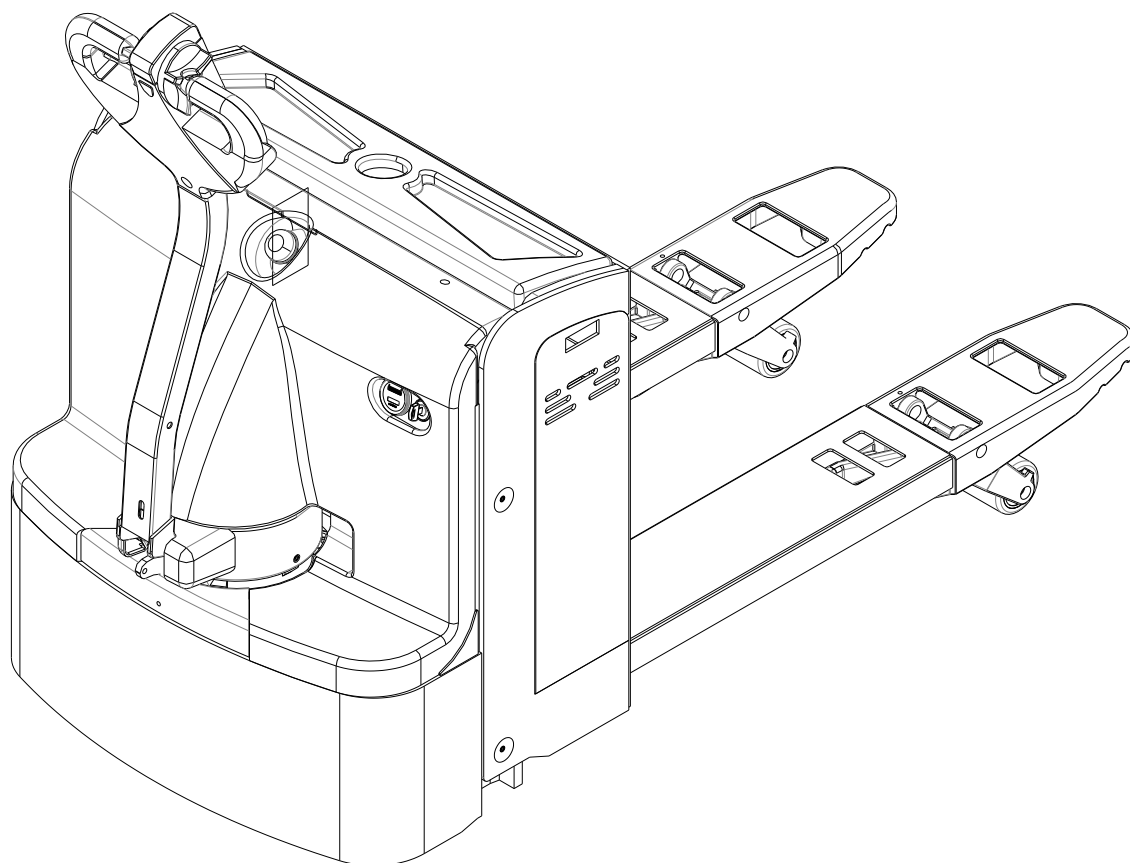


20EP

- Operation manual
- Service Manual



- We hope our electric pallet truck 20EP will provide great convenience for your work! Please read the manual carefully before operation。
- This manual is universal manual. We reserve the right to modify technology of the electric stacker. If there is anything in the manual that is not consistent with the actual stacker, the actual stacker should be considered correct and the manual is only for reference。

