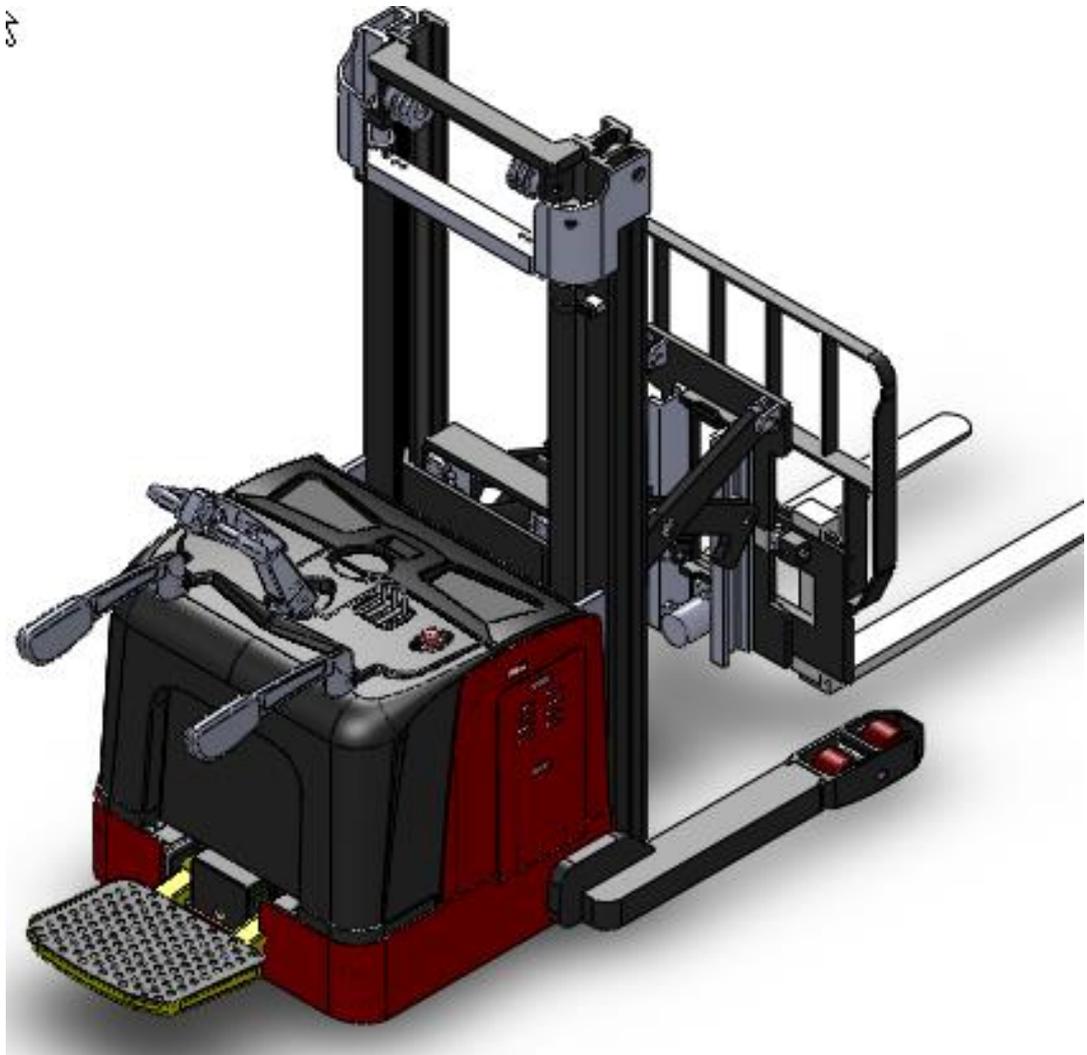


## 15/20ERSP

- Operation Manual
- Service Manual



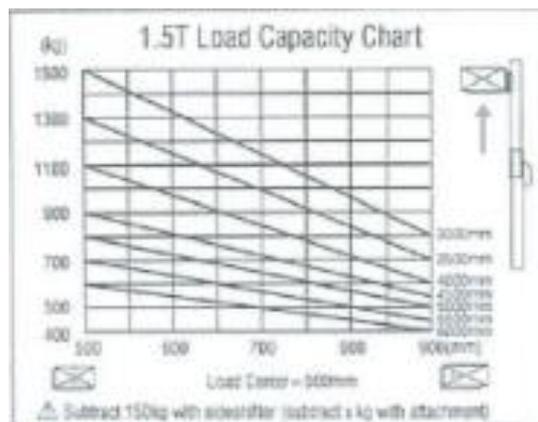
**Welcome to choose “HYUNDAI” Fork Reach Electric Stacker. We hope our fork reach electric stacker will bring great convenience to your work.**

- Please read the manual carefully before operation.
- This manual is a common manual. We reserve the right to modify technology of the reach electric stacker. If there is anything in the manual that is not consistent with the actual truck, the actual truck should be considered correct and the manual is only for reference.

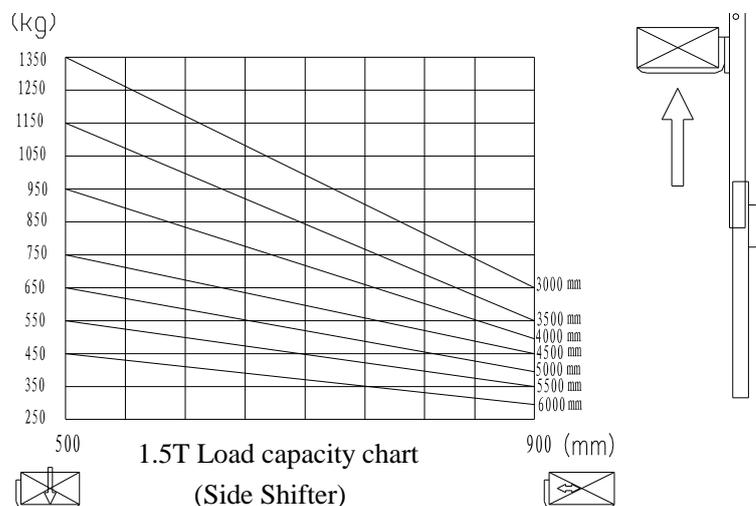
## Warning!

According to ISO 3691 “Safety Norm of Motor Industrial Vehicles”, Load and lifting height of our ERSP fork reach electric stacker are stipulated as follows:

- When the lifting height of ERSP stacker is below 3000mm (including 3000mm), the maximum bearing capacity is the rated bearing capacity. Overload is prohibited.
- When the lifting height of ERSP stacker is above 3000mm (excluding 3000mm), the bearing capacity is less than the rated bearing capacity. And you can take height curve as a reference.
- When the center of gravity is not in accordance with standards, you can take load center curve as a reference.



