12ESH Electric Stacker • Operation Manual • Service Manual



Welcome to use "HYUNDAI" Electric Truck!

Wish our Electric truck will bring greater convenience for your work!

- Please read this operation manual carefully before using the truck.
- This operation manual is universal, and we reserve right to make technical modifications on electric trucks. If this manual does not accord to the actual truck, please in kind prevail while this manual is only for reference.

Warning

• Truck operators shall strictly conform to ISO3691 Safety Norms of Motor Industrial Trucks.

It is strictly prohibited for any untrained person to operate the truck.

According to ISO3691 *Safety Norms of Motor Industrial Vehicles* load and lift height of 12ESH electric stacker are required as follows:

- 1. When lift height of 12ESH is below 2500mm (including), the maximum load is the rated load; overloading is strictly prohibited;
- 2. When lift height of 12ESH stacker is above 2500mm (excluding), the load of truck shall decrease. Refer to the load curve for detailed values.



Contents

1. Outline drawings	1
2. Brief Introduction of Structure	3
3. Safety Norms	3
4. Putting into Use for the First Time	8
5. Instructions for Use and Operations	9
6. Use, Maintenance and Charging of Storage Battery	
7. Inspections Before Operations	15
8. Inspections after operations	16
9. Periodical Maintenance	
10. Loading, unloading, transportation and storage of truck	21
11. Replacing Battery	22
12. Common Faults and Troubleshooting	22
13. Common Fault Signals and Troubleshooting	25
14. List of Accessories, Spare Parts and Wearing Parts	28
15. Structural Dwgs (Exploded Dwgs) and Schematic Dwgs of Main Parts	28
16. Packing List	28
Appendix ISO3691 Motor industrial vehicle—Safety Norms	

Brief Introduction:

12ESH series electric pallet stackers adopt storage battery as its power source, AC motor as power, the truck is driven to travel through gear transmission, forks lift through hydraulic transmission and DC motor, pushing oil cylinders to move up and down to lift forks and cargo. Because the trucks adopt both electric lifting and electric travelling, the operation mode is walkie and the steering operation is tiller steering, it enjoys advantages of effort-saving, high efficiency, easy operation, safety and reliability, low noise and no pollution. The truck adopts 24V big-capacity, greatly prolonging its service time after charging.

Use conditions:

- a. The altitude shall not exceed 1000m;
- b. Ambient air temperature shall be between -25 $^\circ\!\!\!\mathrm{C}$ and 40 $^\circ\!\!\!\mathrm{C};$
- c. When the ambient temperature is 40°C, the relative humidity should not exceed 50%; at a lower temperature, greater relative humidity is allowed;
- d. For hard and flat ground;
- e. Never use this truck in flammable or explosive environment or corrosive environment with acid or alkali.

Instructions:

Operators shall keep this operation manual and read it for several times;

This manual contains the correct operations, easy maintenance and routine inspections;

Before operating, read this manual carefully in order to ensure safe and effective material handling through correct driving and proper maintenance:

Due to product improvement, this manual may be different from the actual products;

When renting or transferring truck, please rent and transfer this manual as well;

Please contact our sales department timely if you have any questions.

Instructions for signals: these signals are crucial for safety of you and others, therefore please conform to the instructions.

	Danger	Indicating upcoming dangerous situations which, if not avoided, will lead to death or serious injury; you shall conform to these instructions.
	Warning	Indicating potential dangerous situations which, if not avoided, will lead to death or serious injury; you shall conform to these instructions.
	Caution	Indicating potential dangerous situations which, if not avoided, may cause moderate injury; you shall conform to these instructions.
	Attention	Referring to words related to personal safety and truck maintenance in a direct or indirect manner; pay attention to these instructions.

1. Outline drawing



1

	1.1	Manufacturer		HYUNDAI
	1.2	Model		12ESH
Chara	1.3	Driving mode: electric (battery), diesel,		Electric (battery)
ctorict	1.4	Operation mode: manual, walkie, stand		Walkie
clerist	1.5	Rated load	Q(kg)	1200
ICS	1.6	Load center distance	<i>c</i> (mm)	600
	1.8	Front overhang	<i>x</i> (mm)	697
	1.9	Tread	Y(mm)	1330
W/oia	2.1	Service weight (with battery)	kg	1282
ht	2.2	Axle load, laden, front/rear	kg	1298/1184
пс	2.3	Axle load, unladen, front/rear	kg	417/865
	3.1	Wheel (rubber, high elasticity, pneumatic, PU)		PU
	3.2	Wheel dimension, front		φ 250×70
Wheel	3.3	Wheel dimension, rear		φ 80×84
chassi	3.4	Additional wheel (dimension)		φ 150×60
s	3.5	Wheel number, front/rear (x=driving		1x+1/4
	3.6	Tread, front	<i>b</i> ₁₀ (mm)	520
	3.7	Tread, rear	<i>b</i> ₁₁ (mm)	400/525
	4.2	Height of mast, withdrawn	<i>h</i> i(mm)	1735/1985/2235/1720/1883/2050
	4.3	Free lift height (3.5m(option)~4.5m)	<i>h</i> ₂(mm)	0/0/0/1800/1403/1570
	4.4	Lift height	<i>h</i> ₃(mm)	2500/3000/3500/3500/4000/4500
	4.5	Max. Mast height during operation	<i>h</i> ₄(mm)	2955/3455/3955/4010/4530/5030
		Min./max. Height of operation handle in		670/1300
	4.9	driving position	<i>h</i> 14(mm)	
	<i>A</i> 15	Height lowered	$h_{\rm p}(\rm mm)$	90
Dime	<u>4</u> .13	Overall length	///3(mm)	1639
nsion	4.20	Length to fork face	6(mm)	878
	4.20	Truck width	h(mm)	816
	4.22	Fork dimension	s/e/l(m	60/180/1070(1150)
	4.25	Fork overall width	$b_{\rm f}$ (mm)	570/695
	4.32	Wheelbase center ground clearance	$m_{\rm m}$ (mm)	31
	1 33	Aisle width for pallets 1000x1200 crosswavs 層)	Λ (mm)	2//50
	131	Aisle width for pallets 800x1200 lengthways	$\Delta_{st}(mm)$	2430
	4.54	Turning radius	M/(mm)	1/192
	51	Travel speed laden/unladen	Km/h	58/6
Perfo	52	Lift speed, laden/unladen	m/s	0.09/0.13
rmanc	53	Lowering speed, laden/unladen	m/s	0.12/0.11
e data	5.8	Max Grade ability Jaden/unladen	%	6/15
C Gata	5.0	Travelling brake	10	Electromagnetic brake
	6.1	Driving motor power	kW	1.2(AC)
	6.2	Lifting motor power	kW	2.2
Motor	6.4	Battery voltage/rated capacity	V/Ah	24/210
	6.5	Battery weight	ka	180
	0.0	Battery dimension (1 x w x h)	mm	750×170×534
Δdditi				
onal	81	Noise level at driver's ear according to	$dB(\Lambda)$	65
	0.4	DIN12053		CO
data				
	1. Pa	arameters concerning h1, I, Q shall be coun	ted as h1=4	1500mm,I=1070mm

12ESH Electric Stacker

2. Brief Introduction of Structure

(Refer to structural drawings and schematic drawings of main parts)

This truck is mainly composed of truck frame, mast, forks, lift oil cylinder, operation handle, steering gear, driving wheel, battery pack, hydraulic power unit and electric control system.

