the charger		1 set	
3	Fuse	Electrical parts	10A	1	
4	Fuse	Electrical parts	30A	1	
5	Fuse	Electrical parts	250A	1	
6	Fuse	Electrical parts	400A	1	
7	Seal ring	Side cylinder	OSI 45*35*6	2	
8	Seal ring	Side cylinder	ISI 35*45*6	2	
9	Dust ring	Side cylinder	LBH 35*43*5	2	
10	O- seal ring	Side cylinder	55*3.1	2	
11	Combined washer	Oil tube	D22	2	
12	Combined washer	Oil tube	D16	2	
13	Combined washer	Oil tube	D14	2	
14	Combined washer	Oil tube	D12	2	

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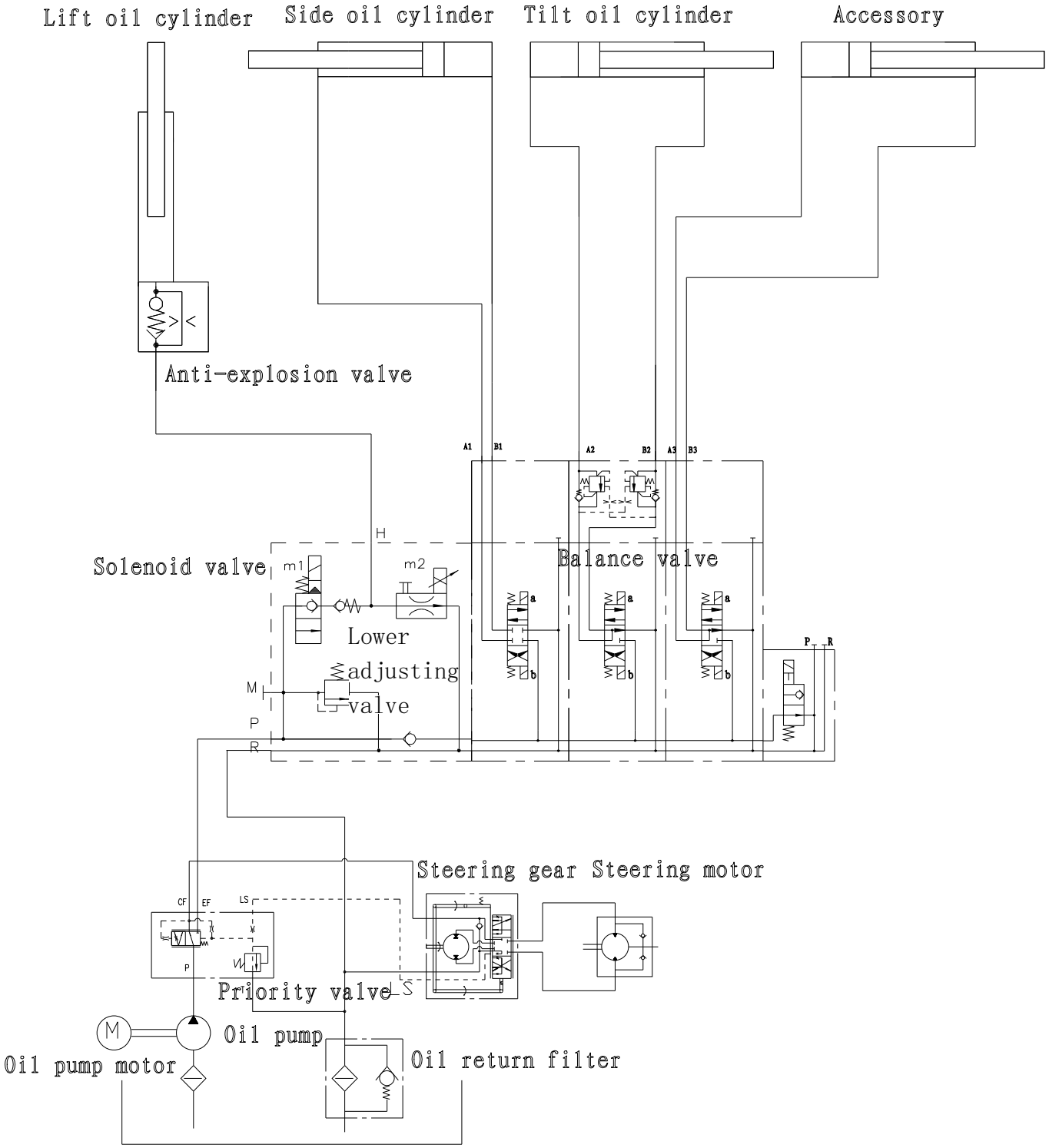
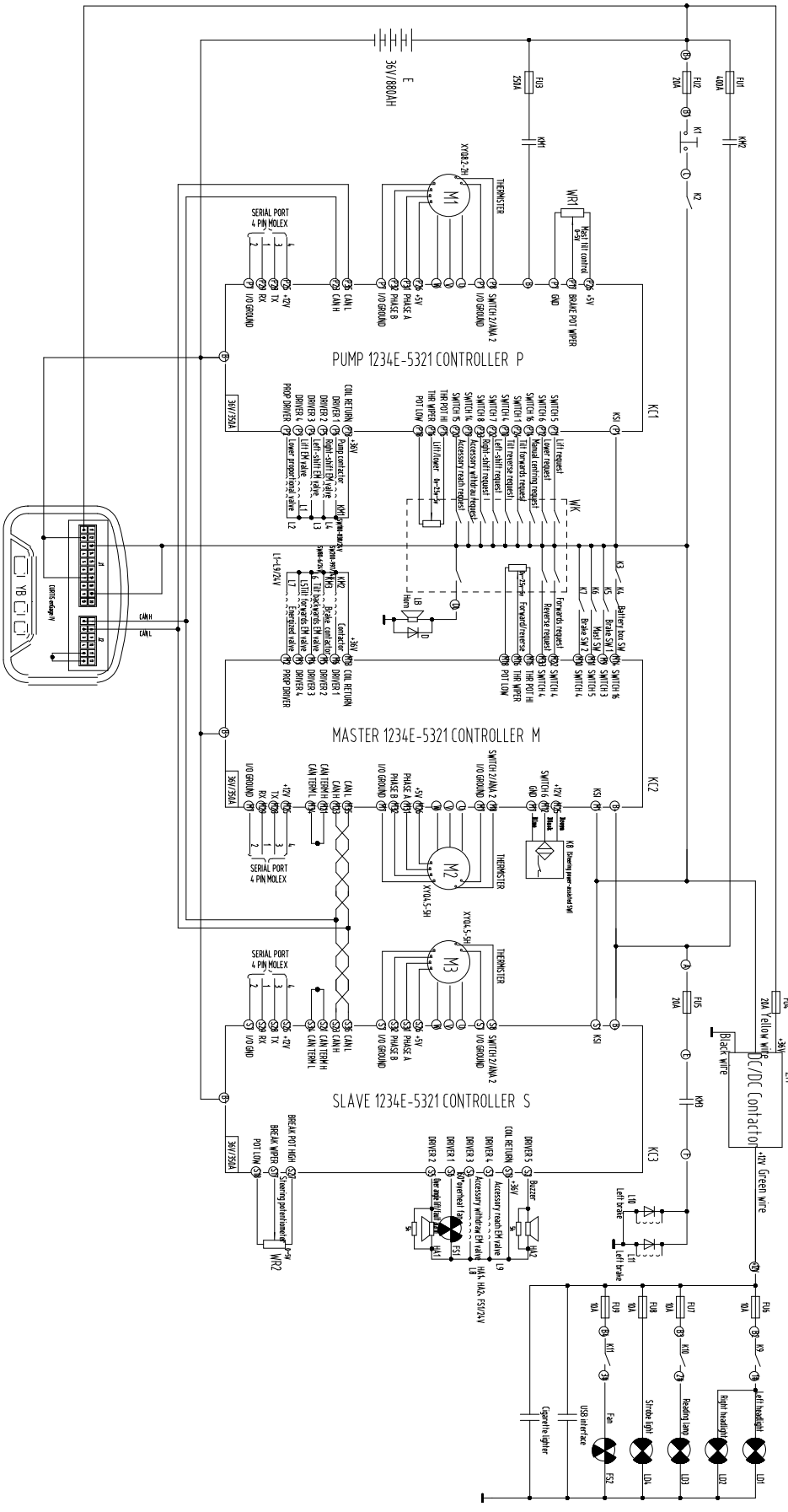
17. Structure diagrams, schematics of main components

Hydraulic schematic diagram



Electrical schematic diagram



18. Packing list

Item	Name	Quantity	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	Content
		1.2	Random list		
		1.4	Use instructions		
		1.5	Parts catalogue		
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	

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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

Appendix I - Safety Specifications of Motor Industrial Vehicles

19. Appendix I

ISO3691-1980

Motor Industrial Vehicle—Safety Norms

The Second Part Safety Code of motor industrial trucks in service, operation and maintenance

14 Safety rules for the user and driver

In order to use the motor industrial truck 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 truck 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, except for the following conditions:

The truck mounted working platform (except for the high-lift order picker):

A） The platform should be fixed on fork rack/ fork firmly.