1.5T Load Capacity chart  
(STD)



1.5T Load capacity chart  
(Side Shifter)

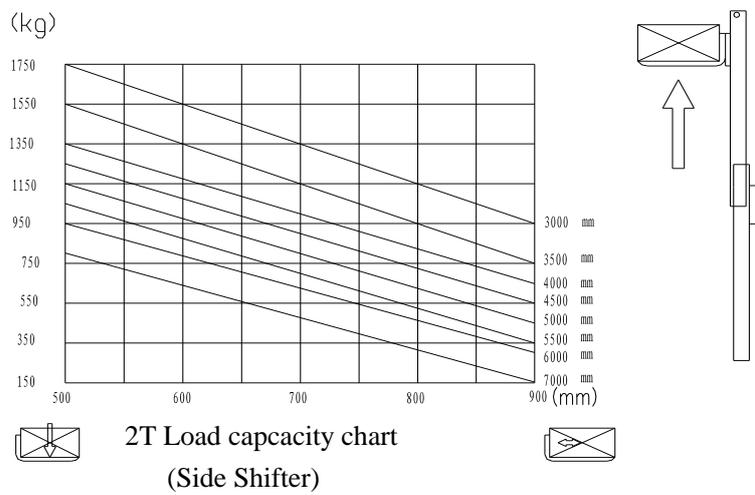
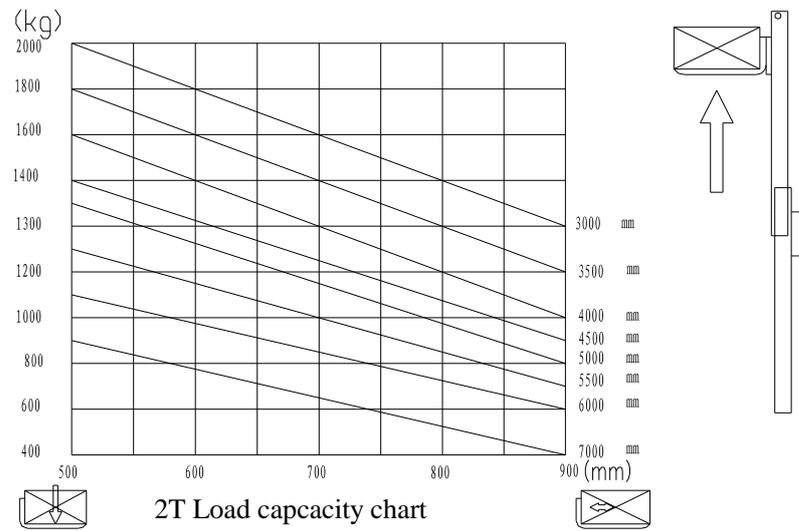


Fig. 1

**Note:**

When the lifting height of the forks exceeds 500mm, the stacker must travel at the lowest speed and the continual travel distance must not exceed 2m. Inconformity with the regulation may result in:

- a. Injury of the driver or other people
- b. Damage of the stacker and goods

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Feature	1.2	Model		15ERSP					
	1.3	Driving mode		Electric					
	1.4	Driving mode		Standing(EPS)					
	1.5	Rated load	Q(kg)	1500					
	1.6	Load center distance	c(mm)	500					
	1.8	Front overhang	x(mm)	287		315			
	1.9	Tread	Y(mm)	1319		1354			
Weight	2.1	Service weight(with storage battery)	kg	2300	2350	2500	2550	2600	
Chassis	3.1	Wheels (rubber, high elasticity, pneumatic tyre, polyurethane wheel)		polyurethane					
	3.2	Front wheel dimension	mm	250x80					
	3.3	Rear wheel dimension	mm	125x82X2					
	3.5	Wheel number, front/rear (x=driving wheel)		1x+2/4					
	3.6	Additional wheel		150×62 X2					
	3.7	Tread, front	b <sub>10</sub> (mm)	715					
	3.8	Tread, rear	b <sub>11</sub> (mm)	1074/1154					
Dimension	4.1	Tilt of mast/fork carriage forward/backward	Grad	2/5					
	4.2	Height, mast lowered	h <sub>1</sub> (mm)	2119	2369	2619	2179	2341	2499
	4.3	Free lift height	h <sub>2</sub> (mm)				1776	1776	2010
	4.4	Lift height	h <sub>3</sub> (mm)	3000	3500	4000	4500	5000	5500
	4.5	Height, mast extended	h <sub>4</sub> (mm)	3881	4381	4881	5381	5881	6381
	4.2	Overall length	l <sub>1</sub> (mm)	2384		2404			
	4.20	Length to fork face	l <sub>2</sub> (mm)	1289		1314			
	4.21	Overall width of truck body	b <sub>2</sub> /b <sub>1</sub> (mm)	1220 /950					1300/950
	4.2	Fork dimension	s/e/l(mm)	35 x 100 x 1070					
	4.3	Reach distance	l <sub>4</sub> (mm)	500					
	4.3	Wheelbase ground distance	m <sub>2</sub> (mm)	50					
	4.3	Aisle width for pallets 1000x1200 crossways	A <sub>s1</sub> (mm)	2742		2767			
	4.3	Aisle width for pallets 800x1200 lengthways	A <sub>s2</sub> (mm)	2806		2830			
	4.4	Turning radius	W <sub>2</sub> (mm)	1613		1647			
	Performance Data	5.1	Travel speed, laden/unladen	Km/h	4.8/5		4.8/5		
5.2		Lift speed, laden/unladen	m/s	0.095/0.12					
5.3		Loweringspeedladen/unladen	m/s	0.2/0.15					
5.8		Max.gradeability,laden/unladen	%	5/12					
5.10		Traveling brake		Electromagnetic brake					
Motor	6.1	Drive motor power	kW	2.2 AC					
	6.2	Lift motor power	Kw/V	24					
	6.4	Batteryvoltage/nominal capacity	V/Ah	24/320					
	6.5	Battery weight	kg	325					
		Battery dimension (L X W X H)	mm	812x324x535					
	8.4	Noise level at operator's ear, according to DIN12053	dB(A)	75					

Feature	1.2	Model		20ERSP					
	1.3	Driving mode		Electric					
	1.4	Driving mode		Standing(EPS)					
	1.5	Rated load	Q(kg)	2000					
	1.6	Load center distance	c(mm)	500					
	1.8	Front overhang	x(mm)	265		262			
	1.9	Tread	Y(mm)	1462		1481			
Weight	2.1	Service weight(with storage battery)	kg	2500	2550	2700	2750	2800	
Chassis	3.1	Wheels (rubber, high elasticity, pneumatic tyre, polyurethane wheel)		polyurethane					
	3.2	Front wheel dimension	mm	250x80					
	3.3	Rear wheel dimension	mm	125x82X2					
	3.5	Wheel number, front/rear (x=driving wheel)		1x+2/4					
	3.6	Additional wheel		150×62×2					
	3.7	Tread, front	b <sub>10</sub> (mm)	710					
	3.8	Tread, rear	b <sub>11</sub> (mm)	1120					
Dimension	4.1	Tilt of mast/fork carriage forward/backward	Grad	2/5					
	4.2	Height, mast lowered	h <sub>1</sub> (mm)	2125	2375	2625	2185	2345	2505
	4.3	Free lift height	h <sub>2</sub> (mm)				1776	1776	2010
	4.4	Lift height	h <sub>3</sub> (mm)	3000	3500	4000	4500	5000	5500
	4.5	Height, mast extended	h <sub>4</sub> (mm)	3897	4397	4897	5397	5897	6397
	4.2	Overall length	l <sub>1</sub> (mm)	2570			2594		
	4.20	Length to fork face	l <sub>2</sub> (mm)	1480			1504		
	4.21	Overall width of truck body	b <sub>11</sub> b <sub>2</sub> (mm)	1220/950					1300/950
	4.2	Fork dimension	s/e/l(mm)	40 x 100 x 1070					
	4.3	Reach distance	l <sub>4</sub> (mm)	500					
	4.3	Wheelbase ground distance	m <sub>2</sub> (mm)	50					
	4.3	Aisle width for pallets 1000x1200 crossways	A <sub>s</sub> (mm)	2928			2950		
	4.3	Aisle width for pallets 800x1200 lengthways	A <sub>s</sub> (mm)	2996			3019		
	4.4	Turning radius	W <sub>6</sub> (mm)	1779			1799		
	Performance Data	5.1	Travel speed, laden/unladen	Km/h	4.8/5			4.8/5	
5.2		Lift speed, laden/unladen	m/s	0.095/0.12					
5.3		Loweringspeedladen/unladen	m/s	0.2/0.15					
5.8		Max.gradeability,laden/unladen	%	5/12					
5.10		Traveling brake		Electromagnetic brake					
Motor	6.1	Drive motor power	kW	2.2 AC					
	6.2	Lift motor power	Kw/V	4.5/24					
	6.4	Batteryvoltage/nominal capacity	V/Ah	24/490					
	6.5	Battery weight	kg	490					
		Battery dimension (LXWXH)	mm	774x332x580					
	8.4	Noise level at operator's ear, according to DIN12053	dB(A)	75					