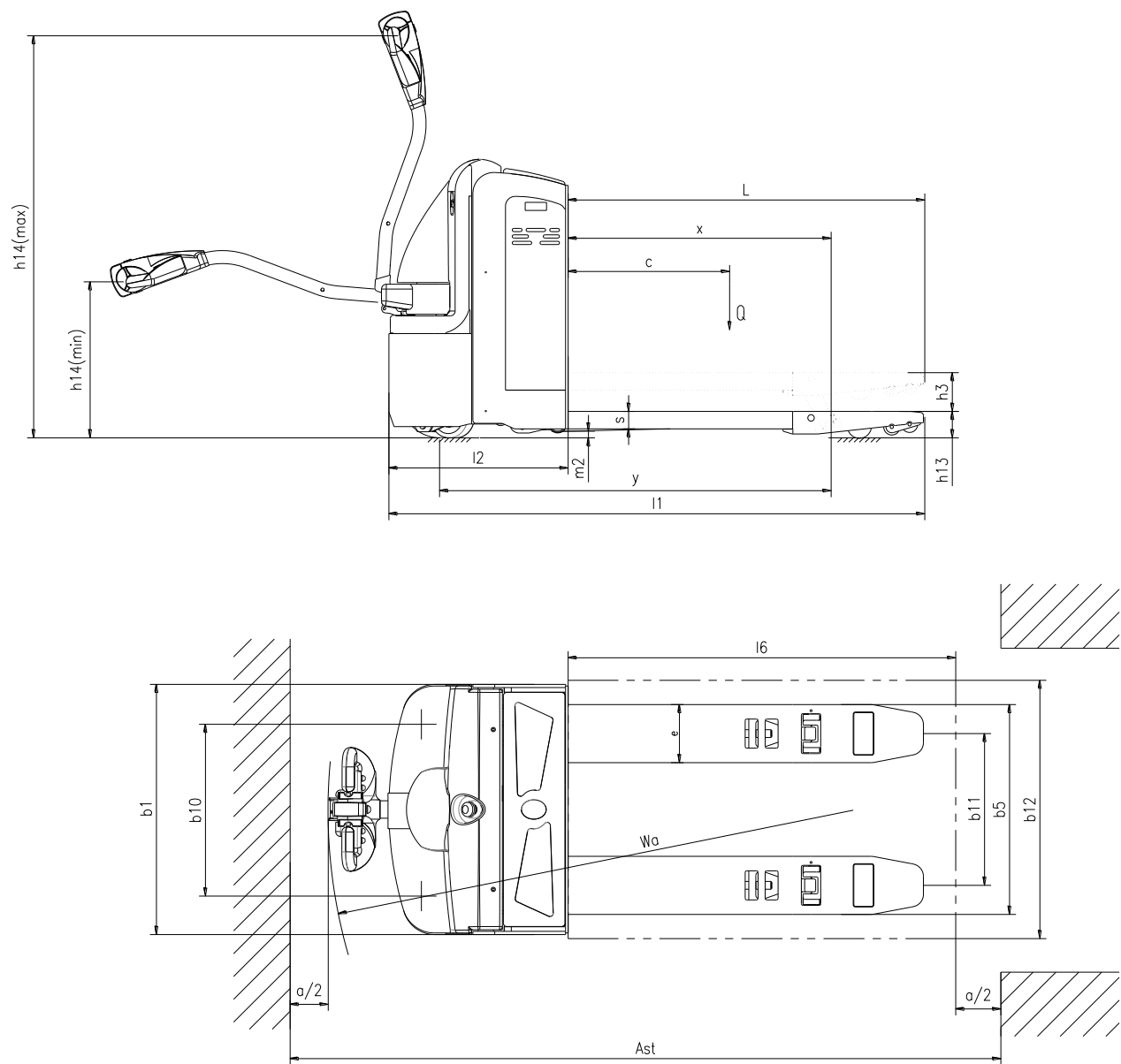
Warning

Operator of the truck must strictly follow ISO 3691“Safety Specification for Industrial Vehicles” and it is prohibited for untrained people to operate the truck.