3. Safety Norms



Before using this truck, pay attention to the following items:

(1) The electric truck is only allowed to be used on flat and hard ground. It is prohibited to use this truck in flammable or explosive environment or corrosive environment with acid or alkali.

(2) Only trained and recognized drivers are allowed to drive this truck.

(3) Before operating the truck, please read this manual carefully, and master the performance of this truck; every time before use, check if the truck is in normal conditions; it is strictly prohibited to use faulted trucks; it is strictly prohibited to repair the truck by any untrained person.

(4) Overloading is strictly prohibited.

(5) When transporting, the center of gravity of the cargo must be between the two forks. It is strictly prohibited to transport loosely stacked cargo.

(6) Drive the truck slowly when the forks enter or leave the pallets.

(7) It is strictly prohibited to push the lifting or lowering button while the truck is travelling. It is strictly prohibited to make quick and frequent switches of the lifting and lowering buttons which may damage the truck and the cargo.

(8) It is not allowed to load cargo on the forks swiftly!

(9) Do not leave cargo on the truck body for an extended period of time!

(10) It is strictly prohibited to make sudden turns in narrow aisles; rather, decelerate and make slow turns to ensure the safety of people and cargo.

(11) When the truck is not in use, the forks should be in the lowest position.

(12) It is strictly prohibited to put any part of human body under the cargo or forks!

(13) This truck is to be used on flat ground or flat operation platforms. It is strictly prohibited to park it on slops for an extended period of time.

(14) Overloaded or over-ramp travelling is strictly prohibited, otherwise the wheels will skid, damaging the wheels and the motor as well as the safety of cargo and people.

(15) It is strictly prohibited to use this truck below the specified voltage of 20.4V.

(16) It is strictly prohibited to charge by connecting the socket to AC power directly.

(17) It is not allowed to drive the truck when lift height of forks exceeds 500mm.

3.1 Norms for safe operations

(1) Training of drivers

3 Attention

Even for trucks with the same technical parameters, they may differ in characteristics such as braking and accelerated speed. Therefore, do not drive the truck until you have got familiar with all the operations.

(2) Wearing when driving the truck

I Attention

Please put on safety shoes and working clothes; for safety reasons, do not wear clothes that are too loose in order to prevent the danger of getting hooked.

(3) Necessary to conform to the norms

Attention

Do not drive the truck when you feel tired, not concentrated, or have adopted anesthetics or drunk.

Please conform to safety norms when operate or repair the truck.

(4) Safety of working sites



The electric trucks can only be used on flat and hard indoor ground. It is strictly prohibited to use in flammable or explosive environment or corrosive environment with acid or alkali.

- A. Keep good road conditions. The paths shall not be blocked.
- B. The working sites shall be well-lighted.
- C. In places where the truck is to be used and charged, there must be equipped with firefighting devices. The fire extinguishers must live up to extinguishing fires from solid combustibles and electrical appliances.
- D. The noise level in this manual refers to the tested value of a new truck on flat, smooth and hard road conditions. If you have a bad road condition or the wheels are damaged, the noise of the truck may become greater.

(5) Ensure the integrity of the truck.



A. When operate, check and repair the truck, please conform to the safety norms and the norms of your working site.

B. Without written permission of our company, it is not allowed to modify the truck or add any device. Modifications on the truck may influence its safe operations.

(6) Set up safe operation procedures:

Before use, please set up procedures for safe operations, and take safety into full consideration.

(7) Never operation truck under unsafe conditions:

A. It is strictly prohibited to use the truck on uneven ground or where the route is blocked; never lift cargo on a slope.

B. Never use a faulted truck.

C. Make sure to check the truck every day; repair or replace timely whenever any abnormal condition is discovered.

(8) Overloading is strictly prohibited.



Overloading is strictly prohibited, because it will damage the truck or get people injured.

(9) Use proper pallets :

The pallets adopted should have proper size, not too wide or too big.

(10) Check of electrical system



3.2 Safe driving norms

(1) Check the safety conditions around the truck.



Before starting the truck, make sure there is nobody around the truck.

I Attention

When transporting bulky cargo which blocks the sight, please drive reversely or be led by other people.



Attention

When driving reversely, make sure there is nobody around the truck.

Attention

When driving in narrow aisles, it should be led by other people.

Attention

At crossroads or other sight-blocked places, the driver should stop the truck, and start again after making sure there is nobody around.



Attention

When driving and operating the truck, be concentrated.



Different from normal trucks, the driving mechanism of this truck is installed at the front end of the truck. When turning, the swing speed at the front will be relatively higher, therefore, when the front end of the truck approaches other objects, make sure to drive or turn slowly to prevent collision.

(2) Brutal driving is strictly prohibited



Do not make sudden starting, braking or steering.

Sudden starting or braking will make the cargo fall off.

Attention

Sudden turning during driving will make the truck overturn and lead to serious accidents. Slow down and turn cautiously

Conform to all the safety regulations of the working sites. When driving by other trucks, decelerate and honk the horn. Do not drive in sight-blocked places.



Make sure there is certain gap between the truck and the entrance/exit.

(3) Do not drive by the road side.

Attention

Make sure there is enough distance between the truck and the roadside or the platform edge.

When driving on narrow roads or platforms, must keep a certain safe distance from the edges to prevent the truck from falling.

Marning

Do not make steering or loading/unloading operations on ramps, otherwise the truck will be endangered by overturning.

3.3 Operation norms:

Attention

The truck can only transport cargo under the rated weight.

- 1) Overloading is strictly prohibited.
- 2) Never transport side-loaded cargo.
- 3) Never transport people with the truck.
- 4) Never operate handles suddenly.
- 5) Never use the truck as a tractor.
- 6) When transporting cargo of extra-width, be extremely careful, slow down when turning, keep the cargo in balance, lift and descend slowly and pay attention to the surroundings.
- 7) Park the faulted truck under repair at places where it won't block traffic, descend forks to the lowest position, hang on a warning plate and pull out the key.
- 8) Do not operate the truck when protective devices like mast and protective cover have not been installed.
- 9) Avoid wind hazard when loading.