### 3. Application

ERSP reach electric stacker adopts storage batteries as the dynamic source and AC motor as the driving force, traveling through gear transmission. The lifting and forward/backward movement of the fork relies on the DC motor and the hydraulic transmission system. The up-and-down movement of the cylinders lifts the fork and the goods. As the traveling and lifting of the truck are electrically driven, it possesses the characteristics of energy saving, high efficiency, stable operation, easy operation, safety and reliability, low noise and no pollution, etc.

The most important character of fork reach forklift is that not only can it lift-descend and handle goods, but also it can move the goods forward and backward with the movement of forks. In this way it overcomes the inconvenience of "straddle leg". Meanwhile, it is more suitable to operate this stacker in narrow aisle, as it possesses the feature of smaller volume and more flexible operation comparing the same type of balance weight forklift.

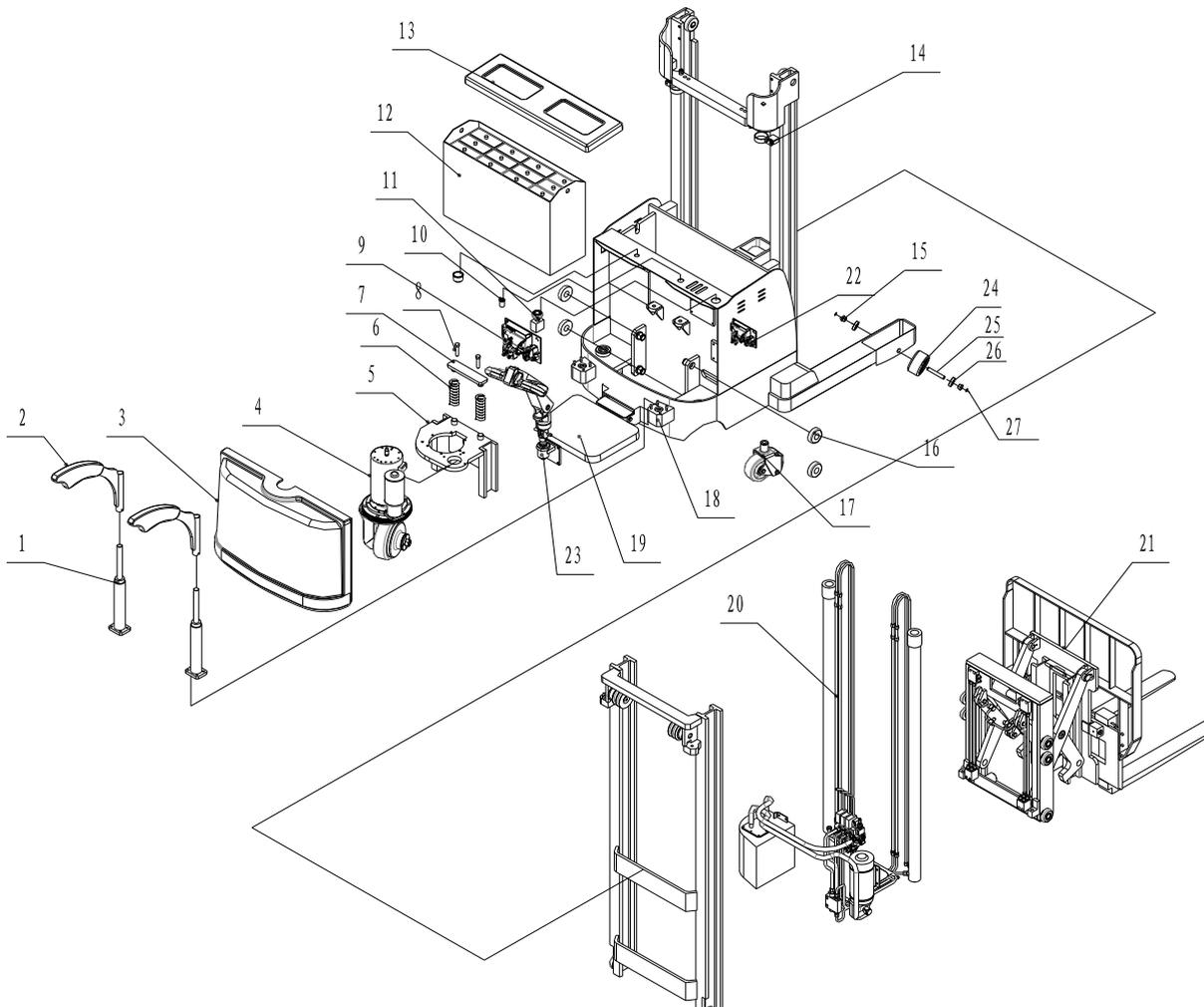
The fork reach electric stacker is applicable for goods piling and handling operation on hard and flat ground.

Allowed environment for using:

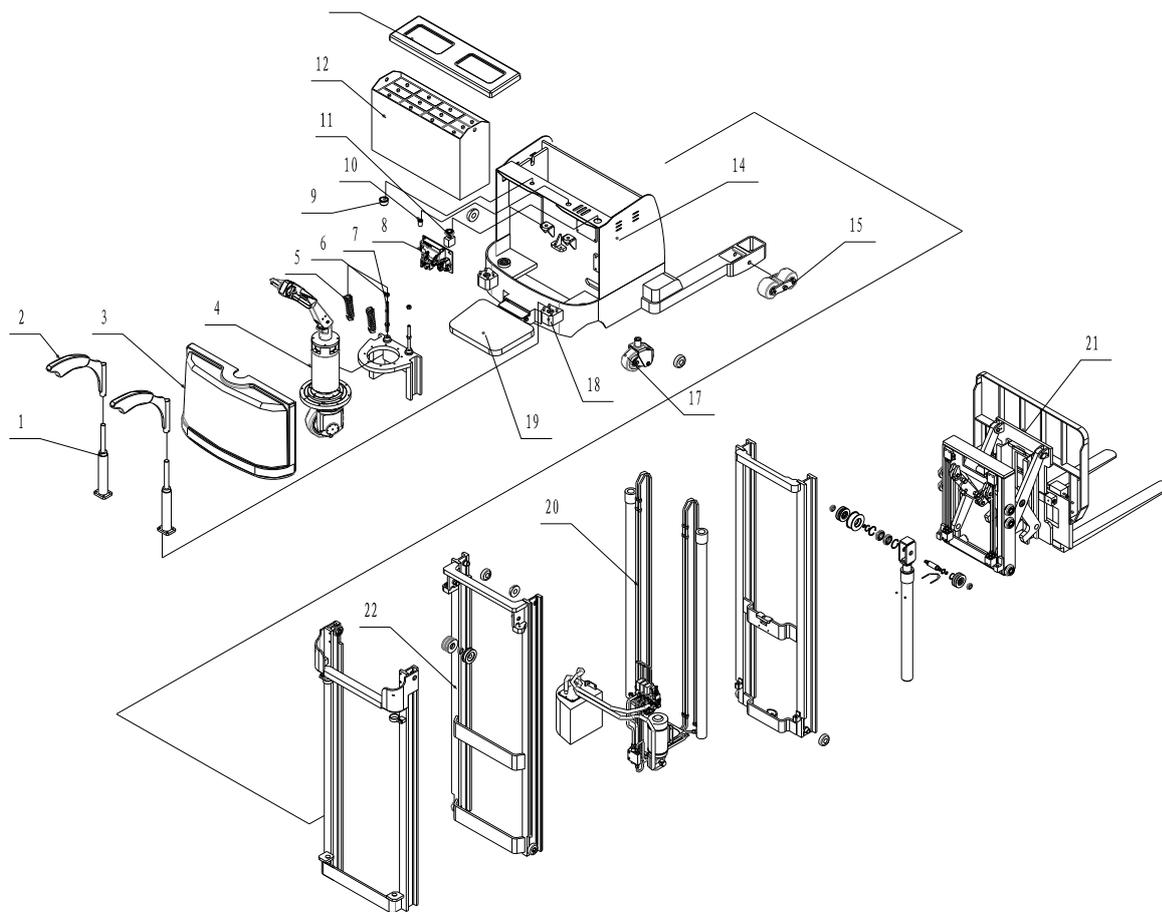
- a. Height above sea level shall not be over 1200m;
- b. Ambient temperature shall not be higher than +40°C and lower than -25°C;
- c. When the ambient temperature reaches +40°C, the relative humidity shall not exceed 50%; at a lower temperature, higher relative humidity is allowed;
- d. Hard and flat ground
- e. It is prohibited to use the stacker in a flammable, explosive or corrosive environment with acid and alkali.

### 4. Brief introduction of Structure

#### 4.1 Structure chart of EPS



## 4.2: Structure chart of EPS



(See also the structure diagram and the principle diagram of the major parts)

The stacker mainly consists of frame, mast, fork carriage, fork, lifting oil cylinder, forward movement oil cylinder, inclination oil cylinder, operating handle, steering device, drive wheel, storage battery pack, hydraulic power unit, control system for electrical equipment, etc.

As for detailed structure, please refer to explosion view of different parts.

## 5. Use and operation instructions

The ERSP fork reach electric stacker adopts storage batteries as the power supply for short distance goods handling and stacking. Correct use and operation will bring you great convenience in your work but incorrect use and operation will damage the stacker and pose risk to your safety and goods.

### 5.1 Before operation

5.1.1 Before operation, please check if the truck is in normal condition: Is there any oil leakage in the hydraulic pipes? Are the supporting wheels able to operate normally? Is there any block? Faulty stackers are strictly prohibited.

5.1.2 Check if there is any electric power in the batteries with the method indicated in Fig. I. Pull the general power supply switch out to turn on the general power supply, unlock the electric lock on the handle, and check the electric energy meter on the instrument panel of the truck. If one grid at the zero end is bright, it indicates that there is no electric power in the batteries and charging should be conducted at once. It is prohibited to operate the stacker without electricity as that will greatly reduce the service life of the batteries and even damage the batteries.

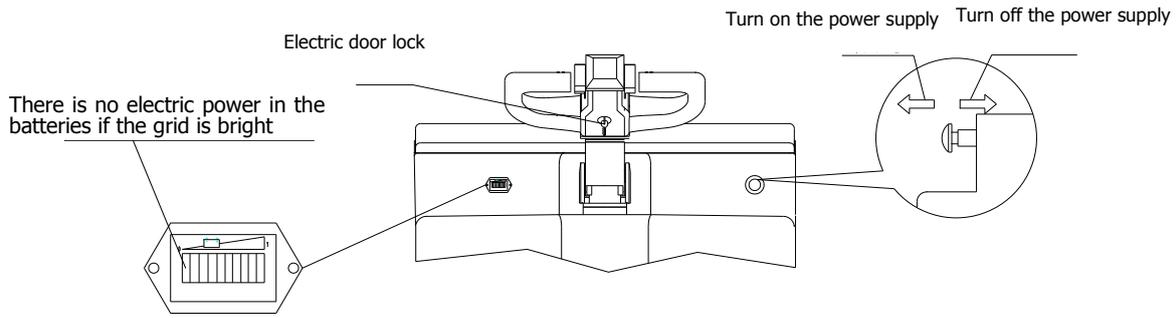


Fig. I

5.1.3 Check if the stacker brake is normal. Check the lifting, lowering, forward and backward extension of fork, and forward and backward traveling of the truck to see if the actions are normal. Check if the emergency reverse action of the stacker is normal with the method indicated in Fig. II:

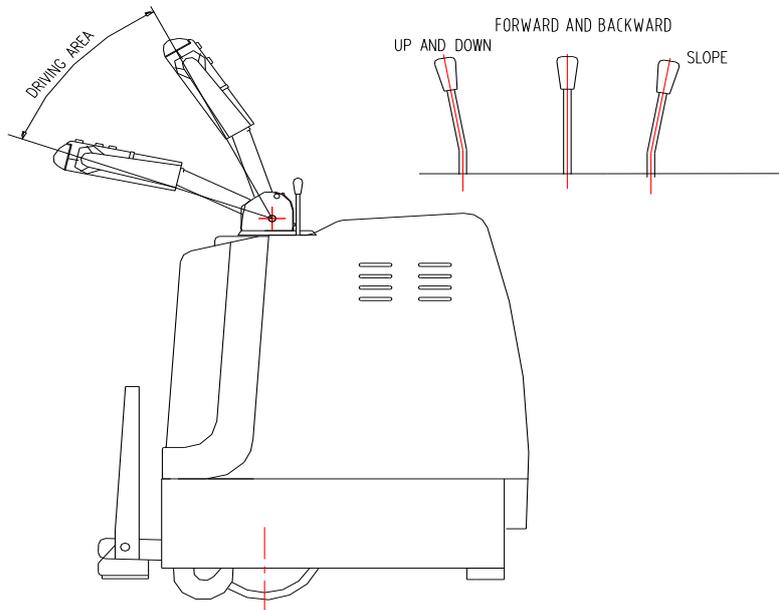


Fig II

Operating handle is located as indicated in Fig II. Move the steering switch on the accelerator of the operating handle to see if the stacker can travel forward and backward. Operate the handle of multi-way valve to see if the lifting, lowering and forward/backward movement of fork is normal.