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1. Contour diagram



2. Brief technical parameters(Electric Pallet Truck)

Characteristics	1.1	Manufacturer		HCE
	1.2	Model		20EP
	1.3	Driving model		Electric
	1.4	Driving model (Manual, Walking, Stand driving, seat driving ,Order picking)		Walking
	1.5	Rated load	Q(kg)	2045
	1.6	Load center distance	c(mm)	600
	1.8	Axle center to fork face	x(mm)	815/865/935
	1.9	Tread	Y(mm)	1211/1261/1331
weight	2.1	Service weight(with battery)	kg	620
	2.2	Axle load, front/rear, laden	kg	1170/1450
	2.3	Axle load, front/rear, unladen	kg	470/150
Chassis	3.1	Wheels (rubber, high elasticity, pneumatic tire, polyurethane wheel)		polyurethane
	3.2	Wheel dimension, front		Φ 250×70
	3.3	Wheel dimension, rear		Φ 82×126
	3.4	Additional wheel(dimension)		Φ 127×57
	3.5	Wheel number, front/rear (x = driving wheel)		1X+2/2
	3.6	Tread, front	b ₁₀ (mm)	510
	3.7	Tread, rear	b ₁₁ (mm)	340/370/470/505
Dimension	4.4	Lift height	h ₃ (mm)	120
	4.9	Min./Max. height of operation handle in the driving position	h ₁₄ (mm)	780/1230
	4.15	Height, lowered	h ₁₃ (mm)	82
	4.19	Overall length	l(mm)	1655/1705/1775
	4.20	Length to fork face	l ₂ (mm)	555
	4.21	Overall width of truck body	b ₁ (mm)	775
	4.22	Fork dimension	S/e/l(mm)	54×180×1100 (1150/1220)
	4.25	Fork width	b ₅ (mm)	520/550/650/685
	4.32	Wheelbase ground distance	m ₂ (mm)	28
	4.33	Aisle width, with pallet 1000x1200 crosswise	A _{s1} (mm)	2015/2065/2135
	4.34	Aisle width, with pallet 800x1200 lengthwise	A _{s2} (mm)	2115/2115/2135
	4.35	Turning radius	W _a (mm)	1400/1450/1520
Performance Data	5.1	Traveling speed, laden/unladen	Km/h	5.5/5.6
	5.2	Lifting speed, laden/unladen	m/s	0.039/0.056
	5.3	Descending speed, laden/ unladen	m/s	0.064/0.050
	5.7	Grade ability, laden/unladen	%	6/12
	5.8	Max. grade ability, laden/unladen	%	8/20
	5.10	Traveling brake		Electromagnetic brake
Motor	6.1	Driving motor power	kW	1.2
	6.2	Lifting motor power	kW	1.2
	6.4	Battery voltage/rated capacity	V/Ah	24/165 (210)
	6.5	Battery weight	Kg	170
		Battery dimension (LXWXH)	mm	750×170×474 (534)
	8.4	Noise level at operator's ear, according to DIN12053	dB(A)	70

3. Applications

20EP electric pallet truck , adopts storage batteries as the dynamic source and a AC motor as the driver, traveling through gear transmission. The lifting of the fork relies on the DC motor and the hydraulic transmission system. The up-and-down movement of the oil cylinders lifts the fork and the goods. As the traveling and lifting of the stacker are electrically driven, it possesses the characteristics of energy saving, high efficiency, stable operation, easy operation, safe and reliable, low noise and no pollution, etc.

Environment for application:

- a. Elevation no more than 1200m;
- b. Ambient temperature no higher than +40°C and no lower than -25°C;
- c. When the ambient temperature reaches +40°C, the relative humidity should not exceed 50%; at a lower temperature, higher relative humidity is allowed;
- d. Hard and level ground.
- e. It is prohibited to use the truck in a flammable, explosive or corrosive environment with acid and alkali.

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

The truck mainly consists of electric drive wheel, steering assembly, front frame, back frame, lifting oil cylinder, hydraulic station, electric control system, connecting rod wheel supporter and balance wheel, etc.

5. Use and operation instructions

The truck adopts storage batteries as the power supply for goods handling and stacking and a AC motor as the power source .to drive the truck and lift goods. Correct use and operation will bring you great convenience in your work but incorrect use and operation will damage the truck and bring you and your goods danger.