B） If there is no ascent control device, when there is person on the platform, the driver should leave the driving position.

C） When there is person standing on the platform with ascent control device, only this ascent control device on the platform can be used.

D） The overall weight of the platform, the load and the people should not over the half of the weight marked on the vehicle nameplate.

E） The platform on the truck should not be used to transport people. But if for the hand work, the truck can be adjusted for operation in a small range.

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, gradient, 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 stated in the section 6, 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 obvious color differing from the surrounding circumstance.

The driving type high –lift truck should be mounted with protection cabin, except for the condition where the load could not drop onto the driver.

When convey the load maybe fall to the driver using high –lift truck, should adopt shielding shelf with enough height, weight and the opening size is small enough to prevent the entire load or part of them from falling onto the driver.

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

In the permit of the factory, it is allowed to install turning hand hold on the steering wheel formerly without it.

14.1.4.4 The transportation and storage of the fuel

The truck should refuel in the stated place. The fuel station should be ventilated, in order to reduce the accumulation of the fuel gas to the least. In opening pit, subway entrance, and lift well or other similar conditions nearby should not fill in the liquefied petroleum gas and replace other dismountable liquefied petroleum gas container.

It is forbidden to smoke in the place of refuel, and should alarm using placard.

If the liquid fuel is not transport using pipeline, it should be transported using airtight container.

Only the personnel trained and appointed can fill or change the liquefied petroleum gas container.

When store and transport the liquefied petroleum gas container should fasten up the filling valve and the safety valve should connected to the vaporization room directly. When storing the container, should screw the protective cap on the connection mouth.

Before filling and/or reusing, should inspect the container to ensure that it is vapor proof. Especially pay attention to the valve and the connective part is vapor proof. The damaged container should not be used. Only the permitted corporation could repair the liquefied petroleum gas container.

14.1.4.5 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.

14.1.4.6 The invalid or damaged truck

If finding the motor industrial truck 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.

14.1.4.7 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 from 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.

14.1.5.6 Elevator (lifter)

The elevator (lifter) for transporting the industrial truck can bear the overall weight of truck, load and the drivers. This kind of elevator (lifter) must be appointed, and the drivers should use the appointed elevator (lifter).

14.1.5.7 Operating on the road vehicle (trailer) and rail vehicle

Before the motor industrial truck drive to the road, the road vehicle should apply the brake and wedging to prevent moving.

Exception: the road vehicle equipped with automatic snap lock type parking brake cannot use the wedge.

The industrial motor truck passing in and out without connect to the tractor, to prevent the semi-trailer hold up can use support.

It is necessary to build up the operating communication and operating order, to prevent the rail vehicle move accidentally when downloading.

The road vehicle (trailer) and rail vehicle should endure the overall weight of vehicle, load and the drivers. It is necessary to inspect if the pavement is crushing, having holes or other damage.

When the industrial truck is operating at high place or platform, should not use the industrial truck to move other vehicles. Never open the door of the rail truck using industrial truck; expect for equipped with special device and the driver has passed the train to use the device.

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 (lifting and stacking) 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 truck 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. When operating high stacking job, convey high and multi-piece piled goods using driving type high-lift truck, it is necessary to use the truck with blind goods shelf and canopy guard shelf.

Exception: if there is no danger of the load fall down on the driver, the truck without blind goods shelf can be used.

When operating high stacking job, convey high and multi-piece piled goods using walking type truck, the blind goods shelf is necessary.

14.2.2 Load carriage (lifting and stacking) rule

14.2.2.1 Load

The industrial truck or the combination of the industrial truck and attachment only can convey the load not over its rated load weight. The capacity of the industrial truck with attachment maybe less than the one marked on the nameplate.

Any measure of enhancing the capacity of the truck is forbidden, for example the adding people or balance weight.

In any conditions, especially when using the attachment, it is necessary to pay attention to the operation, location, fixation and transportation of the load. The truck with attachment when unloaded should be treated as with some capacity.

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.

C） When conveying high and multi-piece piled goods, it is necessary to tilt the mast back ward a little (if can tilt back) to stabilize the load, and should be careful specially.

When unloading the goods, it is necessary to descend carefully. If possible, tilt the mast forward a little (or limited) in order to put ready the load and draw out the fork.

14.2.2.3 Stacking

When stacking, the mast should tilt backward to ensure the stability of the load, approach

the goods pile slowly.

When the truck approach and face to the goods pile, it is necessary to adjust the mast to the vertical location, and lift the load a little higher than the height of the pile. Then running backward the truck or if using reach truck, extended the fork and descend it to unload the goods.