After the above check, if there is no failure in the stacker, it can be put into use; if there is some failure, please repair at once. It is prohibited to use faulty trucks.

## 5.2 In operation

5.2.1 Note: A side-magnetic brake is installed on the shaft end of the driving wheel motor and there is a cam and an inching switch installed on the rotary shaft of the operating rotary arm. Only when the rotary arm is at  $30^\circ \pm 20^\circ$  (as indicated in Fig. II), can the truck get power and operate. Larger or less than the angle, the truck has no power and is braked. In that case, the truck can lift, lower and move the goods forward and backward. When lifting, lowering and moving the goods, the truck cannot travel as indicated in Fig. II.

5.2.2 Operation of handling and stacking

As indicated in Fig. I, pull out the general power supply switch, unlock the electric door lock, and drive the stacker to goods pile nearby (the tip of the fork is 30cm from the goods pile). Turn lifting-lowering handle of multi-way valve so as to adjust the height of the fork to a proper position; turn fork reach handle to insert the fork slowly and as deep as possible into the goods pallet. Turn the lifting-lowering handle of multi-way valve to lift the fork until it is 20-30cm from the ground. Turn extension handle of multi-way valve to return the fork. Drive the truck to the location of the goods shelf and slowly stop until the tip of the fork (or the front end of goods) is 20cm from the goods shelf. Turn lifting-lowering handle until the fork rises to a proper height of the shelf (The bottom of the pallet is about 10cm higher than the shelf). Move the goods slowly to the accurate position of the shelf and turn fork reach handle to

move the fork forward slowly to a proper position. Turn lowering handle of multi-way valve to put the goods carefully on the shelf. Turn extension handle of multi-way valve to return the fork inside the truck to lower the fork until it is about 30mm from the ground to drive the stacker away from the goods shelf. During operation, please pay attention to obstacles around and slow down when turning around.

#### 5.2.3 Operation of taking goods down from shelves

As indicated in Fig. I, pull out the general power supply switch, unlock the electric door lock, drive the truck to the goods shelf nearby (the tip of the fork is 30cm from the goods shelf). Turn lifting-lowering handle of multi-way valve so as to adjust the height of the fork to a proper position. Turn extension handle of multi-way valve to insert the fork slowly and as deep as possible into the goods pallet. Turn lifting-lowering handle of multi-way valve to lift the goods (the bottom of pallet is 10mm from the goods shelf). Turn extension handle of multi-way valve to move the goods slowly from goods shelf. Turn lifting-lowering handle of multi-way valve to lower the fork until it is 20mm to 30mm from the ground. Drive the stacker away from the goods shelf until it reaches a desired position and then slowly stop it. Turn the extension handle of multi-way valve to reach the goods wholly outside the fork leg. Turn the lifting-lowering handle of multi-way valve to make the fork completely away from the goods. Turn extension handle of multi-way valve and move the fork slowly out of the goods pallet.

### 5.3 Abnormal situation handling in operation

- 5.3.1 When the handle of multi-way valve returns to the middle position from some working position, if it is still during operation, press down the general power supply switch to cut off the power supply at once. Meanwhile move the stacker to a safe place and lower the goods manually so as to repair the stacker.
- 5.3.2 If the brake is out of function when the stacker is in operation, the operation must be stopped at once and repair the truck.
- 5.3.3 When the truck is moving backward and pushing the operator against a wall or other objects, press the emergency reverse button on top of the control handle and the stacker will automatically move forward to avoid injuring the operator.

### 5.4 After operation

After operation, the stacker should be parked in a fixed parking position and routine maintenance should be conducted according to the stipulations in clause 6 and charging should be carried out.

## 6. Maintenance

**Note: It is prohibited for untrained personnel to maintain the truck.**

- 6.1 Whether the truck can operate satisfyingly depends on the efficient maintenance. When maintenance is ignored, the truck may pose a threat to human lives and cause property damage. Routine inspection should be conducted, when the truck is in operation, to eliminate abnormal conditions in time. Never use a faulty truck to ensure safety and to prolong the service life of the stacker.
- 6.2 Maintenance: The maintenance of the truck is divided into three levels, i.e. routine maintenance, level I maintenance and level II maintenance.

**Routine maintenance:** Daily maintenance is to clean the surface of the stacker body and the surface of the storage battery and to examine the firmness of the power supply line and whether the elasticity of the chain is normal.

**Level I maintenance:** Level I maintenance should be performed once every week. Besides what should be done in daily maintenance, the operation situation of all the parts should be carefully inspected to see whether the operation is normal; whether there is any loose of the fasteners; whether the elasticity of the chain is appropriate; whether the connecting pin of the chain connection is bending or twisting; whether the up and down movement of the internal and external door frames is normal; is there any oil leakage at the hydraulic connection; is there any abnormal wearing and tearing in the mechanical parts; is there any abnormal temperature rise or sparks in the electric part, etc. If there is any abnormal situation, adjustment or trouble-shooting should be conducted promptly.

**Level II maintenance:** Level II maintenance should be carried out as planned. Overall inspection should be performed for the truck according to the following requirements.

**a. Maintenance for mechanical system:** Once half a year. The major content is to add lubricant to the transmission gears and bearings of the drive wheel and the rotary joints, examine the firmness of the fixing fittings, the flexibility of the wheels, as well as whether the forks can be lifted and lowered normally. The operation noise of

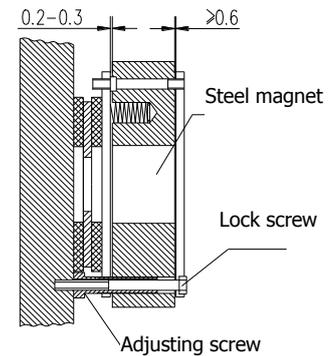
the truck shall not exceed 75 dB.

**b. Maintenance for hydraulic system:** Once every 12 months. Examine if the oil cylinder is normal, if there is any leakage externally or internally, if the hydraulic connection and the hose are reliable with no leakage. The hydraulic oil should be kept clean and generally it should be replaced every 12 months. ISO oil product standard is adopted for the hydraulic oil. When the ambient temperature is  $-5\sim 40^{\circ}\text{C}$ , HL-N46 or HL-N68 should be used; when the ambient temperature is  $-35\sim -5^{\circ}\text{C}$ , HV-N46 or HV-N68 should be used. The replaced waste oil should be treated according to the local rules and regulations.

**c. Maintenance for electric equipment:** Once every three months. First examine whether the specific gravity of the electrolytic solution of the storage battery [specific gravity at 1.24 (at  $25^{\circ}\text{C}$ ) in tropical areas and 1.26 (at  $25^{\circ}\text{C}$ ) in other areas] fits and the terminals are clean. Otherwise, the specific gravity of the electrolytic solution should be adjusted as required and the terminals should be cleaned and painted with Vaseline and tightened. Then examine if the connections of the electrical devices are reliable, the switches are normal and the insulation is ok (The insulating resistance between the electrical devices and the truck body should be above  $0.5\text{M}\Omega$ ).