10) The driver shall control the travel speed according to situations. Slow down when turning, operating in narrow aisles, passing through swing doors, or in sight-blocking areas. Keep sufficient braking distance from forklift ahead, and control the electric truck all the time. Never stop suddenly (except for emergencies), turn quickly or override in dangerous or sight-blocking areas. Never put your body or hands out of the driving compartment.

11) **Driver's sight during driving:** the driver shall always keep his sight on the travel direction, and pay attention to situations of the travel route. If the cargo under transportation should block the driver's sight, the cargo must be arranged at the rear end of driver's sight. If it is impossible to adjust, another operator must be arranged to walk with the truck at the front side of driver to report the road condition to the driver.

12) **Travelling uphill or downhill:** the route uphill or downhill must be the appointed travel route. The road shall be clean without skidding, safe and reliable, and live up to technical performance of stacker. When travel uphill with load, the forks must be kept forward; while when downhill, drive reversely. While travelling uphill or downhill, never turn or park the stacker in the middle. Drive slowly when travelling uphill or downhill, and always be prepared to brake.

13) Drive the stacker to a lift or a material-loading platform: if you are to drive the stacker to a lift or a material-loading 7

platform, make sure that the lift or platform has adequate bearing capacity, their structures are suitable for the stacker, and that you've acquired permission from user of equipment. Make inspections before operations. When the stacker enters lift, let cargo enter first. Choose a proper parking position to avoid collision with walls. If any personnel should use the lift at the same time, he or she shall not enter until the stacker has been parked well. When reaching the determined height, the personnel should leave the lift first.

14) **Conditions for the cargo under transportation:** driver of stacker must inspect the cargo carefully to avoid danger. Before transporting, arrange the cargo carefully and fasten it. If the cargo is endangered with overturning or falling during transportation, proper protective devices (such as guardrail) shall be installed.

3.4 Precautions after work

1) Parking: park the truck in the appointed place; do not park on a ramp.

Do the following items before leaving the truck:

- a) Lower the forks naturally to the lowest position;
- b) Make the steering wheels to the neutral position;
- c) Turn off the key switch.
- 2) Truck cleaning:

S Attention

When cleaning the electrical system of the truck, use compressed air; never use water to clean the electrical system.

3) Charging:



Open flame is not allowed in the charging area, otherwise it will lead to explosion or fire.

Keep good records of the charging conditions. For charging methods, please refer to the storage battery operation part.

4. Putting into Use for the First Time

4.1 Putting into use for the first time:

4.1.1 To achieve power disconnect in emergencies, the battery plug (not included in the delivery) shall be connected with the emergency stop plug of the electric truck.



- 4.1.2 The stacker shall only be driven by battery power. Rectified AC power will damage the truck and its electronic components. Length of battery cable shall not exceed 6m.
- 4.13 Never lift the load capacity when the stacker is driven by an external battery.
- 4.14 When you have received the stacker or the stacker has been transported, conduct the following inspections before putting it into use:

- a) Check whether the equipment is complete and in normal condition.
- b) Install the battery. Pay attention not to damaged the battery cable.
- 4.1.5 Adjust the characteristic curve of charger (charging curve).
- 4.1.6 If the stacker has been parked for an extended period of time, the wheels may be a little bit flattened. When the stacker has travelled for a while, it will recover automatically.

4.2 Driving the stacker without its own driving devices:

Warning Dragging the stacker on a ramp is strictly prohibited.

4.2.1 In order to drag the stacker in emergent operations, the electromagnetic-controlled brake must be released.

4.2.2 When the truck has been parked at the appointed place, the electromagnetic-controlled brake must be fastened again so as to make the stacker in braked condition again.

5. Instructions for Use and Operations

Travelling and lifting of electric pallet stacker adopt storage battery as power source, used for short-distance cargo transportation and cargo stacking; correct use and operations will bring great convenience for your work while incorrect use and operations will damage the truck or cause danger for human safety and cargo.

5.1 Before use:



- 5.1.1 Check whether the truck is in normal condition before use: whether the hydraulic pipeline has leakage, whether each supporting wheel works normally and whether there is stuck phenomenon. Never use a faulted truck.
- 5.1.2 Check whether the battery is powered according to figure 1: pull out general power switch to turn on the power supply, turn on the key on the handle, and check power indicator on instrument panel. If 0-end is lighted, it suggests the battery has run out of power. Charge it immediately. Never use the truck when it has run out of power, otherwise it will greatly shorten the service life of battery and even damage it.



5.1.3 Check whether braking is normal, whether lifting, lowering, travelling forward/backward and other movements are normal, and whether emergency reverse movement is normal. The methods are specified in figure 2.



Pull operation handle to area A or C in figure 2, press the lift/lower button on operation handle to see whether forks lift or lower normally. Then pull operation handle to area B in figure 2, start the truck slowly, pull the handle to horizontal position and see whether the truck travels and brakes normally.

Pull operation handle to area B in figure 2. Press the emergency reverse switch button on top of operation handle to see whether the truck can drive backward.

Through the above inspections, if no fault is discovered, the truck can be put into use; if there is any fault, please repair timely. Never use a faulted truck.

5.2 During Use:

5.2.1 Accelerator rotary knob: used to control travel direction and truck speed. When performing travelling operations, first pull the operation tiller to area B. when the tiller is in area A or C, the truck will be powered off and unable to travel. When the operation tiller is in area B, and rotate the accelerator rotary knob to one direction the truck will travel to that direction, and the travel speed will increase along with the rotation amplitude. When you rotate the knob to another direction, the travel will travel to that direction, and the travel speed will increase along with the rotation amplitude.

Note: The driving wheel motor is equipped with brake, and the spindle which controls the rocker arm is equipped with cam and micro switch. Only when the rocker arm is $45^{\circ} \pm 35^{\circ}$ (as shown in figure 2), will the stacker be allowed to be powered on. When the angle is bigger or smaller, the stacker will be powered off, and lifting operations will be allowed. The truck cannot travel while lifting cargo, i.e. as shown in figure 2, when operation tiller is in area A or C, the truck can only lift or lower, and travelling is not allowed; when operation tiller is in area B, the truck can both lift and lower. In the following text, work position of operation handle will not be mentioned again, i.e. when operation tiller is used to be powered or C, the truck cannot travel, but only lift or lower. When the truck travels, the operation tiller is surly

in area B.

5.2.2 As shown in left figure 2, there is a slow button on operation tiller. When press the slow button and rotate the acceleration knob, the truck will travel with low speed. Such a condition is suitable for turning, stacking and entering/exiting cargo shelves. When release the slow button and rotate the acceleration knob, the truck will travel at normal speed.

5.2.3 Safe connection height:

When lift height is about 1.8m (according to the mounted lifting mast); when higher than safe connection height, travel speed of stacker will be lowered to about 3km/h.