After lifting, start the vehicle, no matter with or without load, it is necessary to operate the brake carefully and placidly.

It is necessary to ensure that the stacking is firm.

After stacking, draw off the fork, and lower the fork to the operating height. After confirm there is no block on the road, drive away the truck.

As for truck can tilt backward, it is necessary to use this function to stabilize the load.

14.2.2.4 Unpiling

The truck approaches the pile slowly, and stopped when the fork tip is 0.3 m far away from the pile.

The space of the fork should adjusted to the width of the conveying load, and should check the weight of the load, to make sure the load is in the lifting weight range of the truck.

It is necessary to lift the fork vertically and insert it to the bottom of the goods.

After lifting, start the truck, no matter the truck with or without load, it is necessary to operate the brake carefully and placidly.

The fork should insert into the bottom of the load as possible. But pay attention to not make the fork tip touch the substance except the load. Then lift the fork to the enough height to move the goods.

Further lift the fork, make the goods away from the pile exactly. If the mast can tilt backward, the fork should tilt back properly to stabilize the load. If it is reach truck, it is necessary to draw back the fork.

After make sure the road is smooth, descend the load from the pile.

The fork should be descended to the operation height and the mast tilt backward mostly. After make sure the road is smooth, drive the truck away placidly.

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.

The load or the device that bears load must be kept at the operating height when the truck is moving. If possible, the load shall be tilted backward when the vehicle is running. Except for stacking operation, it is not permitted to lift the load. This regulation does not apply to truck specially designed that can move with lifting load.

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.

Exception: Under some condition (such as stacking and climbing), the load should be located in the front of the truck's moving direction when the truck is moving. At this moment, the driver should drive the truck very carefully. If operating conditions requires, some subsidiary (attached help) facilities or the other person’s lead can be adopted.

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.

When the truck is operating with load, the driver must control turning equipment and brake system slowly and stably.

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.

It is forbidden that to put the arms, legs or the head in the columns of mast or between the trucks other moving components.

When the vehicle is running, the driver must not let his body outside the contour line of the truck.

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 tire width.

E) When the gradient is more than 10% during the truck's running up and down the slope, if possible, when the lifted load truck and flat stacking truck (except the side bearing load fork-lift truck, cross-country fork-lift truck , stride- truck and platform carrying vehicle) moves, the load surface must be in a upgrade direction.

F) When the truck works on various slopes, the load and the load bearing device must tiltt backward (if possible), and the driver can only elevate the load's height that is enough for running through the road surface and local barrier.

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.

14.2.3.5 Working in road truck and railroad vehicle

Before a motor-driven industry truck runs on (or run down) the road vehicle or railroad vehicle, some necessary measures must be taken to prevent road truck and railroad vehicle from moving.

Before a semi- trailer that is not linked with a tractor runs on the road truck or railroad truck,

it must be ensured that the supporting part of the stilt of the semi- trailer is located at the supporting position.

Before a motor-driven industry truck runs on the road vehicle or railroad vehicle, it must be ensured that the floor board can endure all the weight of the industry vehicle, load and the driver. Besides, it is required to check the plank to see if there are crashes, holes or other damages.

When the industry truck works on high place or platform, it is forbidden to move other truck by industry truck. It is also prohibited to close railroad truck's door by industry truck except for one case that the industry truck is equipped with a special device and the driver has also been trained how to use this device.

If possible, the truck should cross over the railway virgule.

14.2.3.6 The truck operating on the gangplank or transition board

Before the motor industrial truck 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 adopted to the walking type truck.

After the truck driving into the elevator (lifter), it is necessary to put the control device in the central position, switch off the power, and tighten the brake.

14.2.3.8 Parking

After the driver leaving, the carrying device must lower to the lowest position, put the control device to the central position, switch off the power, and tighten the brake, 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: fuel oil system, alarm system, power system, brake, steering equipment, lighting, wheel and air tire pressure (namely gas filled type) and lifting system (including lifting chain, wire rope, limit switch and hydraulic cylinder).

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. The truck which fuel oil system is leaking could not be uses without repair.

14.2.4.2 Refuel

Before refuel, it is necessary to close the engine, brake the truck and the driver should leave the truck.

The open flame and smoking is forbidden during refueling.

14.2.4.2.1 Liquid fuel (for example gasoline and diesel fuel)

The truck using liquid fuel should add fuel in the appointed places.

Before take away the refueling equipment, cover the filler cap and clear up the excessive fuel, the engine could not start up.

14.2.4.2.2 Liquefied petroleum gas fuel (liquefied petroleum gas)

Only the personnel trained and appointed can refuel or change the liquefied petroleum gas container.