### 6.3 Adjustment of brake clearance

After a period of use, braking performance of the brake will decline due to the wearing of the brake. Therefore, it is necessary to adjust the brake's clearance. As indicated in drawing on the right, check the clearance between brake plate and magnetic steel with feeler, if the clearance is bigger than 0.5mm, clearance should be adjusted. Before adjustment, loosen the tightening screws, adjust the length of the adjusting screws, and then screw down the tightening screw. After the adjustment, the clearance between brake plate and magnetic steel should be kept at 0.2-0.3mm. During the adjustment, please pay attention to the balance adjustment of three lock screws so as to ensure that clearance between brake plate and magnetic steel is distributed evenly around.



## 7. Common faults and trouble shooting

No.	Trouble	Cause	Shooting
1	The stacker cannot be started (The contactor does not work either.)	① The fuse of the control circuit is burnt out.	Replace
		② The power switch contact is bad or damaged.	Repair or replace
		③ The fuse of the major circuit is blown.	Replace
		④ The contact of the electric lock switch is bad or damaged.	Repair or replace
		⑤ The connection of the storage batteries is loose or has fallen off.	Tighten
	The stacker cannot be started (The contactor works.)	① The side-magnetic brake of the drive wheel does not suck and the stacker is in a braked condition.	Repair or replace
		② The walking motor carbon brush is worn or bad contact between the steering device and the carbon-brush.	Repair or replace
		③ The magnet-exciting coil of the stepper motor is broken or bad contact at the wire end.	Repair or replace
		④ Bad contact	Repair or replace
		⑤ There is a trouble at the MOSFET tube type circuit board.	Repair or replace
2	The stacker can only move forward (or backward)	① Bad or broken contact.	Repair or replace
		② There is a trouble in the circuit board.	Repair or replace
3	The stacker can not stop while traveling	Broken contact. The moving contact cannot be reset.	Cut off the power supply at once and replace the head of contactor.
4	The brake does not work	① The erection bolt of the inching switch looses or is damaged.	Adjust or tighten the bolt or replace the inching switch.

		② The connecting wire of the side-magnet brake is loose or damaged	Tighten the bolt or repair the side-magnet brake.
		③ The braking plates of the side-magnet brake are worn.	Replace the braking plates.
5	The steering is blocked.	① The bearing of the steering device is damaged.	Replace the bearing
		② The bearing of the steering device lacks lubricant or there is too much dust	Clean the bearing
6	Difficult steering of the drive wheel, noise and the motor is overloaded.	① The gear or bearing has is blocked because of foreign matters.	Clean or replace the bearing
		② There is a gap in the bearing installed or the fixing ring has come off.	The fixing ring has come off. Reinstall the ring and adjust the gap.
		③ The front wheel bearing is damaged.	Replace the bearing
7	The forks cannot be lifted	① Overload	Reduce the load
		② The pressure of the overflow valve is too low	Adjust the pressure higher
		③ Internal abnormal leakage in the lifting oil cylinder	Replace the seals
		④ Insufficient hydraulic oil	Add appropriate quantity of filtered hydraulic oil
		⑤ Insufficient voltage of the storage battery	Charge the battery
		⑥ The control handle is not horizontal or vertical, the motor of oil pump has not been turned on.	Improper operation
		⑦ Damaged oil pump motor	Repair or replace
		⑧ Damaged oil pump	Repair or replace
		⑨ Damaged lifting button	Repair or replace
		⑩ The electric lock is not unlocked or is damaged.	Repair or replace
		⑪ Seriously insufficient voltage in the cell.	Recharge
8	The forks cannot be lowered	① The internal doorframe is overloaded and deformed	Repair or replace
		② The external doorframe is overloaded and deformed	Repair or replace
		③ Frame roller is blocked.	Repair or adjust
		④ Frame guiding rode is curved	Repair or straighten
		⑤ The oil return hole is blocked	Clean
		⑥ The electromagnetic valve of hydraulic station is out of control	Shoot the trouble
9	Voltage at the storage battery reduces. (after charging)	① Damage of individual battery	Repair or replace
		② Low level of the electrolytic solution	Add electrolytic solution
		③ Foreign matters in the electrolytic solution	Replace electrolytic solution

## 8. Use, maintenance and charge of the storage batteries

### 8.1 Initial charge

**Note: The charging environment requires good ventilation and there should be no open flame, otherwise explosion may occur.**

- 8.1.1 Initial charge should be conducted for batteries that have never been used. Before the initial charge, the surface of the batteries should be cleaned and the batteries should be examined for damage. The bolts should be tightened to ensure reliable connection.
- 8.1.2 Pull out the sealing cover and replace it with the open cover type liquid hole plug and open the cover.
- 8.1.3 When the charging equipment is able to operate normally, pour the sulfuric acid electrolytic solution with a density of  $1.260 \pm 0.005$  ( $25^{\circ}\text{C}$ ) and a temperature of lower than  $30^{\circ}\text{C}$  into the batteries. The liquid surface should be 15-25mm higher than the protective board. In order to reduce the temperature rise caused by chemical reaction of the electrolytic solution and let the electrolytic solution fully penetrate into the pores of the polar plates and the baffles, the batteries should be placed still for 3-4 hours but not exceeding 8 hours. The initial charging can only be conducted when the temperature of the solution reduces to below  $35^{\circ}\text{C}$ . (When necessary, the batteries can be put into cold water for temperature reduction). After the still placement, if the surface of the solution reduces, electrolytic solution should be added.
- 8.1.4 The sulfuric acid electrolytic solution is prepared with battery sulfuric acid complying with the state standard GB4554-84 and distilled water. Never use industrial sulfuric acid and running water. The standard temperature and density of the electrolytic solution can be converted as follows:  
 $D_{25} = D_t + 0.0007(t - 25)$   
Where:  $D_{25}$ : the density of the electrolytic solution at  $25^{\circ}\text{C}$   
 $D_t$ : the actual density of the electrolytic solution at a temperature of  $t^{\circ}\text{C}$ .  
 $t$ : temperature of the electrolytic solution when testing the density.
- 8.1.5 Sweep the electrolytic solution on the surface of the batteries and connect the positive and the negative poles of the battery pack respectively with the positive and the negative ends of the DC power supply (charger). Turn on the power supply. First charge with 18A (the first stage current,); when the voltage reaches 28.8V ( $12 \times 2.4\text{V} = 28.8\text{V}$ ), change to the second stage current 9A and continue to charge. The temperature of electrolytic solution during the process of charging must not exceed  $45^{\circ}\text{C}$  and when it is close to  $45^{\circ}\text{C}$ , the charging current should be reduced by 50% or the charging should stop temporarily. Wait till the temperature drops to  $35^{\circ}\text{C}$  to continue the charging. The charging time, however, should be properly prolonged.
- 8.1.6 Fully charged basis: When the voltage during the second stage charging reaches 31.2V ( $12 \times 2.6\text{V} = 31.2\text{V}$ ), the variation of the voltage is no greater than 0.005 (V); the density of the electrolytic solution reaches  $1.280 \pm 0.005$  ( $25^{\circ}\text{C}$ ), no obvious variation in 2 hours and there are fine air bubbles appear violently, it can be deemed that the batteries are fully charged. The charged power capacity is 4-5 times of the rated capacity and the charging time is about 70 hours.
- 8.1.7 In order to accurately control the sulfuric acid content of the electrolytic solution, the electrolytic solution density of the batteries should be examined during the last period of charging. If there is inconsistency, adjust with distilled water or sulfuric acid with a density of 1.40. The electrolytic solution density and the liquid surface should be adjusted to the stipulated value within two hours in the charging state.
- 8.1.8 After the initial charging is completed, the surface of the batteries should be cleaned. Close the cover of the open cover type liquid hole plug and then the batteries can be used.