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? The trucks with problems are prohibited for operation. .

5.1.2 Check if there is any electric power in the batteries with the method indicated in Fig.I. Pull the general power switch out to turn on the general power supply, unlock the electric lock on the handle, check the electric energy meter on the instrument panel of the truck. If the zero end grid is bright,

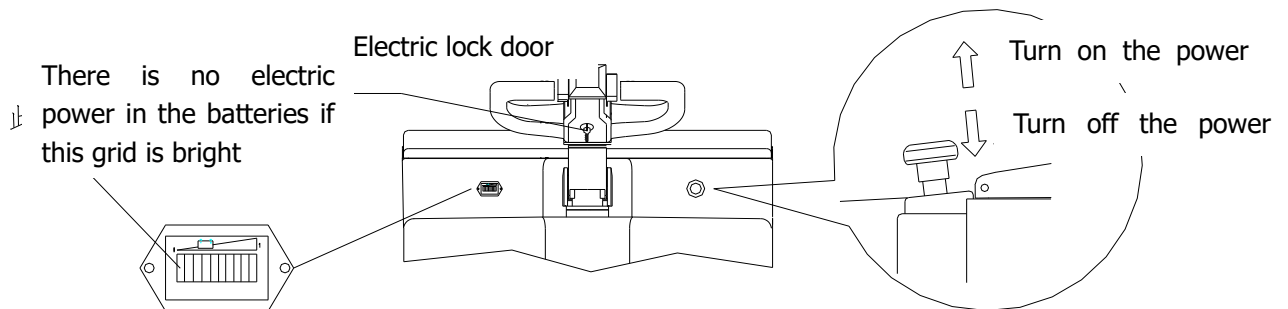


Fig I

it indicates there is no electric power in the batteries and charging should be conducted at once. It

is prohibited to operate the truck without electric power as that will greatly reduce the service life of the batteries and even damage the batteries.

- 5.1.4 Check if the truck brake is normal. Check the lifting, dropping, forward and backward traveling of the truck to see if the actions are normal. Check if the emergency reverse action of the truck is normal with the method indicated in Fig.II:

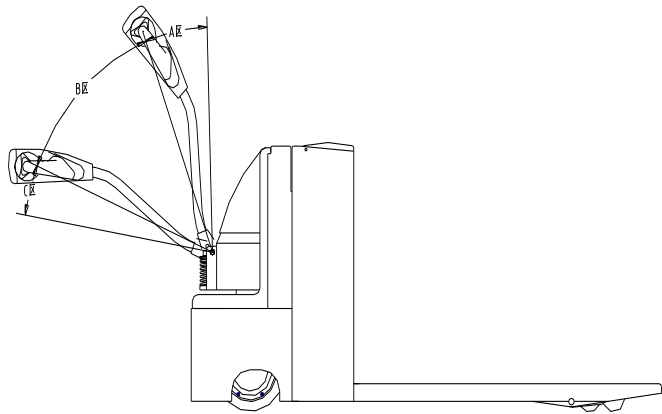


Fig II

Move the control handle to division A or division C as indicated in Fig.II and press the rise/lowering button

on the control handle to see if the lifting and lowering of the fork is normal.

Move the control handle to division B as indicated in Fig. II slowly start the truck and press the handle to the horizontal position to see if the truck can travel or brake normally.

Move the handle to division B as indicated in Fig. II and press the emergency reverse switch button on top of the control handle to see if the truck can travel forward.