5.2.4 Transporting and stacking operations:

Check the following items before operating the truck: Make sure no cargo shall fall or be damaged in the loading area. Make sure no cargo or objects shall hinder safety.

As shown in figure 2, pull out power supply switch to turn on general power supply, turn on the key, drive the stacker to cargo pile (fork head 30cm from pile), press the lowering button, adjust fork height to a proper position, insert forks slowly into cargo pallets as deep as possible, press lifting button to forks 20–30cm above ground, drive the truck to cargo shelf and park at the position where fork head is 30cm from cargo shelf, press lifting button, forks lift to a proper height (pallet bottom 10cm higher than shelf), move the cargo slowly to the exact position of shelf, press the lowering button, place the cargo on the shelf carefully, make the forks away from cargo, start the truck slowly, make the forks away from cargo pallets (fork head 30cm from shelf), lower the forks to 30cm from ground, and drive the truck away from the shelf. During travelling, make sure there is no obstacle around. Slow down when turning.

⚠́ Caution

Different from normal trucks, the driving mechanism of this truck is installed at the front end of the truck. When turning, the swing speed at the front will be relatively higher, therefore, when the front end of the truck approaches other objects, make sure to drive or turn slowly to prevent collision.

5.2.5 Operations of claiming cargo from shelves:

As shown in figure 2, pull out general power switch to turn on power supply, turn on key, drive the truck near cargo shelf (fork head 30cm from shelf), press lowering button, adjust fork height to the proper position of shelf, insert forks slowly into cargo pallets as deep as possible, press lifting button, lift cargo to the position where bottom of cargo pallets is 10cm from shelf, drive truck slowly to make forks away from shelf (fork head 30cm from shelf), press lowering button until forks are 20–30cm from ground, drive the truck away from shelf to the demanded position, park the truck slowly, press lowering button to place down cargo, make forks totally away from cargo, and make forks away from cargo pallets slowly.

5.3 Treatment for abnormal conditions during use:

- 5.3.1 When press the lifting button, the forks can lift, but when release the button, the forks still lift, and the lifting becomes out of control. If this occurs, press the general power switch immediately to cut off power supply. Move the truck to a safe position, lower the cargo manually and repair truck circuits.
- 5.3.2 If braking failure occurs, stop use immediately and inspect and repair the truck.

11

5.3.3 If any personnel is pushed against a wall or other object when the truck travels forward, you only need to press the emergency reverse button on top of operation handle, then the truck will travel reversely automatically to prevent damage to human body.

5.4 After use:

Park the truck at a fixed parking position after use, and conduct routine maintenance according to item 6. charge the truck.

6. Use, Maintenance and Charging of Storage Battery

Charging method: this truck is equipped with fixed charger, and built-in charger is optional. When you use a fixed charger, first open the side door, pull the charging connector out of the truck, and insert the charging connector into the connector of fixed charger, then insert the plug of fixed charger into two-phase AC power, and charging will start in a few seconds. When you use a built-in charger, take the charging plug out of the hole, insert the charging plug into two-phase AC power, and charging will start in a few seconds.

<u> M</u>Warning

When charging, hydrogen is accumulated inside the battery box, therefore the charging environment should be well-ventilated. No open flame is allowed; otherwise it will lead to explosion or fire disaster.

6.1 Initial charge

6.1.1 Initial charge shall be made for new batteries, 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.

6.1.2 Open gas cap.

6.1.3 When the charging equipment is able to work normally, pour the sulfuric acid electrolyte with a density of 1.260 ± 0.005 (25°C) and a temperature of lower than 30°C 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 charge can only be conducted when the electrolyte temperature reduces to below 35°C. (When necessary, the batteries can be put into cold water groove for temperature reduction). After the still placement, if the electrolyte level reduces, electrolyte should be added.

6.1.4 The sulfuric acid electrolyte is prepared with battery sulfuric acid complying with the state standard GB4554-84 and distilled water. Never replace it by industrial sulfuric acid or running water. The standard temperature (25°C) and density of the electrolyte can be converted as follows:

D25 = Dt+ 0.0007 (t-25)

Where: D25: the density of the electrolyte at 25° C

Dt : the actual density of the electrolyte at t $^\circ\!\!C.$

 $\ensuremath{\mathsf{t}}$: temperature of the electrolyte when testing the density.

6.1.5 Dry up the electrolyte spilled on the surface of battery. Connect the positive and negative poles of battery with those of DC power (charger) respectively and the power will be turned on. Charge with the current of 30A (the current of the first stage). After the charge voltage achieves 28.8V ($12 \times 2.4V = 28.8V$), switch to the 15A current

of the second stage to continue charging. When charging, the temperature of electrolyte shall never exceed 45°C. When the temperature rises nearly to 45°C, reduce the current by half or stop charging temporarily. After the electrolyte temperature reduces to below 35°C, continue charging, however the charge time needs to be extended properly.

6.1.6Evidence of full charge: When the voltage during the second stage charging reaches 31.2V ($12 \times 2.6V = 31.2V$), the variation of the voltage is no greater than 0.005 (V); when the density of the electrolyte reaches 1.280 ± 0.005 (25° C), no apparent changes in 2 hours and there are fine air bubbles appear violently, it can be regarded as that the batteries are fully charged. The charging amount is 4-5 times of the rated capacity and the charging time is about 70 hours.

6.1.7 In order to accurately control the sulfuric acid content of the electrolyte, the electrolyte 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 electrolyte density and the liquid level should be adjusted to the stipulated value within two hours in charging state.

6.1.8 After the initial charge is completed, the surface of the batteries should be cleaned. Close the cover of the liquid hole plug and then the batteries can be used.

6.2 Use and maintenance

6.2.1 In order to guarantee the service life of battery, the battery in use should be fully charged. Insufficiently charged battery 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 cell (when the total voltage reduces to 1.7V \times 24 = 40.8V). When the density of the electrolyte reduces to 1.17, discharge should be stopped and charge should be conducted at once. The battery should not be placed idle for an extended period of time. The supplementary charge which is frequently conducted during use is called common charge.

6.2.2 Common charge: for common charge, current of the first phase is 30A, and the second phase is15A. The charging method is the same as initial charge. The charge amount is 130-140% of the discharged amount. The charging time is around 12 hours.

6.2.3 The cells in normal use should avoid over-charge, but over-charge must be properly conducted for the cells in following situations, i.e. equalizing charge.

a. The "lag-behind" cells--- cells with a voltage lower than that of the other cells in the discharging process and the cells having been repaired for failure. (When equalizing charge is conducted, the positive and negative poles of the "lag-behind" cell 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. Equalizing charge should be conducted for cells in normal use every 2-3 months.

c. Equalizing charge should be conducted for the cells which have not been used for a long period of time before use them again.