### 8.2 Use and maintenance

- 8.2.1 In order to guarantee the service life of the batteries, the batteries in use should be fully charged. Insufficiently charged batteries must not be used. During the process of use, close attention should be paid to the discharge extent. Over discharge is prohibited---the voltage reduces to 1.7V per battery (when the total voltage reduces to  $1.7\text{V} \times 12 = 20.4\text{V}$ ). When the density of the electrolytic solution reduces to 1.17, discharging should be stopped and charging should be conducted at once. The batteries should not be placed idle for a long period of time. The supplementary charging frequently conducted during the process of use is called common charge.
- 8.2.2 Common charge: The first stage current of common charge is 26A and that of the second stage is 13A. The charging method is the same as that of initial charge. The charged volume is 130-140 % of the discharged volume and the

charging time is about 15 hours.

- 8.2.3 The batteries in normal use should avoid over-charge, but over-charge must be properly conducted for the batteries in the following situation, i.e. equalizing charge.
- The "lag-behind" batteries--- batteries with a voltage lower than that of the other batteries in the charging and discharging process and the batteries having been repaired for failure. (When equalizing charge is conducted, the positive and negative poles of the "lag-behind" battery should be respectively connected with the positive and negative ends of the charger, the DC power supply, and the charge should be conducted independently.).
  - Equalizing charge should be conducted for the batteries in normal use every 2-3 months.
  - Equalizing charge should be conducted for the batteries that have not been used for a long period of time before use.
- 8.2.4 Equalizing charge
- Charge with a 4A current.
  - When the charge voltage reaches 31.2V ( $12 \times 2.6V = 31.2V$ ) and air bubbles occur in the electrolytic solution, the current should be reduced by 50% (2A) and continue to charge.
  - When the batteries are fully charged, stop charging for 0.5 hour and charge again with a 1A current for one more hour.
  - Stop charging for another 0.5 hour and charge with a 1A current for another one hour.
  - Repeat according to item d till air bubbles occur violently in the batteries once the charger is switched on.

### 8.3 Storage

- 8.3.1 Batteries should be stored in a clean, dry and well ventilated warehouse with a temperature of 5-40°C. The valid shelf life is 2 years. The batteries should be kept according to the following requirements during storage:
- No direct sunlight on the batteries and at least 2m away from heat source.
  - Avoid contacting with any harmful substances. No metallic matters are allowed to drop into the batteries.
  - The batteries should not be placed upside down and should not be hit mechanically or heavily pressed.
  - The batteries must not be stored with electrolytic solution. When it is required in special situation that the batteries must be stored with electrolytic solution, the batteries should be fully charged and the density and the liquid surface of the batteries should be adjusted to the stipulated values. When the storage period comes to one month, the batteries should be complementarily charged with the common charge method.

## 9. List of accessories, spare parts and vulnerable parts

No.	Name	Use position	Type & specification	Quantity	Remarks
1	Key to the electric lock	Unlock the electric lock		2	
2	Charging plug and socket	Matched with the charger		1 set	
3	Fuse	Electric equipment	10A	1	
4	Fuse	Electric equipment	160A	1	
5	Sealing ring	Lifting oil cylinder	UHS38	1	
6	Sealing ring	Tilting oil cylinder	UHS30	1	
7	Sealing ring	Tilting oil cylinder	UHS63	1	
8	Sealing ring	Reach oil cylinder	UHS28	1	
9	Sealing ring	Reach oil cylinder	UHS40	1	

## 10. Package & transportation

The stacker is packed with a tray. During transportation, turnover and upside-down are not allowed. Collision is not allowed when lifting and loading onto the truck. Do not damage the outward surface of the stacker when opening the package.

## 11. Warning (points for attention)

- 11.1 Read the manual carefully before operation so as to know the performances of the stacker.
- 11.2 It is forbidden to press and frequently switch the lifting or lowering, otherwise it might damage the stacker and the goods.
- 11.3 Do not shake the handle rapidly or with high frequency.
- 11.4 It is not allowed to rapidly put heavy goods onto the forks.
- 11.5 The stacker should not be overloaded. When overloaded, the stacker will not be able to operate normally.
- 11.6 The center of gravity of the goods should be placed between the two forks, otherwise, the forks will be damaged and the goods will fall down in the process of operation.
- 11.7 Loose and unstable goods are not allowed to load onto the truck.
- 11.8 Do not put the goods on the forks for a long period of time.
- 11.9 Turning rapidly on narrow road is forbidden. In order to ensure the safety of the people and goods, the truck should turn slowly in this situation.
- 11.10 When the truck is not in use, the forks should be lowered to the lowest position.
- 11.11 Never put any part of human body under heavy goods and forks.
- 11.12 The truck is applicable for use on plane ground and should never be parked on slope for a long period of time.
- 11.13 Over-load or over-slope operation is forbidden. Otherwise the wheel will slip, damaging the wheel and the motor. The safety of people and goods will be affected as well.
- 11.14 It is forbidden to repair the stacker without training.
- 11.15 Operation of the stacker under the stipulated voltage 20.4V is forbidden.
- 11.16 It is forbidden to directly connect the plug with AC power supply for charge.
- 11.17 When lifting height of forks exceeds 500mm, the truck must travel at the minimum speed and the continual traveling distance must not exceed 2m.

## 12. Structure diagram (explosion diagram) and principle diagram of the major parts

- See Electric Instructions for "Instruction of the electric system"
- See attached diagrams for "The explosion diagram"

# 13. Packing list

## Packing List of ERSP Fork Reach Electric Stacker

Consignee:

Ex-work No.:

Contract No.:

Ex-work date:

No.	Name	Quantity	Net weight	Dimension (L×W×H)	Remarks
1	ERSP Fork Reach Electric Stacker	1			A complete set.
2	Accessory box	1			Technical documents, accessories and spare parts.

Note: 1. The following documents are in the file bag:

- ① Operation manual of ERSP Fork Reach Stacker 1 volume
- ② Packing list 1 copy
- ③ Qualification certificate 1 copy