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

5.2 In operation:

- 5.2.1Note: A side-magnetic brake is installed on the shaft end of the drive wheel motor and there is a cam and a fine motion switch installed on the rotary shaft of the rotary arm. Only the rotary arm is at $30^\circ \pm 20^\circ$ (as indicated in Fig.II), the truck can get power and operate. Larger or less than the angle, the stacker has no power and is braked. In that case, the truck can lift goods. When lifting goods, the truck cannot travel. As indicated in Fig.II, when the control handle is in division A or division C, the truck can only lift or lower but not travel; when the control handle is in division B, the truck can travel, lift as well as lower. The operation position of the handle will not be specially described in the following descriptions, i.e. the handle must be in division A or C when the truck lifts or lowers and it must be in division B when the truck is traveling

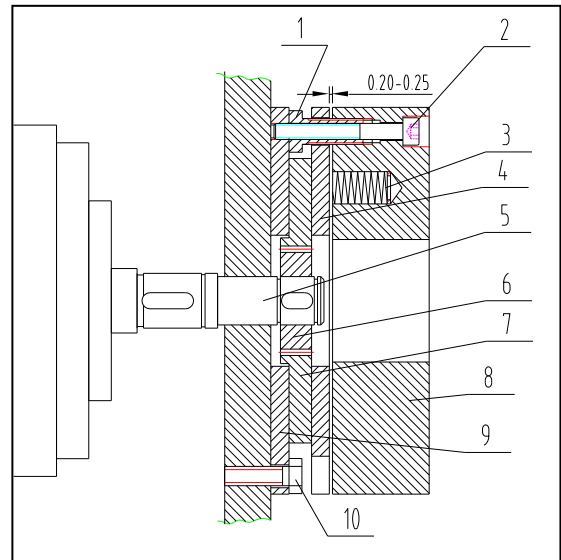
5.2.2 Operation of handling

As indicated in Fig.I, pull out the general power supply switch, unlock the electric door lock. Control the travel knob, the truck moves forward when the knob point forward, and backward when the knob backward. After start, rotate the knob slowly whether it is with or without load to reach the rated speed smoothly. Move the truck near the goods pile (the head of the fork is 30cm from the goods piles). Press the lowering button, adjust the height of the fork to a proper position, insert the fork slowly and as deep as possible into the pallet of the goods. Press the lifting button till the fork is $\geq 30\text{cm}$ from the ground. Stop lifting, move the truck to the desired location and then press the lowering button after the truck stops. After the fork is completely away from the pallet, drive the truck away from the pallet. The handling operation is finished

5.2.3Adjustment of the brake clearance

- ① Hollow screw
 - a) Fitting screw
 - b) Spring
 - c) Armature

- d) Motor shaft
- e) Spline housing
- f) Friction plate
- ⑧ Electromagnetic coil
- ⑨ Mounting cover plate
- ⑩ Mounting screw



The brake structure is indicated as the Fig on the right. After being used for a while, the performance of the brake may decline with the wearing of the brake block or the brake plate can't be released. At this time, it is necessary to adjust brake clearance. As indicated in the figure on the right, in braking status, use a feeler to check the gap between the brake block and electromagnet, if the gap is more than 0.5mm, then it needs adjustment. Before adjustment, clean the dirt and dust on the friction plate. When adjusting, loosen the fixed screw 2, adjust the length of set screw 1, then fasten the retention screws, after adjustment, the clearance between the brake block and electromagnet should be fixed from 0.2~0.3mm. It has to be noted that even adjustment for three retention screws can make even clearance gap between the brake block and electromagnet after adjustment. After the adjustment, turn on the brake with 24v DC power. Then the brake will make clear sound.

- Be alert to obstacles when the truck travels. Slow down at turns.
- Switch off the power immediately when the truck is out of control to cut off the power supply.
- There is quick advance switch on the top of the handle assembly. The truck will advance quickly in a reverse direction when it is moving backward after pressing the switch in case of emergency.

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. Never use a truck with trouble to ensure safety and to prolong the service life of the truck.

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 truck body and the surface of the storage battery and to examine the firmness of the power supply cable.

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; 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 performed promptly.