6.2.4 Equalizing charge:

a. Charge with a 4A current.

b. When the charge voltage reaches 31.2V ($12 \times 2.6V = 31.2V$) and air bubbles occur in the electrolyte, the current should be reduced by 50% (2A) and continue to charge.

c. When the cells 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 1A current for another one hour.

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

6.3 Keep and storage

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

a. Avoid direct sunlight. The distance from heat source shall be no less than 2m.

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

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

d. Do not store the battery with electrolyte in it. In special cases where it is necessary to store with electrolyte, the density and liquid level of electrolyte shall be adjusted to the stipulated value. Whenever one month of storage period expires, a complementary charge shall be made with the common charge method.

6. 4 Operations of electrolyte

(1) Density check

Use the suction type densi-meter to check density. During operation, avoid spilling out the electrolyte, and do wear protective tools.

(2) Operation besides check

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

(3) Electrolyte leakage

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

6.5 Operations for storage batteries of end service life

(1) Operation of storage batteries during the final stage of their lifetime

When the service life of storage battery is about to terminate, the electrolyte in single cells reduces very fast. For this reason, distilled water shall be complemented every day.

(2) Treatment of waste batteries

For the waste batteries, draw out the electrolyte and decompose the batteries. It can be negotiated whether the waste batteries shall be recycled by the battery manufacturer. The waste electrolyte should be disposed according to relevant local rules and regulations.

6.6 Emergency treatment

(1) The electrolyte is spilled on skins:

Wash with a large amount of water;

(2) The electrolyte is spilled to eyes:

Wash with a large amount of water, and go for professional medical treatment;

(3) The electrolyte is spilled onto clothes:

Take off the clothes immediately; after washing with water, wash with liquid soap of alkalescence;

(4) The electrolyte leaks:

If the electrolyte leaks out, neutralize it with lime, strong carbonated soda or carbonated soda or others, and wash with a large amount of water.

6.7 Charger

If you are using self-prepared electric charger, then the charger must live up to the following requirements:

a. Charger output voltage: 24V

b. Charger output current: 30A

If you are using the semi-electric or manually-adjustable charger, please charge the battery according to instructions given in item 2 "Use and maintenance".

7. Inspections Before Operations

In order to achieve safe operations and keep the truck in good conditions, full inspections on the truck is required before operating, which is a legal duty. Contact our sales department timely if any problem is discovered.

7.1 Inspection points and contents

	NO.	Check point	Check content	
Braking	1	Operation handle	Pull operation handle to make it switch between areas A and B; the brake has sounds of absorption.	
system	2	Brake clearance	Brake clearance shall be kept between 0.20.8mm.	
Steering system	3	Operation handle	Degree of tightness and steering flexibility.	
	4	Oil pipe	Oil pipe leaks or not.	
	5	Hydraulic oil	Proper oil amount.	
6 Lifting oil cylinder Oil cylinder leaks or not.		Oil cylinder leaks or not.		
Wheel	7	Pins, screws and all fasteners	If any pin, screw or fastener becomes loose or falls or not.	
	8	Wearing condition	Compared with parameter list, replace of wheel diameter has reduced by 5%.	
	9	Charge	Determine display condition of battery capacity.	
Battery	10	Electrolyte	Liquid level and density of electrolyte.	
11 Connecting wire Connecting wire and		Connecting wire and socket shall be firm.		
Horn	12	Horn	Push the button, whether it sounds or not.	
Instrument	13	Function	Turn on key switch, whether instrument display is normal or not.	
	14	Structural parts including truck frame No damage or crack.		
Others	15	Function	Whether lifting/lowering, forward/backward, emergency reverse and others are normal, whether there is any abnormal sound.	

8. Inspections after operations

After operations, wipe out dirt on the truck, and conduct the following inspections:

Keep all the warning signs, nameplates, warning labels and other image-text signals complete and clear. Such signals have certain guiding, reminding and warnings functions for operators.

Check whether there is any distortion, damage or breaking condition.

Add lubricating oil according to situations. Replace the faulted spare parts.

9. Periodical Maintenance

Full inspections on the truck can avoid failures and ensure its service life. The hour listed in the maintenance procedures is based on the situation where the truck works for 8 hours per day and 200 hours per month. For safe operations, the truck should be maintained according to the maintenance procedures.

Attention
All the repair work should be performed by professionally trained and
jualified personnel

For the service work such as adjusting or replacing the spare parts, please contact our sales department.

9.1 Precautions for maintenance:

	Attention
	When replacing, adopt the original spare parts of our company. All of the
	spare parts of the truck should be replaced by those which have equivalent
	safety requirements as the original design when they need to be replaced.
	Adopt the lubricating oil and hydraulic oil recommended by our company.
(1)	Sites for maintenance:
	Attention
	Should be the designated sites, able to provide the service mechanisms
	such as hoisting and safety protection devices.
	The site should be flat ground.
	The site should be well-ventilated.

The site should be equipped with firefighting devices.

(2) Precautions before maintenance:

Attention
No smoking.
Make self-protective measures.
Wipe out the leaked oil timely.
When add lubricating oil, first clean the dirty oil or dust on the joint with a brush or cloth.
Except for certain situations, turn off the key switch and plug out the power socket.
When doing maintenance for the truck, the forks should be in the lowest position.
When dismantle the high-pressure oil pipe, make sure that there isn't any cargo on the truck, and the forks are in the lowest position to release the pressure in the hydraulic system.
Before contact the terminal of the main circuit, please conduct discharge operations for the circuit. There is capacitor in the circuit, thus a small amount of electric energy may exist.
Clean the electrical part with compressed air. Never clean it with water. When the truck needs to be maintained at a high altitude, the personnel should be protected.

9.2 Inspections and Maintenance before starting a new truck

In order to conform to relative industrial regulations and ensure absolute safety of truck during transportation, it is probable that the battery is not equipped with electrolyte (except for inland sales) before starting for the first time.

When the truck leaves the factory, the prepared electrolyte is with it. Before first use, pour the electrolyte into the battery by professional personnel. First, place the truck in a well-ventilated place, open the cap of the battery box, and open the plastic cap on the battery top completely. Lift the plastic pot filled with the electrolyte with a plastic funnel, pour the electrolyte into the battery slowly till the liquid level can be seen. When the battery is filled, conduct initial charge for the battery in time according to the operation instructions given in 5.1.(For maintenance-free batteries, there is no need to add electrolyte.)

9.3 Daily inspections

Check the oil level of the hydraulic oil:

Lower the forks to the lowest position, and the amount of added oil is 1.5L. For the hydraulic oil, adopt the recommended brands.

Check the power of storage battery.

Refer to the use and maintenance of storage battery.

9.4 Inspection according to needs

Clean the truck. Check and fasten each fastener. Check wearing condition of wheels.