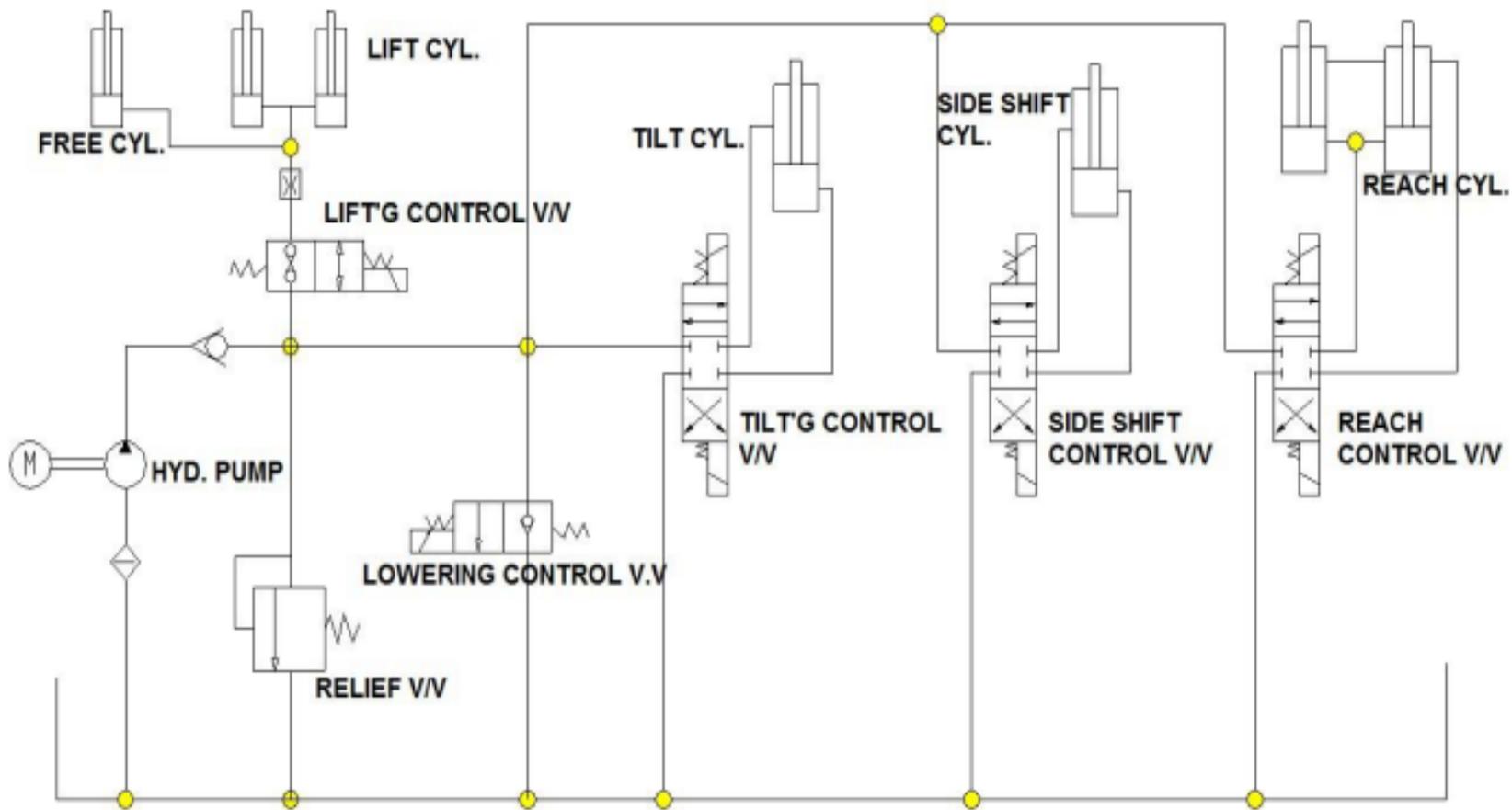
2. Accessories and spare parts

No.	Name	Use position	Type & specification	Quantity	Remarks
1	Key to the electric lock	Unlock the electric lock		2	
2	Charging plug and socket	Matched with the charger		1 set	
3	Fuse	Electric equipment	10A	1	
4	Fuse	Electric equipment	160A	1	
5	Sealing ring	Lifting oil cylinder	UHS38	1	
6	Sealing ring	Tilting oil cylinder	UHS30	1	
7	Sealing ring	Tilting oil cylinder	UHS63	1	
8	Sealing ring	Reach oil cylinder	UHS28	1	
9	Sealing ring	Reach oil cylinder	UHS40	1	

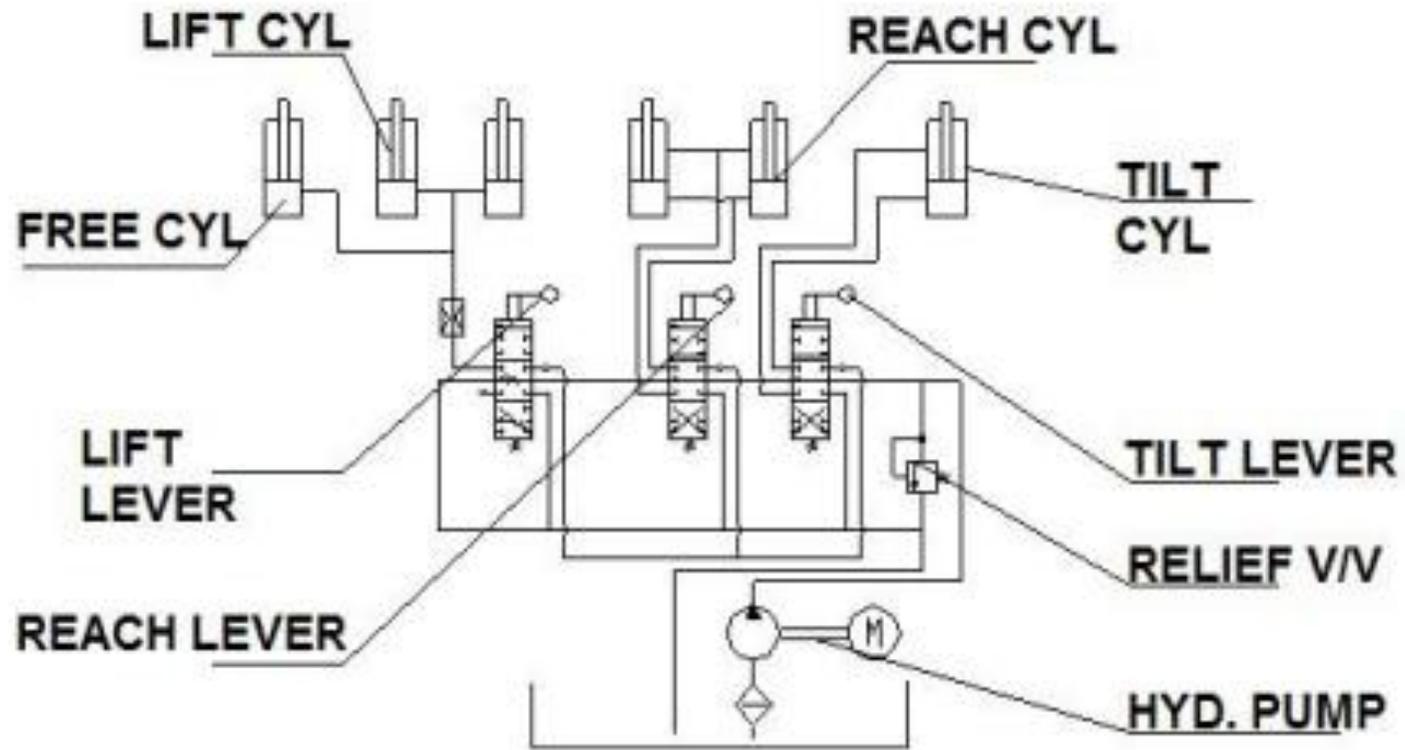
Consigner: Ningbo Ruyi Joint Stock Co., Ltd

Appendix I: Hydraulic schematic diagram of Solenoid valve

### HYDRAULIC SCHEMATIC



Appendix II: Hydraulic schematic diagram of multi way valve



### Appendix III: Electrical schematic diagram