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, and examine the firmness of the fixing fittings, the flexibility of the wheels, as well as whether the forks can be lifted and lowered normally. Clean the dirt and dust on the friction plate of electromagnetic arrester and adjust the

clearance to the proper distance. The operation noise of the truck should be no more than 70dB after maintenance.

b. Maintenance for hydraulic system: Once half a year. 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°C) in tropical areas and 1.26 (at 25°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. Examine if the connections of the electrical devices are reliable, the switches are normal and the insulation is ok (The insulation resistance between the electrical devices and the truck body should be above $0.5\text{M}\Omega$). Clean the dirt, dust, and carbon fouling of motor. Meanwhile check the wearing condition of the electric brush and replace it if necessary.

7. Common faults and trouble shooting

No.	Faults	Cause	Shooting
1	The truck can't be started. (The contacts do not work.)	①The fuse of the control circuit is burn out.	Replace
		②The power switch contact is bad or damaged.	Repair or replace
		③ The fuse of the major circuit is broken.	Replace
		④ The contact of the electric lock switch is bad or broken.	Repair or replace
		⑤ The connection of the storage batteries is loose or has fallen off.	Tighten
	The truck cannot be started (The contacts work.)	① The side-magnetic brake of the drive wheel does not suck and the truck 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 truck 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 truck can not stop while traveling	Broken contact. The moving contact cannot be reset.	Cut off the power at once and replace the contact

4	The brake does not work	① The erection bolt of the fine motion switch looses or is damaged.	Adjust or tighten the bolt or replace the fine motion switch.
		② The connecting wire of the side-magnet brake is loose or the side-magnetic brake is damaged	Tighten the bolt or repair the side-magnet brake.
		③ The moving plates of the side-magnetic brake is loose or damaged.	Replace the braking plates.
5	The steering has got stuck	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 got stuck because of foreign matters.	Clean or replace the bearing
		② There is clearance in the bearing installed or the fixing ring has come off.	Reinstall the ring. Adjust the clearance.
		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 operation 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 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 after rising	The electromagnetic valve is out of control	Shoot the trouble
9	Reduced voltage of the storage battery (after charged)	① Individual battery is damaged.	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 ± 0.005 (25°C) and a temperature of lower than 30°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 penetrates into the pores of the polar plates and the baffles, the batteries should be placed still for 3-4 hours, not exceeding 8 hours. The initial charging can only be conducted when the temperature of the solution reduces to below 35°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 (25°C) 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°C

D_t : the actual density of the electrolytic solution at a temperature of t °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 group 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 ($12 \times 2.4V = 28.8V$), 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°C and when it is close to 45°C, the charging current should be reduced by 50% or the charging should stop temporarily. Wait till the temperature reduces to 35°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 ($12 \times 2.6V = 31.2V$), the variation of the voltage is no greater than 0.005 (V); the density of the electrolytic solution reaches 1.080 ± 0.005 (25°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 $1.7V \times 12 = 20.4V$). 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 20A and that of the second stage is 10A. The charging method is the same as that of initial charge. The charged volume is 130-140 % of the discharged volume and the charging time is about 12 hours

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

The "lag-behind" batteries--- batteries with a voltage lower than that of the other batteries in the discharging process and the batteries having been repaired for failure. (When 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.).

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

c. 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:

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 electrolytic solution, the current should be reduced by 50% (2A) and continue to charge.

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

d. Stop 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:

a. No direct sunshine on the batteries and at least 2m away from heat source.

b. Avoid contacting with any harmful substances. No metallic matters are allowed to drop into the batteries.

c. The batteries should not be placed upright down and should not be impacted mechanically or heavily compressed.