9.5 Inspection and maintenance after 50 hours (weekly)

	1	Pull the operation handle to make the handle switch between area A and B;	
		the brake has sounds of absorption.	
Braking system	2	Oil dirt and dust on the steering gear should be wiped clean.	
	3	The brake clearance should be kept between $0.2 - 0.8$ mm.	
Electrolyte	Л	Check the liquid level of electrolyte; when too low, it can be supplemented	
capacity 4		by pure water. (except for maintenance-free batteries)	
Electrolyte	F	Tast the density after sharping is finished; it should be 1,28g/ml	
density			
Clean the			
storage	6	6 Close the cap, and clean with tap water.	
battery			
Check the	7	Polich the rough surface of the contactor with abracive paper	
contactor	/		

9.6 Inspections and maintenance after 200 hours (1 month)

Besides weekly maintenance, the following maintenance is necessary:

Through inspections, if it is necessary to make adjustment and replacement, please contact the repair personnel of our company (records for monthly repair should be kept).

	NO.	Inspection point	Inspection content
	1	Overall condition	If there is any abnormal condition
Whole truck	2	Horn	Sound
Steering system;	3	Pedal switch	Tread and release the pedal switch, the brake has the sounds of absorption.
braking system;	4	Brake clearance	The brake clearance should be kept between 0.2 – 0.8mm.
hydraulic	5	Operation handle	Tightness and flexibility of steering
system; lifting	6	Truck frame and fasteners	Function, crack or not, lubrication conditions, fasteners become loose or not.
system	7	Connecting rod and wheel carriage	Functions, crack or not, crooked or distorted or not, lubrication conditions.

	8	Oil pipe	The oil pipe leaks or not.		
	9	Hydraulic oil	Proper amount of oil.		
	10	Lift oil cylinder	Leaks or not.		
	11	Electrolyte	Liquid level, density, degree of cleanness		
	12	Plug	Functions, damaged or not		
	13	Key switch	Functions		
Storage battery; charger; electrical system	14	Contactor	Contact and functions		
	15	Micro switch	Functions		
	16	Controller	Functions		
	17	Driving motor	Wearing conditions of carbon brush and commutator		
	18	Lifting motor	Wearing conditions of carbon brush and commutator		
	19	Steering motor	Wearing conditions of carbon brush and commutator		
	20	Fuse	Complete or not		
	21	Wiring harness and terminals	Loosened and damaged or not		





1 Hollow screw	2 Connecting screw	3 Spring
4 Iron	5 Motor shaft	6 Key sleeve
7 Friction plate 8 Ele	ectromagnetic coil	
9 Mounting cover p	late 10 Mounting scre	2W
1. Structure of brake	e is shown in the drawing	. When the truck
has been used for a p	eriod of time, the braking	performance will
degrade as braking pl	ates become worn or bra	aking plates stuck
and cannot release th	e brake. Then it is require	ed to adjust brake
clearance. As shown	in the drawing, in brake	ed condition, first

measure the clearance between braking plate and magnetic

steel. If the clearance is greater than 0.5mm, the clearance needs

to be adjusted. Before adjustment, first wipe clean the oil dirt and dust on friction plate. During adjustment, first release the connecting screw, adjust length of adjusting screw 1, and then fasten the locking screw. After adjustment, the clearance between braking plate and magnetic steel shall be between 0.2 to 0.3mm. While adjusting, pay attention to adjust the three adjusting screws in balance, to make the clearance between braking plate and magnetic steel spread evenly. After adjustment, connect brake with 24V DC power, and sounds of absorption shall be heard.

9.7 Maintenance for every 600 hours (three months)

When conducting maintenance of every three months, repeat the monthly process. If it's necessary to adjust or replace spare parts, please contact repair personnel of our company.

Contrator	Polish uneven contacts with abrasive paper
Contactor	Replace when it fails to function well
Motor	Wearing condition of carbon brush and commutator.
Brake	Clean dirt and dust on friction plate, and check the wearing condition

9.8 Maintenance after 1200 hours (half a year)

When conducting maintenance for every half a year, please repeat the process of maintenance for every three months. When it is necessary to adjust and replace the spare parts, please contact the repair personnel of our company.

Contactor	Polish the uneven contact with abrasive paper
Contactor	Replace when it does not function well
Motor	The wearing conditions of carbon brush and commentator.
Reduction	Deplace gear oil
gearbox	Replace gear oil
Filter	Clean
Drake	Clean the dirt and dust on the friction plate of the brake; check the wearing
вгаке	conditions of the friction plate
Hydraulic	Replace the hydraulic oil, check the lift oil cylinder leaks or not, replace the sealing
system	when necessary
Fork wheel	
and fork	Check the weating conditions, replace when not function well
wheel	Check the wearing conditions, replace when not function well
bearing	

9.9 Recommended working medium

(1) Hydraulic oil:

A. When normally loaded, we recommend:

Hydraulic oil: LHPISOVG46, in accordance with DIN51524T.2, average sustained temperature 40-60 degrees. B. When heavily loaded, we recommend:

Hydraulic oil: LHPISOVG68, in accordance with DIN51524T.2, average sustained temperature above 60 degrees.

C. When light loaded in low temperature, we recommend:

Hydraulic oil: HLPISOVG32, in accordance with DIN51524T.2, average sustain temperature below 60 degrees. For variably loaded situations, we recommend:

D. For all the working conditions mentioned above, it can be replaced by hydraulic oil LHPISOVG46 in

accordance with DIN51524T.2. This kind of lubricating oil has very high viscosity (mostly applied to hydraulic oil). When the hydraulic oil is difficult to purchase, engine oil SAE20W/20 can substitute hydraulic oil HLP68.

(2) Gear oil:

Hypoid gear oil 85W-90 (GL-5)

(3) Lubricating grease:

Lithium base grease NO.3

All the wasted hydraulic oil, gear oil and grease can pollute the environment, therefore, please recycle the replaced working mediums or dispose according to local regulations.

Item	Maintenance content	Maintenance periods	Remarks
Fork wheel bearing	Replace	1200 h	
Fork wheel	Replace	1200 h	
Sealing parts	Benlace	1200 h	Replace anytime damage is
	hepidee	1200 11	discovered
Gearbox	Replace lubrication oil	1000 h	
Hydraulic oil	Replace	1000 h	
() Oil nine	Replace	2000 h	Replace anytime damage is
	nepiace	2000 11	discovered
Filter screen	Clean	1000 h	
Driving motor	Check carbon brush and bearing	1000 h	
Steering motor	Check carbon brush and bearing	1000 h	
Oil pump motor	Check carbon brush and bearing	1000 h	

9.10 Maintenance periods of consumables and some components:

10. Loading, unloading, transportation and storage of truck

10.1 Storage of truck

If this truck will not be used for over 2 months, it should be parked in a well-ventilated, frostless, clean and

dry room, and the following measures should be taken:

Clean the truck thoroughly.