The person charging for refuel liquefied petroleum gas should wear protective suit (that is to say long sleeve unit and glove).

The pouring of the fixed type liquefied petroleum gas container and the pouring and change of the liquefied petroleum gas container should be carried on the appointed place.

When transporting or conveying the liquefied petroleum gas container, it is necessary to be careful, the container should not fall down, nor be thrown, rolling or draw. If it is necessary to transport several containers one time, a proper transporting device should be adopted.

The liquefied petroleum gas container should not be filled in excessive.

Before filling the fuel, power off the engine, brake the truck, and the driver leave away the truck.

It is necessary to using soap liquid to check the leak dictation.

The truck driven by liquefied petroleum gas could not park near the heat source, open flame or the similar ignition, and not near to the open air pit, the entrance of the under crossing, the elevator well or other similar place, and could not change the removable container in the upper place.

Before fill fuel into all liquefied petroleum gas container and before the reuse of the removable liquefied petroleum gas container, it is necessary to inspect if there is defect or damage as follows:

A） the dent, scoring and groove of the pressure container;

B） the damage of any kinds of valve and fluid level gage;

C） the scraping in the safety valve;

D） the damage or the loss of the safety bonnet;

E） the leak in the connection of valve or screw-threaded joint;

F） The deterioration, damage or lose of the flexibility seal in the connection of prime or air feed.

If finding the above defect and/or damage, the container should not be used until repaired.

The truck which is driven by liquefied petroleum gas is over night or stay indoor for a long time and the liquefied petroleum gas container stayed on the truck, it is necessary to close all of the feed valves on the container.

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 truck depends upon maintenance. Truck may damage personal health and properties in case of maintenance neglect.

15.2 Maintenance items

The following items shall be carried on for all motor industrial vehicles shall be in accordance with schedule, especially with maintenance instructions supplied by the manufacture.

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

15.2.1 Brake set, steering mechanism, control mechanism, alarming device, lighting, adjustor, and overload protection device for lifting shall be kept within safe operation condition.

15.2.2 Regular inspection shall be taken for components and members of lifting and inclination systems, which shall be kept within safe operation condition.

15.2.3 Regular inspection shall be taken for safety protection shelf and safety devices, which shall be kept within safe operation condition.

15.2.4 Regular inspection and maintenance shall be taken for all the hydraulic systems.

Inspection must be taken for oil cylinder, valve, and other similar components to ensure that internal leakage or external leakage would not develop into a dangerous condition.

15.2.5 Inspection and maintenance shall be taken for storage battery, driving motor, contactor and controller, limit switch, protection device, lead wire and connecting assembly, which shall be kept within safe operation condition. Special attention shall be paid to electrical insulation state.

15.2.6 Inspection for damage and leakage must be taken for exhaust gas system of internal combustion truck, adjustor of carburetor, evaporator, and fuel injection pump.

Notice: hazardous substances may be produced by the internal combustion engine in case of operation under close place. Sufficient ventilation is recommended in that condition.

15.2.7 Check damaged condition of wheel tread, side face and wheel rim of the air-filled type pneumatic tire. Pressure of the tire that is specified by the manufacture must be kept. Gas in the tire shall be firstly released before dismantling the air-filled type pneumatic tire from separable rim.

15.2.8 Check the bonded condition between solid tire and metal wheel band or wheel rim. Foreign matters on wheel tread of the tire shall be cleared if necessary.

15.2.9 Make sure that all the nameplates, indicator boards and labels (pattern) are clear and legible.

15.2.10 Inspection shall be taken for fuel oil system and auxiliary fittings to see if there is any leakage. Soap bath shall be used for leakage inspection of liquefied petroleum gas system. truck must leave the working site in case of any leakage in fuel oil system. And the truck cannot be put into operation until all the leakages have been repaired.

Inspection must be taken before reuse of all the dismountable liquefied petroleum gas containers or filling fuel into all the liquefied petroleum gas containers, to see whether there is the following defective or damage:

A） Dent, scuffing, flute;

B） Damage of various valves or lever meters;

C） Scraps in emergency valve;

D） Damage or loss of emergency valve bonnet;

E） Leakage at connection of valve and thread;

F） Deterioration, damage, or loss of flexible seal at connections of gas filling or gas supply.

In case of occurrence of any defective or damage as above mentioned, no container would be allowed to be used before 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.

15.2.12 Special purpose truck or equipment that is designed for dangerous condition, or is permitted to be used under dangerous condition, shall be paid special attention to, thus ensure the original safe operation performance of the truck.

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.

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