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 electrolytic solution 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

SN	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 个	
4	Fuse	Electric equipment	100A	1 个	
5	Fuse	Electric equipment	200A	1 个	
6	Sealing ring UHS35	Oil cylinder	35X45X6	2	
7	O type sealing ring	Oil cylinder	35.5×2.65	2	
8	O type sealing ring	Oil cylinder	45×2.65	2	
9	Dustproof ring DH35	Oil cylinder	DH35	2	

10. Packaging & transportation

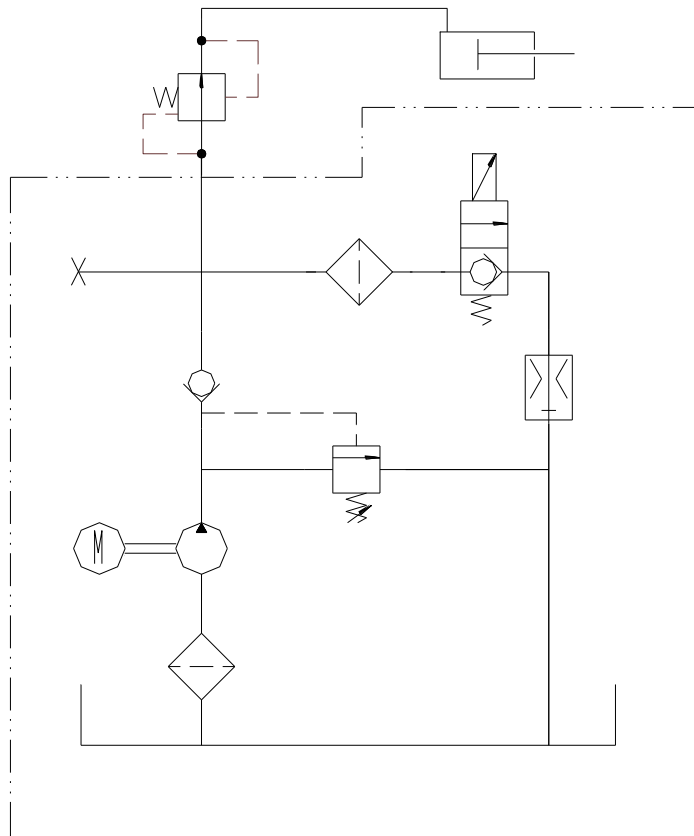
The truck is packed with a tray. During transportation, turnover and upside-down are not allowed. Collision is not allowed when lifting and loading onto the truck. Do not damage the outward surface of the truck when opening the package.