Lift and lower the forks completely for several times, and check if it's normal.

Lower the forks to the lowest position.

Support the end of the truck which nears the operator with wood beams to make the drive wheels away from the ground.

Apply a layer of thin oil or grease to all the exposed surfaces of mechanical parts.

Lubricate the truck.

Inspect the battery conditions and the electrolyte, and apply non-acid lubricating grease to the battery terminals.

Spray all the electrical contacts with proper spray.

10.2 Transportation of truck

If the truck is to be transported for a long distance, support the end of the truck which nears the operator with wood beams, to make the drive wheels of the truck away from the ground, and fix the two front wheels with wedge blocks. Bind the truck and the transportation truck firmly with ropes.

10.3 Loading and unloading of truck

Before loading and unloading, please first check the overall truck weight marked on the name plate, and choose proper hoisting and loading/unloading devices. When hoisting, the truck should be kept horizontal, and touch the ground slowly. People around should be careful, and it should be guided by a person. If making loading/unloading with a truck, first observe the condition of the bottom of the truck being loaded/unloaded. Operate cautiously when the forks are inserted to the bottom of the truck to prevent damaging the drive wheels, balance wheels and front wheels of the truck.

11. Replacing Battery

Procedures for replacing battery:

- 1. First open and remove housing;
- 2. Screw down battery platen; remove connecting wire;
- 3. Take out the upper and lower batteries;
- 4. Procedures for mounting battery pack are the reverse.

Attention

Handle it carefully when hoisting or transporting batteries, otherwise it may damage the batteries or cause injuries to human bodies.

12. Common Faults and Troubleshooting

NO.	Fault	Cause	Troubleshooting
		① Fuse of control circuit burnt	Replace
		② Bad contact performance or damage	Donair or roplaco
	Stacker cannot start	of power switch	Repair or replace
	(contactor does not work,	③ Fuse of main circuit burnt	Replace
	either)	④ Bad contact performance or damage	Donair or ronlaco
I		of key switch	Repair or replace
		⑤ Battery connection loosened or fallen	Fasten
	Ctackor cannot ctart	① Brake of driving wheel not closed,	Donair or roplaco
	Stacker Carinot Start	truck in braked condition	Repair or replace
	(CUTILACIUE WUEKS)	② Carbon brush of travelling motor worn	Repair or replace

		or bad contact between	
		commutator and carbon brush	
		③ Coil of travelling motor disconnected	Popair or roplace
		bad contact	Repair or replace
		④ Bad contact performance of contactor	Repair or replace
		⑤ MOSFET circuit plate faulted	Repair or replace
2	Stacker can only travel	① Contactor has poor contact performance or burnt	Repair or replace
	IOIWaru (OF Dackwaru)	② Circuit panel faulted	Repair or replace
3	Stacker cannot stop during travelling	Contacts damaged	Cut off power supply in emergency and replace contacts
		① Mounting screw of micro switch loosened or damaged	Adjust or fasten screws, or replace micro switch
4	Braking failure	② Connecting wire of brake loosened or brake damaged	Fasten screws or repair brake
		③ Braking plate worn	Replace braking plate
		① Steering gear bearing damaged	Replace bearing
5	Steering stuck	 Steering gear bearing lacks oil or has too much dust 	Clean bearing
C	Driving wheel has heavy and noisy steering, motor in	① Gear and bearing have foreign matters	Clean or replace bearing
б		② Bearing mounting has gaps	Adjust gap
		③ Front wheel bearing damaged	Replace bearing
		① Overloading	Reduce load
		2 Pressure of relief value too low	Adjust it higher
	Fork not lift	③ Lifting oil cylinder has abnormal inner leakage	Replace sealing parts
		④ Inadequate hydraulic oil	Add some filtered hydraulic oil
		⑤ Inadequate battery voltage	Charge battery
7		⑥ Operation handle not in horizontal or vertical position, oil pump motor not powered on	Improper operations
		⑦ Oil pump motor damaged	Repair or replace
		⑧ Oil pump damaged	Repair or replace
		④ Lifting button switch damaged	Repair or replace
		0 Key not turned on or damaged	Repair or replace
		Battery voltage severely inadequate	Charge
0	Forks not descend after	 Inner mast distorted due to overloading 	Repair or replace
õ	lifted	② Outer mast distorted due to overloading	Repair or replace

		③ Roller wheel of mast stuck	Repair or adjust
		④ Guide rod of mast crooked	Repair or adjust
		⑤ Return oil hole block	Clean
		⑥ Solenoid valve of hydraulic pump out	Exclude fault of solenoid
		of control	valve
	Terminal voltage of storage	1 Some single cell damaged	Repair or replace
9	battery lowered (after	② Battery liquid level low	Add electrolyte
	charging)	③ Impurities in electrolyte	Replace electrolyte
		① Nuts for fixing driving wheel become loose or fallen	Fasten locknut
10	Truck body swings during		Adjust screws on the
10	travelling	② Balance wheel, drive wheel and two	balance wheel to make
		front wheels are not in the same plane	the four wheels within
			the same plain

12. 1Method for adjusting relief valve pressure

Relief valve pressure has already been adjusted. Customers are not allowed to adjust it at will, otherwise hydraulic system and truck safety will be endangered, If oil pressure does not live up to stipulations, adjust it according to test methods stipulated in JB/T3300 by professional personnel:

1 Screw down high-pressure-oil pipe. Mount a pressure meter whose range is greater than 20Mpa at outlet of high-pressure oil.

2 Press lifting button and measure system pressure. For trucks with a rated voltage of 1500KG, the stipulated system pressure is 13.5Mpa.

3 If the oil pressure does not accord with the stipulated value, release locknut of relief valve, and rotate the adjusting screw left and right to adjust the pressure to the stipulated value. When adjust the screw inward, the system pressure will increase; when adjust outward, the system pressure will decrease.

4 Fasten lock nut after adjustment.



13. Common Fault Signals and Troubleshooting

Fault Code List and Troubleshooting of 1230 Controller

LED code	1311 display	Fault explanation	Fault cause
1,2	motor speed encoder	Signal of speed sensor cannot be detected	1 False connecting wire of speed sensor of failure
			2 Controller faulted
	Motor Failsafe	Motor speed out of normal range	1 Speed sensor faulted
			2 Electromagnetic brake of motor not fully released
			3 Braking torque too small
			4 Improper setting of P,I
			5 Failsafe time too short
1,3	Motor Overcurrent	Motor overcurrent	1 False connecting wire of motor
			2 Controller faulted
	Motor Output Fault	Abnormal controller output	1 False connecting wire of motor
			2 Controller faulted
1, 4	Static Return To Off	SRO sequence fault	1 KSI,INTERLOCK,F/R switch sequence error
			2 SRO type error
			3 Direction switch fault
			4 Sequence delay time too short
2, 1	Throttle Wiper High	Accelerator voltage too high	1 Accelerator damaged
			2 False accelerator type
2 2			1 EMR connecting wire or connecting wire check is
2, 2	EMR Wiring Open	EMR connecting wire fault	disconnected
n n	Lligh Dodal Disable		1 Incorrect operation sequence of accelerator and
2, 3	Fight Peual Disable	חצט	KSI,INTERLOCK
			2 False HPD type
			3 Accelerator fault
			4 Key switch, INTERLOCK power off
			5 Sequence delay time too short
			6 False accelerator type
2, 4	Throttle Wiper Low	Accelerator voltage too low	1 Accelerator damaged
			2 False accelerator type
3, 1	Multiplexer Fault	Multiplexer fault	Multiplexer fault
3, 2	Main Contactor	Contactor missing or welded	1 Contactor coil open circuit
			2 Contacts cannot close
			3 Contactor welded
			4 Contactor coil driver short circuit
	Pre charge	Pre charge fault	1 Controller damaged
			2 Battery voltage too low
3, 3	Brake Fault	Electromagnetic brake fault	1 Brake coil short and open circuit
			2 Electromagnetic brake driver fault

4, 1	Service Total Disable	Total KSI time up (stop running)	Total KSI time up
	Service Driver Disable	Total driving time up (stop running)	Total driving time up (stop running)
	Service Total Expired	Set (KSI) service time up	Set (KSI) service time up
	Service Driver Expired	Set (driving) service time up	Set (driving) service time up
4, 2	Battery Over voltage	Battery overvoltage	Battery overvoltage
	Battery Under voltage	Battery under voltage	1 Battery under voltage
			2 Loose battery terminal
			3 Battery damaged
4, 3	Temperature Cutback	Over temp or under temp	1 Controller power too small
			2 Truck overloaded for extended period
			3 Bad dissipating condition
4, 4	Anti Tie down	Mode switch already closec when truck starts	l 1 Mode switch welded
			2 Switch in M2 position
5, 1	Hardware Failure	Hardware self check failure	Controller damaged
5, 2	Software Failure	Software self check failure	Controller damaged
5, 3	Parameters Corrupt	Parameter storage error	Controller damaged

Diagnosis of 1207A Controller and LED Fault Table

1,	2	HWFALLSAFE	Hardware auto-protection	1. Controller damaged
4	2			1 NA such as the sub-state state state of the sub-state state sta
1,	3	M-FAUL I	M-output short circuit	1. M- output snort circuit to ground
				2. Direction contactor not close
				3. Direction contactor closes slowly
				4. Short circuit of inner motor to ground
1,	4	SRO	SRO function fault	1. False sequence of KSI input, brake input and
				direction input
				2. SRO function selection error
				3. Brake or direction switch open circuit
				4. Sequence delay time too short
2,	1.	THROTTLE FAULT1	5000 ohm $-$ 0 or sliding arm	1. Speed governor input wire open circuit
			fault	2. Governor input wire short circuited to B+ or
				ground
				3. Speed governor damaged
				4. Speed governor type selection error
2,	2	BB WIRING CHECK	Connecting wire fault of	1. Key open circuit
			emergency reverse	2. Key check wire open circuit
2,	3	HP0	HPD function time sequence	1. False input time sequence of KSI input, brake
			error	input and governor input
				2. False selection of HP0 function type
				3. False adjustment of governor potentiometer
2,	4	THROTTLE FAULT2	Low leg wire disconnected	1. Low leg wire open circuit
			or short circuited	2. Low leg wire short circuit
				3. False selection of governor type
3,	1	CON70RVROC	Driver output overcurrent	1. Direction contactor coil short circuit
				2, Shunt excitation short circuited

14. List of Accessories, Spare Parts and Wearing Parts

	······································					
No.	Name	Use position Specification		Q'ty	Remarks	
1	Кеу	Open lock		2		
2	Fuse	Electric part	10A	2		
3	Fuse	Electric part	100A	1	Standard configuration	
4	Fuse	Electric part	180A	1		
5	Seal ring	Oil cylinder	UHS27	2		
6	O-seal ring	Oil cylinder	45X2.65	2		
7	O-seal ring	Oil cylinder	14X2.65	1		
8	Combination ring	Oil cylinder inlet	D16	2		
9	Dust ring	Oil cylinder	DH27	2		

14.1 List of Spare Parts, Accessories and Wearing Parts

15. Structural Drawings (Exploded Drawings) and Schematic Drawings of Main Parts

Refer to attached figure 1 for hydraulic schematic drawing Refer to Electric Operation Manual for electrical part Refer to attached drawing 2 for exploded drawings

16. Packing List

Packing List of 12ESH Electric Stacker

Consignee:		Manufacture NO.:				
Cont	ract NO.:		Manufacti	ure date:		
NO	Cargo name	Q'tv	Net weight	Outline dimension	Remarks	
NO.	NO. Cargo hame		(kg)	$(I \times w \times h)$	Remains	
1	12ESH electric stacker	1			Whole truck	
					Technical documents,	
2	Accessory bag	1			accessories and spare	
					parts included	

Note: 1. The following files are included in the technical document bag:

① Operation Manual of 12ESH stacker

2 Packing List

③ Certificate of quality

1 volume

1 сору

1 copy

2. Accessories and Spare Parts

No.	Name	Use position	Specification	Q'ty	Remarks
1	Key	Open lock		2	
2	Fuse	Electric part	10A	2	
3	Fuse	Electric part	100A	1	
4	Fuse	Electric part	180A	1	
5	Seal ring	Oil cylinder	UHS27	2	
6	O-seal ring	Oil cylinder	45X2.65	2	
7	O-seal ring	Oil cylinder	14X2.65	2	
8	Combination ring	Oil cylinder inlet	D16	2	
9	Dust ring	Oil cylinder	DH27	2	



Hydraulic Principle Diagram



1230 Electric Pallet Stacker





CURTIS 1230E CONTROLLER (Serial No. : #20128138~)

Appendix

ISO3691 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 can't 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, 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 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 painted the color differing from the surrounding circumstance.

The driving type high –lift truck should be mounted with protection cabane, 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 ventilative, 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 steeve.

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 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.

14.1.4.7 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 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 fire fighting passage, the upstairs passage and the fire fighting 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 vehicle 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 can not 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 or 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 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 toinfluence 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, extends 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's 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 tyre 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 tilt 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 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 over all 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), 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 fire fighting passage, access stairs and fire fighting 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 lose 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'smanual 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 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 be 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.

Record card for repair and maintenance

Item	Position	Material used	Personnel	Remarks	Item

Customer feedback

Item	Time	Fault position	Cause	Troubleshooting	Remarks