11. Warning (points for attention)

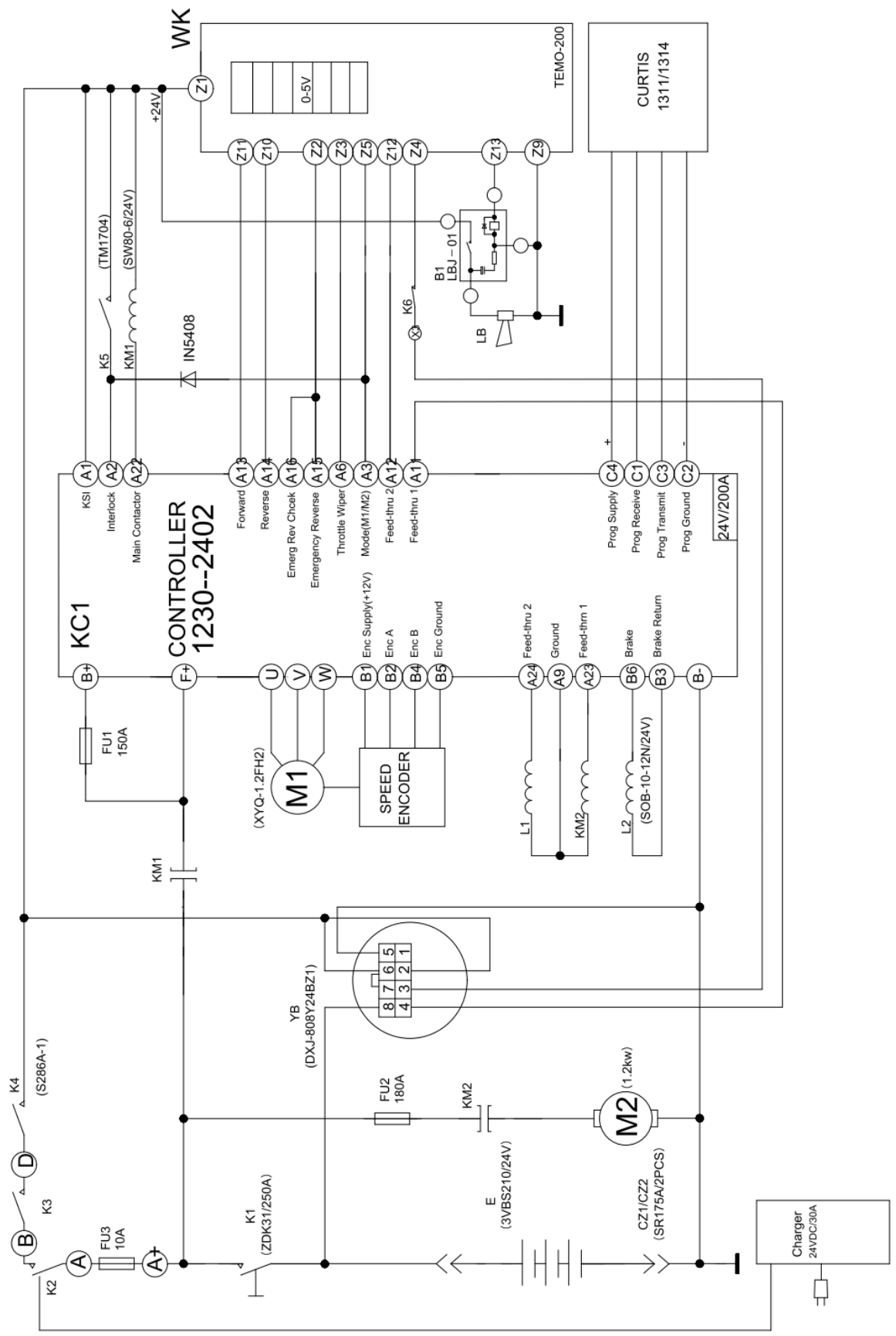
- 11.1 Read the manual carefully before operation and know well the performances of the truck.
- 11.2 It is strictly forbidden to press the lift or lower buttons while the truck is walking and frequently switching the two buttons, which might damage the truck and the goods.
- 11.3 Do not shake the lever rapidly or with high frequency.
- 11.4 It is not allowed to rapidly put heavy goods onto the forks.
- 11.5 The truck should not be overloaded. When overloaded, the truck 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 strictly 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 strictly 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 Repairing on one's own before training is forbidden.
- 11.15 Operation of the truck under the stipulated voltage 20.4V is strictly forbidden.
It is strictly forbidden to directly connect the plug with AC power supply for charge.

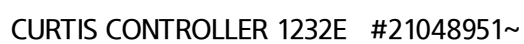
12. Structure diagram of the major parts

- "The principle diagram of hydraulic system"
- "The principle diagram of electrical system"



The principle diagram of hydraulic system





13. Packing list

Packing List of Electric Pallet Truck

Consignee:

Ex-work No.:

Contract No.:

Ex-work date:

SN	Name	Quantity	Net weight	Dimension (L×W×H)	Remarks
1	electric pallet truck	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 Electric Pallet Stacker | 1 volume |
| ② Packing list | 1 copy |
| ③ Qualification certificate | 1 copy |
| 2. Accessories and spare parts | |

SN	Name	Use position	Type & specification	Quantity	Remarks
1	Key to electric lock	Unlock the electric lock		2	
2	Charging plug and socket	Matched with the charger		1 set	With no charger for built-in type
3	Fuse	Electric equipment	10A	1	
4	Fuse	Electric equipment	100A	1	
5	Fuse	Electric equipment	200A	1	
6	Sealing ring UHS35	Oil cylinder	35X45X6	2	
7	O type seal ring	Oil cylinder	35.5×2.65	2	
8	O type seal ring	Oil cylinder	45×2.65	2	
9	Dustproof ring DH35	Oil cylinder	DH35	2	